



British Food Journal

Socio-demographic and lifestyle factors associated with nutrition label use among Malaysian adults

Yong Kang Cheah Foong Ming Moy Debbie Ann Loh

Article information:

To cite this document:

Yong Kang Cheah Foong Ming Moy Debbie Ann Loh , (2015), "Socio-demographic and lifestyle factors associated with nutrition label use among Malaysian adults", British Food Journal, Vol. 117 Iss 11 pp. 2777 - 2787

Permanent link to this document:

<http://dx.doi.org/10.1108/BFJ-01-2015-0001>

Downloaded on: 22 February 2016, At: 23:30 (PT)

References: this document contains references to 44 other documents.

To copy this document: permissions@emeraldinsight.com

The fulltext of this document has been downloaded 144 times since 2015*

Users who downloaded this article also downloaded:

Arianna Ruggeri, Anne Arvola, Antonella Samoggia, Vaiva Hendrixson, (2015), "Food behaviours of Italian consumers at risk of poverty", British Food Journal, Vol. 117 Iss 11 pp. 2831-2848 <http://dx.doi.org/10.1108/BFJ-12-2014-0417>

Meave Broderick, Agnes Bouchier-Hayes, Tracey Larkin, (2015), "The average Irish consumer a packaged food profile", British Food Journal, Vol. 117 Iss 11 pp. 2801-2813 <http://dx.doi.org/10.1108/BFJ-02-2015-0063>

Pi-Chuan Sun, Hsien-Long Huang, Fang-Yi Chu, (2015), "Factors instead of demographic characteristics related to nutrition label use", British Food Journal, Vol. 117 Iss 12 pp. 3024-3038 <http://dx.doi.org/10.1108/BFJ-04-2015-0160>



Perpustakaan
Sultanah Bahiyah

SULTANAH BAHYAH LIBRARY

Universiti Utara Malaysia

Access to this document was granted through an Emerald subscription provided by emerald-srm:394654 []

For Authors

If you would like to write for this, or any other Emerald publication, then please use our Emerald for Authors service information about how to choose which publication to write for and submission guidelines are available for all. Please visit www.emeraldinsight.com/authors for more information.

About Emerald www.emeraldinsight.com

Emerald is a global publisher linking research and practice to the benefit of society. The company manages a portfolio of more than 290 journals and over 2,350 books and book series volumes, as well as providing an extensive range of online products and additional customer resources and services.

Emerald is both COUNTER 4 and TRANSFER compliant. The organization is a partner of the Committee on Publication Ethics (COPE) and also works with Portico and the LOCKSS initiative for digital archive preservation.

*Related content and download information correct at time of download.

Socio-demographic and lifestyle factors associated with nutrition label use among Malaysian adults

Socio-demographic and lifestyle factors

2777

Yong Kang Cheah

*School of Economics, Finance and Banking, College of Business,
Universiti Utara Malaysia, Sintok, Kedah, Malaysia, and*

Foong Ming Moy and Debbie Ann Loh

*Department of Social and Preventive Medicine, Faculty of Medicine,
Julius Centre University of Malaya, Kuala Lumpur, Malaysia*

Received 1 January 2015
Revised 12 June 2015
Accepted 23 June 2015

Abstract

Purpose – Nutrition labels bridge communication between food manufacturers and consumers and are instrumental in shaping food choices and dietary habits. Gaining insight into the factors associated with nutrition label use precedes evaluating the effectiveness of these labels. The purpose of this paper is to investigate the socio-demographic and lifestyle factors associated with nutrition label use among multi-ethnic Malaysian adults.

Design/methodology/approach – Data from the Third National Health and Morbidity Survey ($n = 39,506$) on nutrition label use was analysed. Logistic regression analyses were performed to examine the factors associated with reading nutrition labels, adjusted for confounders.

Findings – The findings show that females, young adults aged between 18 and 30 years, Malays, tertiary educated, singles, employed individuals, physically active adults and non-smokers were significantly associated with increased odds of nutrition label use.

Research limitations/implications – Causality could not be established due to the cross-sectional study design. The scope of the data collected limited investigations to the socio-demographic and lifestyle factors associated with nutrition label use. Future research measuring consumers' attention, motivation and comprehension of nutrition label use and subsequent food selection should be conducted.

Practical implications – Health promotion efforts targeted towards promoting the use of nutrition label among males, older adults aged between 31 and 40 years, ethnic minorities, primary educated, widowed/divorced individuals, unemployed, physically inactive and smokers are recommended.

Originality/value – This nationwide study provides valuable insights into the socio-demographic and lifestyle factors significantly associated with nutrition label use among Malaysian adults.

Keywords Malaysia, Demographics, Lifestyles, Nutrition labelling

Paper type Research paper

Introduction

The overconsumption of easily available and energy-dense food further exacerbated with sedentary lifestyles amidst obesogenic environments has become characteristic of societies at large (Swinburn *et al.*, 2011). Diets high in sugars and fats often displace fruit and vegetable intake when combined with low physical activity significantly increases the risk of non-communicable diseases (NCDs) including obesity, type 2 diabetes, cardiovascular diseases and cancer (Lobstein and Davies, 2009; Swinburn *et al.*, 2011).

The authors would like to thank the Director General of Health, Malaysia for granting permission to use the data from the Third National Health and Morbidity Survey (NHMS III) and to publish this manuscript. This work was supported by the University of Malaya/Ministry of Higher Education, Malaysia under the High Impact Research Grant [H-20001-00-E2000069].



Hence, diet and physical activity remain important modifiable risk factors in the etiology of NCDs that contributes to more than 60 per cent of mortality worldwide (World Health Organization, 2011). From a dietary viewpoint, the trend towards increased consumption of packaged and processed foods in both developed and emerging economies should not go unnoticed (Wills *et al.*, 2009). In recognition of the importance of food safety and the potential influence of these nutritional information on consumers' acquisition of health information, purchase and consumption, certain countries including the USA (US Food and Drug Administration, 1994), and Canada (Health Canada, 2005) mandate the display of nutrition labels on pre-packaged foods. Meanwhile, nutrition labelling in the European Union is not mandatory until 2016 (The European Parliament and the Council of the European Union, 2011).

Nutrition labelling refers to any written, printed or graphic information on food packaging used to inform consumers on the nutritional value of food products (Lobstein and Davies, 2009). Certain characteristics of nutrition labels including the label location, colour scheme, size and format in addition to the visual clutter presented on the food package may influence consumer's motivation (Bialkova and Van Trijp, 2010), attention and understanding of the nutritional information presented (Vissschers *et al.*, 2010).

Malaysia, a developing, multi-ethnic country, is experiencing major dietary shifts towards higher calorie intake from sugars and fats and increased sedentariness leading to the rise in NCDs (Khor, 2012). Basic nutrition information including calories, sugar, protein, fat and sodium clearly stated on the label is mandated by law (Tee, 2011). Insight into the factors associated with nutrition label use is a pre-requisite to evaluating the effectiveness and efficiency of nutrition labels in helping consumers make healthier food choices. Studies among Western populations reported that nutrition knowledge, motivation, socio-demographic and psychosocial factors influenced food label use (Satia *et al.*, 2005; Drichoutis *et al.*, 2005; Stran and Knol, 2011; Grunert and Wills, 2007). However, there is a dearth of studies on the factors associated with nutrition label use among Asian populations. In efforts to address this gap, this study aims to examine the socio-demographic characteristics and lifestyle factors associated with nutrition label use among multi-ethnics Malaysian adults.

Methods

Study design and participants

Data from the Third National Health and Morbidity Survey (NHMS III), a nationally representative, cross-sectional, population-based survey conducted by the Ministry of Health, Malaysia between April 2006 and January 2007 was used. The methodology for NHMS III has been described previously (Institute for Public Health Malaysia, 2011; Cheah and Naidu, 2012). Data collection were carried out in the urban and rural areas across all the 14 states of Malaysia. The inclusion criteria were: adults aged 18 years and above; male or female; all ethnic groups; and Malaysian citizens. Subjects were excluded if they were: chronically ill and cognitively impaired; pregnant; and institutionalised individuals.

Sampling design

Study participants were recruited using a two-stage stratified random sampling proportionate to the population size. The primary sampling units were the Enumeration Blocks (EBs), geographically contiguous areas of land with gazetted boundaries,

classified into urban and rural areas. Each EB contained 80-120 Living Quarters (LQs) with approximately 600 residents. These LQs formed the secondary sampling units. All eligible individuals from the selected LQs were included in the NHMS III.

Study procedures

Face-to-face interviews were conducted by health staff using validated bi-lingual (Malay and English) questionnaires. Socio-demographic data and lifestyle habits on physical activity and smoking were obtained from the respondents. Physical activity was measured using the short form of the International Physical Activity Questionnaire. Being physically active referred to being engaged in moderate and high intensity physical activities (≥ 600 MET/min/week). The respondents were asked the following questions regarding their nutritional behaviours: "Do you read the nutrition label every time you buy food?" and "What kind of information in the nutrition label do you read?". The total number of respondents who responded to questions on nutritional labelling was 39,506. Ethical clearance and approval for this study was obtained from the Medical Research Ethics Committee of the Ministry of Health Malaysia [Project code: (P42-251-170000-00500(00500099) Sub code project: 42005000990001)]. Further details on the data has been published (Institute for Public Health, 2008).

Statistical analyses

Descriptive statistics were used in univariate analyses. Logistic regression estimated the odds ratios (OR) with 95 per cent confidence interval (CI) of reading fat and sugar content on nutrition labels among the respondents adjusting for gender, ethnicity, age, education levels, marital status, region (Peninsular Malaysia or East Malaysia), house locality (urban or rural), job characteristics, income, physical activity and smoking. Likelihood ratio test was conducted to assess the goodness-of-fit of the regression models. In addition, correlation coefficients between income, gender, house locality, education and job characteristics variables were calculated to detect multicollinearity (see the Appendix). Correlation coefficients of less than 0.8 were taken as no serious multicollinearity between two variables (Studenmund, 2006). The significance level was pre-set at $p < 0.05$. Cases with missing data were excluded from the analyses. All statistical analyses were performed using STATA 10.1 (STATA Corp, TX).

Results

A total of 30,992 respondents were included in the analyses. Socio-demographic and lifestyle habits of the participants are presented in Table I. The participants consisted of 55.6 per cent women. Mean age of the participants was 42.10 ± 15.69 years. Majority of them were Malays (56.5 per cent) followed by Chinese (21.6 per cent), Indians (8.47 per cent) and Others (13.46 per cent). Only a tenth of the participants had tertiary education. Majority of them were married (71.3 per cent), resided in Peninsular Malaysia (79.7 per cent) and in urban areas (59.4 per cent). The average monthly individual income of the participants was RM $1,963.05 \pm 2,674.48$. Slightly more than half of the participants were physically active and nearly a quarter were smokers. Overall, only 15 and 11 per cent of the participants read fat and sugar contents on the nutrition labels, respectively.

Table II displays the OR and 95 per cent CIs of reading fat and sugar content on nutrition labels. Multivariable analyses demonstrated that males reported significantly lower odds of reading the fat (OR: 0.71, 95 per cent CI: 0.65-0.77) and sugar content

BFJ 117,11	Variables	<i>n</i> (%)
	<i>Gender</i>	
	Male	13,756 (44.39)
	Female	17,236 (55.61)
2780	<i>Ethnicity</i>	
	Malay	17,515 (56.51)
	Chinese	6,683 (21.56)
	Indian	2,625 (8.47)
	Others	4,169 (13.46)
	Mean age (\pm SD) years	42.10 \pm 15.69
	<i>Age group</i>	
	18-30	8,691 (28.04)
	31-40	6,319 (20.39)
	41-50	6,730 (21.72)
	\geq 51	9,252 (29.85)
	<i>Education</i>	
	Primary	11,773 (37.99)
	Secondary	16,020 (51.69)
	Tertiary	3,199 (10.32)
	<i>Marital status</i>	
	Married	22,105 (71.32)
	Widowed/divorced	2,426 (7.83)
	Single	6,461 (20.85)
	<i>Region</i>	
	Peninsular Malaysia	24,693 (79.68)
	East Malaysia	6,299 (20.32)
	<i>House locality</i>	
	Urban	18,415 (59.42)
	Rural	12,577 (40.58)
	<i>Job characteristics</i>	
	Civil servant	3,079 (9.93)
	Private sector	8,931 (28.82)
	Self-employed	6,071 (19.59)
	Student	986 (3.18)
	Unemployed	11,925 (38.48)
	Income (RM ^a) (Mean \pm SD)	1,963.05 \pm 2,674.48
	<i>Physically active</i>	
	Yes	17,519 (56.53)
	No	13,473 (43.47)
	<i>Smoker</i>	
	Yes	7,054 (22.76)
	No	23,938 (77.24)
Table I. Descriptive characteristics of respondents	Notes: <i>n</i> = 30,992. ^a RM refers to the Malaysian currency, Ringgit Malaysia	

(0.84, 0.76-0.92) on the nutrition labels compared to females. In order to facilitate a better comparison across age groups and provide policy makers with better information on which age groups to focus on, age was formatted as a categorical variable. The results showed that individuals aged between 31 years and older had lower odds of reading the

Variables	Fat content		Sugar content	
	Crude OR	Adjusted OR ^a	Crude OR	Adjusted OR ^a
<i>Gender</i>				
Male	0.76 (0.71-0.81)	0.71 (0.65-0.77)	0.84 (0.79-0.91)	0.84 (0.76-0.92)
Female	1	1	1	1
<i>Ethnicity</i>				
Malay	1.73 (1.55-1.93)	1.34 (1.16-1.54)	1.88 (1.66-2.14)	1.32 (1.12-1.55)
Chinese	1.34 (1.19-1.52)	1.12 (0.97-1.31)	1.40 (1.22-1.62)	1.04 (0.87-1.23)
Indian	1.68 (1.45-1.94)	1.30 (1.08-1.55)	1.82 (1.54-2.15)	1.28 (1.02-1.53)
Others	1	1	1	1
<i>Age group</i>				
18-30	1	1	1	1
31-40	0.79 (0.73-0.86)	0.90 (0.81-0.99)	0.76 (0.69-0.83)	0.89 (0.80-1.00)
41-50	0.61 (0.56-0.67)	0.86 (0.77-0.96)	0.60 (0.55-0.67)	0.88 (0.78-0.99)
≥51	0.31 (0.28-0.34)	0.80 (0.70-0.90)	0.32 (0.29-0.36)	0.89 (0.77-1.02)
<i>Education</i>				
Primary	1	1	1	1
Secondary	4.97 (4.52-5.47)	3.91 (3.51-4.35)	5.82 (5.18-6.55)	4.77 (4.18-5.44)
Tertiary	9.97 (8.89-11.17)	6.45 (5.63-7.40)	11.27 (9.84-12.90)	7.65 (6.51-8.98)
<i>Marital status</i>				
Single	1	1	1	1
Married	0.65 (0.60-0.69)	1.03 (0.93-1.13)	0.61 (0.57-0.66)	0.94 (0.84-1.05)
Widowed/divorced	0.29 (0.24-0.34)	0.82 (0.67-1.00)	0.26 (0.21-0.32)	0.75 (0.60-0.95)
<i>Region</i>				
Peninsular Malaysia	1.37 (1.26-1.48)	1.07 (0.95-1.19)	1.52 (1.38-1.68)	1.19 (1.05-1.35)
East Malaysia	1	1	1	1
<i>House locality</i>				
Urban	1.53 (1.43-1.64)	1.09 (1.01-1.18)	1.51 (1.40-1.63)	1.06 (0.98-1.15)
Rural	1	1	1	1
<i>Job characteristics</i>				
Civil servant	2.77 (2.51-3.05)	1.51 (1.36-1.69)	2.55 (2.28-2.85)	1.32 (1.16-1.49)
Private sector	1.65 (1.53-1.79)	1.16 (1.06-1.27)	1.71 (1.56-1.87)	1.14 (1.03-1.27)
Self-employed	0.84 (0.76-0.92)	0.92 (0.83-1.03)	0.91 (0.81-1.02)	0.97 (0.86-1.10)
Student	2.98 (2.57-3.47)	1.44 (1.21-1.70)	2.93 (2.48-3.46)	1.30 (1.08-1.57)
Unemployed	1	1	1	1
Income (RM) ÷ 100	1.01 (1.01-1.01)	1.00 (1.00-1.00)	1.01 (1.01-1.01)	1.003 (1.00-1.00)
<i>Physically active</i>				
Yes	1.19 (1.12-1.27)	1.18 (1.10-1.26)	1.21 (1.12-1.30)	1.18 (1.09-1.27)
No	1	1	1	1
<i>Smoking</i>				
Yes	0.68 (0.63-0.74)	0.84 (0.76-0.93)	0.68 (0.62-0.74)	0.73 (0.66-0.82)
No	1	1	1	1
LR χ^2		2510.42		2022.66
<i>p</i> -value		< 0.001		< 0.001
<i>R</i> ²		0.850		0.888

Table II. Crude and adjusted odds ratio and 95 per cent confidence intervals (CI) for reading fat and sugar content on nutrition labels

Note: ^aAdjusted for gender, ethnicity, age, education, marital status, region, house locality, job characteristics, income, physical activity and smoking

two components on the nutrition labels compared to younger individuals aged between 18 and 30 years. Malays were more likely to read the fat content (1.34, 1.16-1.54) and sugar content (1.32, 1.12-1.55) on the nutrition labelling compared to other ethnic groups. Tertiary-educated individuals had the highest odds of reading the fat (6.45, 5.63-7.40) and sugar content (7.65, 6.51-8.98) compared to those with only primary education in the adjusted analyses. Widowed and divorced individuals showed a lower likelihood of reading the fat (0.82, 0.67-1.00) and sugar content (0.75, 0.60-0.95) compared to singles.

Peninsular Malaysians and those living in urban areas had marginally higher odds of reading the fat (1.07, 0.95-1.19) and sugar content (1.19, 1.05-1.35) on nutrition labels. Individuals with employment showed increased odds of nutrition label use compared to the unemployed. Higher odds of reading fat (1.18, 1.10-1.26) and sugar content (1.18, 1.09-1.27) were observed among the physically active adults. Smokers were less likely to read fat (0.84, 0.76-0.93) and sugar content (0.73, 0.66-0.82) than non-smokers.

Discussion

This study aimed to identify the factors associated with nutrition label use among Malaysian adults participating in the nationwide NHMS III survey. From our findings, only 11-15 per cent of participants read the nutrition labels, in contrast to the majority of participants who reported label use in a systematic review (Campos *et al.*, 2011), Turkey (Besler *et al.*, 2012) and China (Zeng *et al.*, 2013) which reported > 50, 75 and 40.5 per cent of reading nutrition labels, respectively. This may point towards social and cultural differences inherent in these various countries. Fat and sugar content was the most read nutritional information plausibly because obesity, type 2 diabetes and cardiovascular diseases are among the leading causes of mortality in Malaysia (Ministry of Health Malaysia, 2010).

Females were more likely to read nutrition labels compared to males as similarly reported by previous studies (Rasberry *et al.*, 2007; Drichoutis *et al.*, 2005; Stran and Knol, 2011; Petrovici *et al.*, 2012). Women may be more interested and concerned about their body image, diet and health and tend to possess more nutrition knowledge than men (Grunert *et al.*, 2012). Thus, barriers to reading and utilisation of nutrition label among males warrants further investigation. Health awareness programmes should emphasise the value of nutritional information and healthy eating to prevent diet-related diseases, with more attention directed at men.

Consistent with findings reported by Petrovici and Ritson (2006), our findings found that the older age groups were less likely to read nutrition labels. Although they may have greater interest in healthy eating compared to the younger ones, older individuals are more likely to suffer from visual impairment and may find reading the small-font nutrition labels difficult (Ranilović and Colić Barić, 2011).

In addition, our study revealed ethnic variation in nutrition label use with the highest proportion significantly identified among the Malays, in agreement with a Singaporean study (Vijaykumar *et al.*, 2013). The inter-ethnic variation in education, income, cultural and religious beliefs, health perception and practices (James, 2004), though not measured in this study may offer possible explanations for the ethnic differences observed. Qualitative studies are, therefore, needed to triangulate data to better understand how ethnicity influences nutrition label use.

Low education level, employment status and low income may possibly be inter-related in their associations with nutrition label use. Those with higher education were more likely to use nutrition labels concurring with previous findings (Drichoutis

et al., 2005; Jacobs *et al.*, 2011; Grunert *et al.*, 2012). Well-educated individuals plausibly possess a better knowledge and understanding of health-related information than individuals with a lower education level. With regards to employment status, contrary to Nayga (2000), our findings showed that employed individuals had higher odds of using nutrition labels than those unemployed. Since employed individuals and students are often exposed to health promotion programmes conducted in workplaces and schools, they are likely to be more aware of the importance of using nutrition label compared to the unemployed. Previous studies have likewise highlighted that higher earning individuals were more likely to read nutrition labels compared to lower income groups (Graham and Jeffery, 2012; Stran and Knol, 2011). Affluent individuals are often well educated, more health conscious and can often afford healthier options of food (Grossman, 2000). In view of these findings, focused strategies and concerted public health efforts among the socio-economically disadvantaged group are imperative.

Our findings further showed that marital status was significantly related to the use of nutrition labels, consistent with study by Graham and Jeffery (2012). Family structure and socio-economic status has shown to affect the nutritional status of adolescents (Hanson and Chen, 2007). In-depth research among Malaysians involving different marital status of respondents are therefore, warranted to study the factors involved in label use, particularly among widowed and divorced individuals.

The geographical influence on nutritional behaviours on food choices have been reported in Malaysia (Tan *et al.*, 2011; Yen and Tan, 2012) and the USA (Barreiro-Hurlé *et al.*, 2010). These studies found that nutritional behaviours varied across their residing regions. The paucity of media and health education coverage in rural areas and in East Malaysia may plausibly explain why these individuals have limited access to health-related information (Yen and Tan, 2012) and thus, lower nutritional knowledge. Considerable attention should be given to these often neglected regions to improve the health awareness and well-being in efforts to address the health inequalities in these communities.

In line with the findings of Satia *et al.* (2005), lifestyle factors were significant in explaining the likelihood of using nutrition label. Our study revealed that nutrition label use was less likely among smokers. This paralleled findings from Cheah and Naidu (2012). Longitudinal studies have demonstrated that smoking, physical activity and diet are key determinants of health (Steptoe *et al.*, 2002) with smoking cessation and physical activity linked with healthier dietary intake. Yen and Tan (2012) further confirmed that smokers had lower odds of consuming healthy foods than non-smokers. Smoking cessation programmes and health promotion strategies need to be heightened to inculcate awareness and increase self-efficacy towards practising healthy lifestyles.

Taken together, this calls for nutrition educators and public health practitioners including policy makers in Malaysia to re-evaluate the design and format of nutrition labels, to make it accessible and easily understood for all age groups. Nutrition information in the traditional table form found on the back of food packaging has evolved to front-of-pack nutrition labels in developed countries (Grunert and Wills, 2007; Signal *et al.*, 2012) and have yielded positive outcomes in dietary quality and chronic disease management (Ollberding *et al.*, 2010; Post *et al.*, 2010). In a study comparing the effectiveness of three different formats using the eye-tracking method, participants processed information in the traffic light (TL) format more efficiently than the nutrition table format and guideline daily amount format, proving that the TL format was a consumer-friendly way of communicating nutrition information (Siegrist *et al.*, 2015). TL may prove advantageous in overcoming illiteracy and

language barriers as the colour-coding helps consumers decipher or evaluate information in the form of colours rather than words and numbers, thereby, reducing the complexity of the label. Consumers can choose to focus on information shown in red or amber, thus, the dwell time will be substantially reduced, allowing for quick and informed decision making. That said, labels positioned prominently at the top are usually more viewed than those placed at the bottom of the food package (Graham and Jeffery, 2011).

Causality could not be established due to the cross-sectional study design. The scope of the data collected limited investigations to the socio-demographic and lifestyle factors associated with nutrition label use. That said, the findings of this study provide valuable insights into the factors associated with nutrition label use among a nationally representative sample of multi-ethnic Malaysian adults. These factors are important considerations for public health practitioners, food manufacturers and policy makers in the design, planning and implementation of an integrated approach towards effective and culturally appropriate nutrition education and food labelling. Future research measuring consumers' attention, motivation and comprehension of nutrition label use and subsequent food selection should be conducted.

Conclusion

Drawing from nationally representative data, this study identified that socio-demographic and lifestyle factors were significantly associated with nutrition label use among multi-ethnic adults in Malaysia. Females, young adults aged between 18 and 30 years, Malays, tertiary educated, singles, employed, physically active and non-smokers were significantly associated with increased odds of nutrition label use. Our findings potentially serve as a guide for public health practitioners and policy makers on which groups of adults to focus their health promotion efforts, namely, males, older adults aged between 31 and 40 years, ethnic minorities, primary educated, widowed/divorced individuals, unemployed, physically inactive and smokers.

References

- Barreiro-Hurlé, J., Gracia, A. and De-Magistris, T. (2010), "Does nutrition information on food products lead to healthier food choices?", *Food Policy*, Vol. 35 No. 3, pp. 221-229.
- Besler, H.T., Buyuktuncer, Z. and Uyar, M.F. (2012), "Consumer understanding and use of food and nutrition labeling in Turkey", *Journal of Nutrition Education & Behavior*, Vol. 44 No. 6, pp. 584-591.
- Bialkova, S. and Van Trijp, H. (2010), "What determines consumer attention to nutrition labels?", *Food Quality and Preference*, Vol. 21 No. 8, pp. 1042-1051.
- Campos, S., Doxey, J. and Hammond, D. (2011), "Nutrition labels on pre-packaged foods: a systematic review", *Public Health Nutrition*, Vol. 14 No. 8, pp. 1496-1506.
- Cheah, Y.K. and Naidu, B.M. (2012), "Exploring factors influencing smoking behaviour in Malaysia", *Asian Pac J Cancer Prev*, Vol. 13 No. 4, pp. 1125-1130.
- Drichoutis, A.C., Lazaridis, P. and Nayga, R.M. (2005), "Nutritional knowledge and consumer use of nutritional food labels", *European Review of Agricultural Economics*, Vol. 32 No. 1, pp. 93-118.
- Graham, D.J. and Jeffery, R.W. (2011), "Location, location, location: eye-tracking evidence that consumers preferentially view prominently positioned nutrition information", *Journal of the American Dietetic Association*, Vol. 111 No. 11, pp. 1704-1711.
- Graham, D.J. and Jeffery, R.W. (2012), "Predictors of nutrition label viewing during food purchase decision making: an eye tracking investigation", *Public Health Nutrition*, Vol. 15 No. 2, pp. 189-197.

- Grossman, M. (2000), *The Human Capital Model: Handbook of Health Economics*, Elsevier, New York, NY.
- Grunert, K. and Wills, J. (2007), "A review of European research on consumer response to nutrition information on food labels", *Journal of Public Health*, Vol. 15 No. 5, pp. 385-399.
- Grunert, K.G., Wills, J., Celemin, L.F., Lähteenmäki, L., Scholderer, J. and Storcksdieck Genannt Bonsmann, S. (2012), "Socio-demographic and attitudinal determinants of nutrition knowledge of food shoppers in six European countries", *Food Quality and Preference*, Vol. 26 No. 2, pp. 166-177.
- Hanson, M.D. and Chen, E. (2007), "Socioeconomic status and health behaviors in adolescence: a review of the literature", *J Behav Med*, Vol. 30 No. 3, pp. 263-285.
- Health Canada (2005), "Regulations amending the food and drug regulations (1416 – nutrition labelling, nutrient content claims and health claims)", Canada Gazette I, The Queen's Printer for Canada.
- Institute For Public Health (2008), *The Third National and Morbidity Survey 2006 (NHMS III)*, Ministry of Health, Kuala Lumpur.
- Institute For Public Health Malaysia (2011), *National Health and Morbidity Survey 2011 (NHMS 2011). Non-Communicable Diseases*, Institute for Public Health, Ministry of Health Malaysia, Kuala Lumpur.
- Jacobs, S.A., De Beer, H. and Larney, M. (2011), "Adult consumers' understanding and use of information on food labels: a study among consumers living in the Potchefstroom and Klerksdorp regions, South Africa", *Public Health Nutrition*, Vol. 14 No. 3, pp. 510-522.
- James, D. (2004), "Factors influencing food choices, dietary intake, and nutrition-related attitudes among African Americans: application of a culturally sensitive model", *Ethnicity & Health*, Vol. 9 No. 4, pp. 349-367.
- Khor, G.L. (2012), "Food availability and the rising obesity prevalence in Malaysia", *International e-Journal of Science, Medicine and Education*, Vol. 6 No. S1, pp. S61-S68.
- Lobstein, T. and Davies, S. (2009), "Defining and labelling 'healthy' and 'unhealthy' food", *Public Health Nutrition*, Vol. 12 No. 3, pp. 331-340.
- Ministry Of Health Malaysia (2010), "National strategic plan for non-communicable disease (NSPNC)", in D., C.D. (Ed.), *Non-Communicable Disease Section*, Ministry of Health Malaysia, Putrajaya, pp. 10-12.
- Nayga, R.M. (2000), "Nutrition knowledge, gender, and food label use", *Journal of Consumer Affairs*, Vol. 34 No. 1, pp. 97-112.
- Ollberding, N.J., Wolf, R.L. and Contento, I. (2010), "Food label use and its relation to dietary intake among US adults", *Journal of the American Dietetic Association*, Vol. 110 No. 8, pp. 1233-1237.
- Petrovici, D. and Ritson, C. (2006), "Factors influencing consumer dietary health preventative behaviours", *BMC Public Health*, Vol. 6 No. 222, 12pp.
- Petrovici, D., Fearn, A., Nayga, R.M. and Drolias, D. (2012), "Nutritional knowledge, nutritional labels, and health claims on food", *British Food Journal*, Vol. 114 No. 6, pp. 768-783.
- Post, R.E., Mainous, A.G. III, Diaz, V.A., Matheson, E.M. and Everett, C.J. (2010), "Use of the nutrition facts label in chronic disease management: results from the national health and nutrition examination survey", *Journal of the American Dietetic Association*, Vol. 110 No. 4, pp. 628-632.
- Ranilović, J. and Colić Barić, I. (2011), "Differences between younger and older populations in nutrition label reading habits", *British Food Journal*, Vol. 113 No. 1, pp. 109-121.
- Rasberry, C.N., Chaney, B.H., Housman, J.M., Misra, R. and Miller, P.J. (2007), "Determinants of nutrition label use among college students", *American Journal of Health Education*, Vol. 38 No. 2, pp. 76-82.

- Satia, J.A., Galanko, J.A. and Neuhouser, M.L. (2005), "Food nutrition label use is associated with demographic, behavioral, and psychosocial factors and dietary intake among African Americans in North Carolina", *Journal of the American Dietetic Association*, Vol. 105 No. 3, pp. 392-402, discussion 402-3.
- Siegrist, M., Leins-Hess, R. and Keller, C. (2015), "Which front-of-pack nutrition label is the most efficient one? The results of an eye-tracker study", *Food Quality and Preference*, Vol. 39, pp. 183-190.
- Signal, L., Lanumata, T., Ni Mhurchu, C. and Gorton, D. (2012), "Front-of-pack nutrition labelling in New Zealand: an exploration of stakeholder views about research and implementation", *Health Promotion Journal of Australia*, Vol. 23 No. 1, pp. 48-51.
- Step toe, A., Wardle, J., Cui, W., Bellisle, F., Zotti, A.M., Baranyai, R. and Sanderman, R. (2002), "Trends in smoking, diet, physical exercise, and attitudes toward health in European university students from 13 countries, 1990-2000", *Preventive Medicine*, Vol. 35 No. 2, pp. 97-104.
- Stran, K. and Knol, L. (2011), "Determinants of food label use among US adults", *Journal of the American Dietetic Association*, Vol. 111 No. 9, p. A91.
- Studenmund, A.H. (2006), *Using Econometrics: A Practical Guide*, Pearson, New York, NY.
- Swinburn, B.A., Sacks, G., Hall, K.D., Mcpherson, K., Finegood, D.T., Moodie, M.L. and Gortmaker, S.L. (2011), "The global obesity pandemic: shaped by global drivers and local environments", *The Lancet*, Vol. 378 No. 9793, pp. 804-814.
- Tan, A.K., Dunn, R.A., Samad, M.I. and Feisul, M.I. (2011), "Sociodemographic and health-lifestyle determinants of obesity risks in Malaysia", *Asia-Pacific Journal of Public Health*, Vol. 23 No. 2, pp. 192-202.
- Tee, E.S. (2011), "Development and promotion of Malaysian dietary guidelines", *Asia Pacific Journal of Clinical Nutrition*, Vol. 20 No. 3, pp. 455-461.
- The European Parliament and the Council of the European Union (2011), "Regulation (EU) No. 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No. 1924/2006 and (EC) No. 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/CE, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No. 608/2004", Official Journal of the European Union, 54.
- US Food and Drug Administration (1994), "Guide to Nutrition Labelling and Education Act (NLEA)", in O.O.R.O., Office of Regulatory Affairs (Ed.) *Division of Field Investigations*, US Food and Drug Administration, Maryland, MD, pp. 17-23.
- Vijaykumar, S., Lwin, M.O., Chao, J. and Au, C. (2013), "Determinants of food label use among supermarket shoppers: a Singaporean perspective", *Journal of Nutrition Education & Behavior*, Vol. 45 No. 3, pp. 204-212.
- Visschers, V.H., Hess, R. and Siegrist, M. (2010), "Health motivation and product design determine consumers' visual attention to nutrition information on food products", *Public Health Nutrition*, Vol. 13 No. 7, pp. 1099-1106.
- Wills, J.M., Schmidt, D.B., Pillo-Blocka, F. and Cairns, G. (2009), "Exploring global consumer attitudes toward nutrition information on food labels", *Nutrition Reviews*, Vol. 67 No. S1, pp. S102-S106.
- World Health Organization (2011), *Global Status Report on Noncommunicable Diseases 2010*, World Health Organization, Geneva.
- Yen, S. and Tan, A.G. (2012), "Who are eating and not eating fruits and vegetables in Malaysia?", *Int J Public Health*, Vol. 57 No. 6, pp. 945-951.
- Zeng, Q., Cao, W., Ji, Y. and Chang, C. (2013), "Nutrition label reading and its influence factors research in five cities", *Wei Sheng Yan Jiu*, Vol. 42 No. 4, pp. 600-604.

Appendix

Socio-demographic and lifestyle factors

Variables	Income	Male	Urban	Primary	Secondary	Tertiary
Income	–	0.017*	0.211*	–0.202*	0.028*	0.277*
Male	0.017*	–	0.024*	–0.060*	0.043*	0.025*
Urban	0.211*	0.024*	–	–0.190*	0.092*	0.153*
Civil servant	0.083*	0.064*	0.023*	–0.201*	0.056*	0.230*
Private sector	0.097*	0.180*	0.137*	–0.185*	0.126*	0.089*
Self-employed	–0.022*	0.220*	–0.149*	0.119*	–0.064*	–0.085*
Student	0.007*	–0.013*	0.056*	0.141*	0.091*	0.075*
Unemployed	–0.121*	–0.382*	–0.020*	0.196*	–0.097*	–0.153*

2787

Table A1.
Correlation coefficients between income, gender, house locality, education and job characteristics variables

Notes: The estimated correlation coefficients of the variables are less than 0.8 indicating no serious multicollinearity problems in the current regression models. * $p < 0.001$

About the authors

Dr Yong Kang Cheah is a Senior Lecturer at the School of Economics, Finance and Banking in the Universiti Utara Malaysia. His research interests are in health economics, applied microeconomics and public health. Dr Yong Kang Cheah is the corresponding author and can be contacted at: cheahykang@gmail.com

Dr Foong Ming Moy is an Associate Professor at the Department of Social and Preventive Medicine in the University of Malaya, Malaysia. Her research interests include translational research, trials in the prevention of non-communicable diseases, workplace wellness and nutritional epidemiology.

Debbie Ann Loh is a Research Assistant at the Julius Centre University of Malaya with the Department of Social and Preventive Medicine at the University of Malaya, Malaysia. Her research interests focuses on behavioural aspects of food and nutrition.

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgroupublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com