

ORIGINAL ARTICLE

## AGE, EDUCATIONAL LEVEL AND THE CONSUMPTION OF MEDICAL CARE: EVIDENCE FROM MALAYSIA

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### ABSTRACT

*The present study examines age and educational level determinants of the consumption of medical care using data from Malaysia. A nationally representative data with a large sample size (n = 14838) was used for analyses. Several important findings are noteworthy. First, age and educational level are positively associated with the consumption of medical care. Second, the impact of educational level on the consumption of medical care varies across age. Third, there is no diminishing marginal effect of educational level on the consumption of medical care. Findings of the present study suggest that age and educational level play an important role in determining the consumption of medical care. When designing policies to improve population well-being, consideration should be given to the effects of age and educational level on the consumption of medical care. It is important for policymakers to understand which age group and educational level of people are more or less likely to use medical care. The present study offers a better understanding of the effects of age and educational level on the consumption of medical care and assists policymakers in developing more effective intervention measures to improve population well-being.*

**Keywords:** age; consumption; demographics; education; medical care

### INTRODUCTION

In general, health can be defined as a condition of being free from any physical and mental illnesses. Medical care refers to the supply of a medical doctor or other healthcare professional services for a person's health and well-being, whilst the consumption of medical care refers to the use of services provided by medical doctor or other healthcare professional. The relationships between the consumption of medical care and age, and educational level discussed in Grossman<sup>1</sup> model have widely been studied and tested using data from developed countries.<sup>2-15</sup> The types of medical care which have been investigated include medical screening, physician visits, outpatient, vaccine and drugs. Using different data, variables and statistical methods, some studies found that age was positively associated with the medical care consumption,<sup>14,16</sup> while others evidenced otherwise.<sup>2,6-10,12,15</sup> In terms of educational level, findings of some studies suggested a positive relationship between educational

level and the utilization of medical care,<sup>2,4,5,9,10,13,14</sup> whereas others suggested a negative relationship.<sup>7,12,16</sup>

To date, there have been only a few studies related to age and educational level determinants of the consumption of medical care conducted in developing countries, such as China<sup>16,17</sup> and some African countries.<sup>18,19</sup> In Malaysia, while there appears to be study examining sociodemographic factors associated with medical screening, such as ethnicity, employment status and insurance ownership,<sup>20-23</sup> hardly any special attention has been paid to the effects of age and educational level on the medical care consumption in great detail. Therefore, the associations between the consumption of medical care and age, and educational level remain poorly understood. Furthermore, previous studies did not use a nationally representative data for analyses because they only focused on certain cohorts of population, i.e., females and the elderly.<sup>20-23</sup>

Three research questions arise. First, how do age and educational level affect the decisions of people to consume medical care? Second, is the effect of educational level on medical care consumption significant and varied across age? In other words, does educational level play a more important role in affecting the consumption of medical care among older people than younger people? Third, are there diminishing marginal effects of educational level on the consumption of medical care? The objective of the present study is to answer these three questions using Malaysian data, so that a true understanding of the associations between age, educational level and the consumption of medical care can be gained.

The present study is the first to our knowledge to examine the influences of educational level on the consumption of medical care across various age groups of population in Malaysia. Efforts have been made to stratify the multiple regressions on the consumption of medical care by age categories. In addition, we use a rigorous statistical method to identify the independent relationships between the consumption of medical care and age groups, and educational levels. Moreover, different from previous studies,<sup>20-23</sup> we use a large nationwide data for analyses, thus important findings can be generated.

The contributions of the present study to the literature and policy development are two-fold. First, this study examines the effects of age and educational level on the consumption of medical care in a fast-growing developing country, i.e., Malaysia, in great detail. As pointed out by Boutayeb,<sup>24</sup> burdens of diseases are heavier in developing countries than in developed countries. Therefore, a better understanding of the role of age and educational level in the medical care consumption is important for policymakers. If the objective of improving population well-being is to be met, it is mandatory to understand whether old/young and well-educated/less-educated people consume more/less medical care.

Second, the risk of developing diseases increases with age, and so does the consumption of medical care. We make an effort to analyse the association between educational level and the consumption of medical care at several age groups. In particular, we stratify the analyze by age group to compare the effects of educational level on the medical care consumption at a different age. Additionally, we take into

account of the effects of sociodemographic factors other than age and educational level on the consumption of medical care in order to prevent omitted variable issue. These factors include income, gender, household size, marital status and household location, which are expected to affect the consumption of medical care as well. Given that income determines financial capability, it can influence the consumption of medical care.<sup>21-23</sup> Gender, marital status and household size affect the consumption of medical care via household commitment.<sup>22</sup> Of note, the access to medical care varies across levels of urbanization, thus household locality may affect the consumption of medical care.<sup>22</sup>

The effect of educational level on the consumption of medical care across age has not been studied thoroughly. A somewhat similar study has been conducted by Kaestner et al.<sup>25</sup>, who examined health, instead of the medical care consumption. The authors extended the theory of Grossman<sup>1</sup> and found that the effect of educational level on health was not constant over lifecycle. Educational level appeared to have a small impact on health when individuals were young, especially when their rate of depreciation of health was low. In terms of mortality, the effect of educational level on health became large when individuals reached the age of 60. Moreover, the effect of educational level on health among individuals who had obtained secondary- or tertiary-level education was more apparent than those who had obtained primary-level education only.

## THEORETICAL FRAMEWORK

Our hypotheses are formed based on the theory of Grossman.<sup>1</sup> The theory states that age and educational level play an important role in affecting the consumption of medical care given that the medical care consumption is an investment. The function of the consumption of medical care can, thus, be expressed as:

$$M_t = f(A_t, E_t, O_t) \quad (1)$$

where  $M$  is the consumption of medical care,  $A$  is age,  $E$  is educational level and  $O$  is other sociodemographic factors, such as marital status, income and gender. Our purpose is to test this model and analyze how  $A$  and  $E$  affect  $M$ .

The depreciation rate of health increases with age. Hence, our first hypothesis is that older

individuals will consume more medical care than younger individuals:

$$\frac{\partial M}{\partial A} > 0$$

Our hypothesis is made in the light of the fact that health depreciation happens in older individuals is likely to be attributable to diseases, which have to be treated by consuming medical care rather than exercises and a healthy diet.

Educational level improves the productive efficiency of the medical care consumption. In other words, well-educated individuals are more efficient at using medical care than less-educated individuals because they have better understanding skills and knowledge. For each unit of medical care consumed, well-educated individuals will reap more benefits compared with their less-educated counterparts. Educational level is, therefore, anticipated to have a positive effect on the consumption of medical care. This is our second hypothesis:

$$\frac{\partial M}{\partial E} > 0$$

Educational level improves the output of consuming medical care more than the output of exercise or a healthy diet, thus the effect of educational level on the consumption of medical care varies across age.<sup>25</sup> The fact of the matter is that older individuals tend to consume medical care, while younger individuals are likely to engage in exercise or adopt a healthy diet. Therefore, the marginal effect of educational level on the consumption of medical care may be small when individuals are young, but it may become large when individuals are old. As such, we form the third hypothesis that the marginal effect of educational level on the medical care consumption increases with age:

$$\frac{\partial^2 M}{\partial E \partial A} > 0$$

if the analysis is stratified by age group, the notation can be rewritten as:

$$\left(\frac{\partial M}{\partial E}\right)_A < \left(\frac{\partial M}{\partial E}\right)_{A+1} < \left(\frac{\partial M}{\partial E}\right)_{A+2} < \dots < \left(\frac{\partial M}{\partial E}\right)_{A+n}$$

where marginal effect of educational level in older age group is higher than the marginal effect in younger age group.

According to the law of diminishing marginal returns, we assume that the marginal effect of educational level on the medical care consumption is larger among less-educated individuals than well-educated individuals. Hence, our fourth hypothesis is that the marginal effect of educational level on the consumption of medical care reduces with level of education. In other words, there is a diminishing marginal effect of educational level on the consumption of medical care:

$$\frac{\partial^2 M}{\partial E^2} < 0$$

if educational level variable is categorical instead of continuous, the notation can be rewritten as:

$$(M_E - M_{E+1}) > (M_{E+1} - M_{E+2}) > \dots > (M_{E+n-1} - M_{E+n})$$

where the difference in the consumption of medical care between less- and moderately-educated individuals is greater than the difference between moderately- and well-educated individuals.

## METHODOLOGY

### Data

The present study used secondary analysis of the Malaysia Household Expenditure Survey (HES) 2014.<sup>26</sup> The HES 2014 was a nationwide cross-sectional study conducted by the Department of Statistics Malaysia. It contained a large sample size (n = 14838). The purpose of the HES 2014 was to investigate the overall expenditure pattern among Malaysian households. Two-stage stratified sampling was used. In the first stage, the selection was based on the Enumeration Blocks (EBs) designed for the Malaysian Population and Housing Census. The EBs were divided into urban ( $\geq 10000$  population) and rural ( $< 10000$  population) areas. In the second stage, households in the selected living quarters (LQs) were surveyed. In particular, each EB comprised 80 to 120 LQs. Exclusion criteria were households staying at residential institutions, such as hotels, hostels, hospitals, welfare homes and prisons. During the survey, face-to-face interview was conducted by trained staff. The HES 2014 had the details of sociodemographic profiles and expenditures on various items. Although the HES 2014 was not a longitudinal data, we could make use of it to achieve our research objectives.

### Variables

In order to measure the consumption of medical care, we used monthly out-of-pocket expenditure on medical care [in Ringgit Malaysia (RM)] as the dependent variable. The types of medical care consisted of pharmaceutical products, medical equipment, outpatient services and inpatient services. The main independent variables used in the present study were age and educational level.

Age was categorized into five categories:  $\leq 29$  years, 30-39 years, 40-49 years, 50-59 years and  $\geq 60$  years. Educational level was determined based on the years of schooling a person has attained: primary ( $\leq 6$  years of schooling), secondary (7-11 years) and tertiary ( $\geq 12$  years). To facilitate comparisons, the youngest age group ( $\leq 29$  years) and the lowest educational level (primary) were selected as the reference category for age and educational level variables, respectively. There were two main advantages of forming age and educational level as categorical variables. First, a better knowledge of which age and educational level groups of people consumed more or less medical care could be obtained. Second, it allowed for non-linear relationships between the medical care consumption and age, and educational level variables.

Other sociodemographic variables, such as gender (male, female), monthly income ( $\leq$ RM 1499, RM 1500-2999, RM 3000-4499, RM 4500-5999, RM 6000-7499,  $\geq$ RM 7500), household size [small ( $\leq 4$  members), medium (5-7), large ( $\geq 8$ )],<sup>27</sup> marital status (single, married, widowed/divorced) and location of household (urban, rural) were used as control variables. These variables were selected in the light of the findings of previous studies related to sociodemographic factors associated with the consumption of medical care.<sup>2-15</sup>

### Statistical analyses

Descriptive statistics of all the independent variables were calculated. In terms of bivariate analysis, age and educational level differences in average monthly expenditure on medical care were analyzed. In order to examine the independent effects of age and educational level on the medical care consumption, we regressed medical care expenditure on age, educational level and other sociodemographic variables. The multiple regression model could be written as:

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_{17}x_{17} \quad (2)$$

where  $y$  = monthly expenditure on medical care;  $\beta$  = estimates;  $x_1$  = 30-39 years;  $x_2$  = 40-49 years;  $x_3$  = 50-59 years;  $x_4$  =  $\geq 60$  years;  $x_5$  = secondary;  $x_6$  = tertiary;  $x_7$  = RM 1500-2999;  $x_8$  = RM 3000-4499;  $x_9$  = RM 4500-5999;  $x_{10}$  = RM 6000-7499;  $x_{11}$  =  $\geq$ RM 7500;  $x_{12}$  = male;  $x_{13}$  = medium;  $x_{14}$  = large;  $x_{15}$  = married;  $x_{16}$  = widow/divorce;  $x_{17}$  = urban. Equation (2) was formed by specifying a functional form to equation (1).

We used ordinary least square (OLS) to estimate the regression. OLS was used by previous studies to estimate the use of medical care.<sup>12-14</sup> In an effort to ensure that the model was well-specified, we estimated a restricted model for comparison. Model 1 was a restricted model, while Model 2 was a non-restricted model. The exclusion restrictions were all other sociodemographic variables. This helped to determine whether other sociodemographic variables should be included in the multiple regression. In addition, we performed the White test to detect plausible heteroskedasticity issue.<sup>28</sup>

Additionally, regression was stratified by each age group. Age variables used in these stratified regressions were continuous, instead of categorical. In order to allow for a non-linear relationship between age and the consumption of medical care in different age groups, age-squared was included. The stratified regression could, thus, be written as:

$$y = \beta_0 + \beta_1x_1 + \beta_2x_1^2 + \dots + \beta_{15}x_{14} \quad (3)$$

where  $y$  = monthly expenditure on medical care;  $\beta$  = estimates;  $x_1$  = age;  $x_2$  = secondary;  $x_3$  = tertiary;  $x_4$  = RM 1500-2999;  $x_5$  = RM 3000-4499;  $x_6$  = RM 4500-5999;  $x_7$  = RM 6000-7499;  $x_8$  =  $\geq$ RM 7500;  $x_9$  = male;  $x_{10}$  = medium;  $x_{11}$  = large;  $x_{12}$  = married;  $x_{13}$  = widow/divorce;  $x_{14}$  = urban.

### RESULTS

The majority of respondents aged 40-49 years (27.98%), followed by those aged 50-59 (23.61%), 30-39 (22.66%),  $\geq 60$  (16.29%) and  $\leq 29$  years (9.47%). The educational level breakdown consisted of 22% primary, 56.69% secondary and 21.30% tertiary. In terms of income, 7.65% had  $\leq$ RM 1499, 23.58% had RM 1500-2999, 21.48% had RM 3000-4499, 14.39% had RM 4500-5999, 9.54% had RM 6000-7499 and 23.36% had  $\geq$ RM 7500. A large proportion of the sample were males (84.78%). The majority had a small household size (57.69%),

were married (79.09%) and resided in urban areas (69.05%) (Table 1).

Individuals aged  $\geq 60$  years spent around RM 64 on medical care, whereas those aged  $\leq 29$  years spent only RM 44. Individuals in the age groups of 30-39 years, 40-49 years and 50-59 years spent around RM 52, RM 48 and RM 55 on medical care, respectively. On average, individuals with tertiary-level education spent approximately RM 85 on medical care, whereas those with secondary-level and primary-level education spent around RM 47 and RM 37, respectively. These significant age and educational level differences in the expenditure on medical care supported for the use of multiple regressions (Table 2).

The *F*-statistic for testing exclusion restrictions was highly significant, and this indicated that other sociodemographic variables had significant effects on the medical care consumption and should be included in the model. Moreover, the constant term in Model 1 was highly significant, suggesting that the model may have omitted variables. It appeared, therefore, that Model 2 fitted the data better than Model 1. Furthermore, result of White test for Model 2 implied that heteroskedasticity was not an issue (Table 3).

Compared with individuals aged  $\leq 29$  years, individuals aged 30-39, 40-49, 50-59 and  $\geq 60$  years spent approximately RM 10, RM 14, RM 26 and RM 46 more on medical care, respectively. If all other independent variables were held fixed, individuals with secondary-level and tertiary-level education spent around RM 17 and RM 55 more on medical care, respectively, compared with individuals having only primary-level education.

Among individuals aged 60 years and above, having tertiary-level education instead of primary-level education increased the medical care expenditure by about RM 89, whereas in the age group of 30-39, having tertiary-level education only increased the medical care expenditure by approximately RM 26. In the

age groups of 40-49 and 50-59, having tertiary-level education increased the expenditure on medical care by RM 52 and RM 66, respectively, which were larger than the effect evidenced at the age of 30-39 but smaller than the effect found at the age of  $\geq 60$ . Such differences indicated that as well-educated people aged, their consumption of medical care increased more than less-educated people (Table 4).

In the youngest age group ( $\leq 29$  years), individuals having tertiary-level education spent about RM 44 more on medical care than their counterparts having only primary-level education. This marginal effect of tertiary-level education was larger than the marginal effect evidenced in the age group of 30-39 (RM 26). It seemed that the effect of educational level on the medical care consumption, which was measured by the estimates of tertiary-level education variable in the regressions, reached its minimum at the age of 30-39, but increased after that age group (RM 52-88). Based on this finding, one could suggest that if young individuals ( $\leq 29$  years) were well-educated, they would allocate more resources for medical care than if they were less-educated, and such allocation may reduce as they reached the age of 30-39, but increased at the age of 40 years and above.

In the age groups of 40-49, 50-59 and  $\geq 60$ , having secondary-level education increased the monthly expenditure on medical care by about RM 16-22. However, in the age groups of  $\leq 29$  and 30-39, there was no significant difference in the medical care consumption between secondary-level and primary-level education. This meant that the effect of educational level on the consumption of medical care became more apparent when people aged. Among old individuals, even an increase of one level in education, the consumption of medical care rose significantly. Educational level seemed to play a more important role in promoting the use of medical care among older people than younger people.

Table 1. Descriptive statistics of independent variables

Variables	Percent	Frequency
<b>Age</b>		
≤29 years	9.47	1405
30-39 years	22.66	3362
40-49 years	27.98	4151
50-59 years	23.61	3503
≥60 years	16.29	2417
<b>Education</b>		
Primary	22.00	3265
Secondary	56.69	8412
Tertiary	21.30	3161
<b>Income</b>		
≤RM 1499	7.65	1135
RM 1500-2999	23.58	3497
RM 3000-4499	21.48	3186
RM 4500-5999	14.39	2135
RM 6000-7499	9.54	1415
≥RM 7500	23.36	3465
<b>Gender</b>		
Male	84.78	12580
Female	15.22	2258
<b>Household size</b>		
Small	57.69	8560
Medium	35.56	5277
Large	6.75	1001
<b>Marital status</b>		
Single	12.08	1793
Married	79.09	11735
Widow/divorce	8.83	1310
<b>Household location</b>		
Urban	69.05	10246
Rural	30.95	4592
Observations		14838

Source: Malaysian Household Expenditure Survey 2014

Table 2. Average monthly expenditure on medical care

Variables	Mean	Std. dev.	F-statistics <sup>#</sup>
Age			
≤29 years	44.46	135.38	6.24*
30-39 years	51.98	166.92	
40-49 years	48.12	131.82	
50-59 years	54.83	136.66	
≥60 years	64.22	147.27	
Education			
Primary	37.36	102.14	105.64*
Secondary	46.80	138.10	
Tertiary	84.96	187.43	

Note: \**p*-value<0.05. <sup>#</sup>test of equality of mean.

Source: Malaysian Household Expenditure Survey 2014

Table 3a: Factors associated with expenditure on medical care

Variables	Model 1	Model 2
Constant	10.338* (4.837)	4.628 (7.252)
Age		
≤29 years	Ref.	Ref.
30-39 years	8.141 (4.545)	10.327* (4.731)
40-49 years	10.220* (4.432)	13.639* (4.803)
50-59 years	22.970* (4.591)	26.358* (4.953)
≥60 years	41.423* (5.082)	45.944* (5.449)
Education		
Primary	Ref.	Ref.
Secondary	21.685* (3.211)	16.985* (3.284)
Tertiary	62.662* (3.897)	54.630* (4.055)
Income		
≤RM 1499	-	Ref.
RM 1500-2999	-	3.056 (4.873)
RM 3000-4499	-	3.562 (4.931)

Table 3b: Factors associated with expenditure on medical care

Variables	Model 1	Model 2
RM 4500-5999	-	1.263 (5.243)
RM 6000-7499	-	10.321 (5.687)
≥RM 7500	-	4.956 (4.878)
Gender		
Male	-	-4.381 (3.907)
Female	-	Ref.
Household size		
Small	-	Ref.
Medium	-	1.987 (2.627)
Large	-	-2.245 (4.852)
Marital status		
Single	-	Ref.
Married	-	-5.589 (4.161)
Widow/divorce	-	-14.554* (5.856)
Household location		
Urban	-	17.600* (2.662)
Rural	-	Ref.
<i>F</i> -statistics <sup>a</sup>	5.190	
<i>p</i> -value	<0.001	
White test <sup>b</sup>	99.080	
<i>p</i> -value	0.995	
Observations	14838	

Note: Ref. refers to reference category. \**p*-value<0.05. <sup>a</sup>*F*-statistics for exclusion restrictions. <sup>b</sup>test for Model 2. Standard errors in parentheses.

Source: Malaysian Household Expenditure Survey 2014



Table 4a: Factors associated with expenditure on medical care, by age group

Variables	Age				
	≤29	30-39	40-49	50-59	≥60
Constant	151.600 (273.240)	500.186 (461.187)	-477.579 (545.347)	-858.446 (931.617)	-16.254 (263.057)
Age	-15.879 (22.009)	-26.443 (26.868)	22.761 (24.582)	31.029 (34.387)	0.458 (7.438)
Age <sup>2</sup>	0.402 (0.440)	0.377 (0.389)	-0.255 (0.276)	-0.273 (0.317)	0.006 (0.052)
Education					
Primary	Ref.	Ref.	Ref.	Ref.	Ref.
Secondary	10.364 (15.627)	-6.746 (11.303)	16.668* (6.216)	21.999* (5.448)	16.315* (6.850)
Tertiary	43.899* (16.604)	26.189* (12.009)	52.052* (7.336)	65.892* (7.664)	88.748* (11.598)
Income					
≤RM 1499	Ref.	Ref.	Ref.	Ref.	Ref.
RM 1500-2999	-5.634 (15.736)	-0.259 (11.783)	3.733 (8.284)	9.026 (9.293)	4.472 (12.695)
RM 3000-4499	0.149 (15.998)	-6.333 (11.919)	13.578 (8.421)	-2.117 (9.356)	9.999 (12.821)
RM 4500-5999	5.949 (16.852)	-4.831 (12.656)	-1.255 (9.068)	9.901 (9.912)	-2.359 (13.512)
RM 6000-7499	31.872 (17.887)	10.350 (14.076)	0.656 (9.795)	19.866 (10.808)	-1.276 (14.379)
≥RM 7500	0.093 (15.685)	4.880 (11.734)	2.370 (8.364)	3.894 (9.241)	12.896 (12.776)
Gender					
Male	2.120 (9.182)	-10.080 (9.355)	-1.919 (7.546)	-2.659 (7.790)	-6.358 (10.257)
Female	Ref.	Ref.	Ref.	Ref.	Ref.
Household size					
Small	Ref.	Ref.	Ref.	Ref.	Ref.
Medium	27.708* (8.845)	15.137* (6.259)	-1.267 (4.423)	-7.305 (4.981)	-8.005 (7.863)

Table 4b: Factors associated with expenditure on medical care, by age group

Variables	Age				
	≤29	30-39	40-49	50-59	≥60
Large	4.963 (19.180)	13.374 (13.478)	-5.808 (7.543)	-15.850 (8.783)	11.739 (13.407)
Marital status					
Single	Ref.	Ref.	Ref.	Ref.	Ref.
Married	-15.370 (8.038)	-7.291 (7.919)	-16.607 (8.788)	9.382 (12.352)	-0.587 (19.345)
Widow/divorce	8.514 (27.769)	-6.601 (16.123)	-21.394 (11.565)	-6.810 (14.152)	-18.155 (19.600)
Household location					
Urban	8.873 (8.453)	21.616* (6.940)	18.180 (4.548)	8.863 (5.074)	28.390* (6.366)
Rural	Ref.	Ref.	Ref.	Ref.	Ref.
Observations	1405	3362	4151	3503	2417

Note: Ref. refers to reference category. \**p*-value<0.05. Standard errors in parentheses.  
Source: Malaysian Household Expenditure Survey 2014

## DISCUSSION

The present study used nationally representative data with a large sample size (n = 14838). The data allowed us to take into consideration various sociodemographic variables and stratify the regressions by age groups. Results of the present study could facilitate a comparison of the effects of age and educational level on the medical care consumption between a developing country and the empirical results for the developed countries. Findings of any differences or similarities could be a unique contribution.

Educational level was positively associated with the consumption of medical care, but the association was more apparent in the middle age group, i.e., aged 40 and above. For the age groups below 40, educational level did not have a huge impact on the medical care consumption. This evidence was of importance. Studies that did not consider the changes in the educational level effect across age and assumed the effect to be constant over time may reach an inappropriate conclusion. In addition, our findings suggested that a large proportion of the effect of educational level on the consumption of medical care occurred

when individuals had obtained tertiary-level education. Secondary-level education did not seem to have a strong effect, even though the effect was positive. Furthermore, there was also evidence suggesting that age and educational level were independently associated with the consumption of medical care. In other words, older and well-educated people consumed more medical care than younger and less-educated people, regardless of their sociodemographic profiles. Moreover, we found that the marginal effects of educational level on the consumption of medical care were larger than the marginal effects of age.

As expected, we found that older people consumed more medical care than their younger counterparts, which was consistent with the findings of some previous studies.<sup>10,11,14,16</sup> Furthermore, well-educated people consumed more medical care compared with less-educated people, even they had similar age and sociodemographic profiles. This finding lent support to our hypothesis and findings of previous studies that educational level was positively associated with the use of medical care.<sup>4,6,8-11,13,14</sup>

Comparing between age groups, well-educated people with older age consumed more medical care than well-educated people with younger age, which confirmed our hypothesis that educational level played a more important role in promoting the use of medical care among older people than younger people. In addition, the marginal effects of educational level on the medical care consumption, which were measured by differences in the expenditure on medical care between primary- and tertiary-level education, became larger when individuals aged, especially those in their 40s and onward. Previous studies that did not examine how the effect of educational level on the consumption of medical care varied across age may not offer insight into this phenomenon.

Educational level played a more important role in explaining the increase in the consumption of medical care than age factor. This meant that the marginal effect of educational level on the medical care usage was greater than the marginal effect of age. Although individuals consumed more medical care as they grew older, the consumption would not increase much if the individuals were less-educated. However, the marginal effect of tertiary-level education was about three to five times greater than the marginal effect of secondary-level education, which contradicted our hypothesis that the marginal effect of educational level on the consumption of medical care reduced with level of education. Moreover, the differences in the consumption of medical care were greater between tertiary and secondary than between secondary and primary. These implied that there was no diminishing marginal effect of educational level.

Findings of the present study provided policymakers with useful information on developing policies to promote the use of medical care in the community. If individuals could efficiently utilize medical care, their well-being would improve. Intervention measures that increased the consumption of medical care could be designed based on the impacts of age and educational level evidenced in the present study. If the consumption of medical care was to be increased, efforts to improve knowledge among adults, especially those aged 40 years and above and had low educational attainment were needed. Another important implication was that if the individuals' educational level could be improved, the individuals' demand for medical care would increase and

consequently, better improvement in well-being.

A limitation of the present study was that data used in the present study was cross-sectional and did not have causal design. Hence, the causal relationship between educational level and the medical care consumption, as well as changes in the medical care consumption over lifecycle could not be well-identified. Additionally, non-medical investment, such as participation in physical activity and adopting a healthy diet were not included for analyses. Thereby, we were unable to test the hypothesis of whether younger people were more or less likely to make non-medical investment than older people.

#### CONFLICTS OF INTEREST

The authors have no competing interests to declare.

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