

SHORT COMMUNICATION PAPER

SOCIODEMOGRAPHIC AND LIFESTYLE DETERMINANTS OF HOUSEHOLD CONSUMPTION OF SUGAR-SWEETENED FOOD IN MALAYSIA: A SHORT COMMUNICATION

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Abstract

Diabetes has become a serious public health concern. The objective of the present study is to examine the sociodemographic and lifestyle factors associated with the consumption of sugar-sweetened food among different age groups of households in Malaysia. A nationally representative data (n = 14838) are used for secondary analysis. Multiple regressions are used to examine the independent effects of sociodemographic and lifestyle factors on household expenditure on sugar-sweetened food. The analysis is stratified by age group. Households headed by older individuals tend to spend more on sugar-sweetened food than households headed by younger individuals. Household size is positively associated with household consumption of sugar-sweetened food. Bumiputera households spend more on sugar-sweetened food than non-Bumiputera households. Having married and employed heads increase household expenditure on sugar-sweetened food. Sociodemographic and lifestyle factors play an important role in determining the consumption of sugar-sweetened food. Policymakers should pay special attention to the types of households that consume a lot of sugar-sweetened food.

Keywords: age; diabetes; food; household; sugar-sweetened food
JEL Codes: D1; I1

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Introduction

Huge increases in the prevalence of diabetes have become a serious public health concern. The number of diabetic patients worldwide increased to more than 300 million from 1980 to 2014 (World Health Organization, 2018). It has been increasing more rapidly in developing countries than in developed countries (World Health Organization, 2018; Cheah et al., 2018). The prevalence of diabetes in Malaysia is similar to that of developed countries in Asia, such as Japan, Korea, and Singapore (Tee & Yap, 2017). It was doubled from 6.9% in 1996 to 17.5% in 2015 (Tee & Yap, 2017). The highest prevalence was evidenced in the age group of 60 years and above, accounting for 36.6% of the total prevalence (Tee & Yap, 2017).

In light of the worrying facts and figures of diabetes, researchers from various countries have investigated the factors that affect the consumption of sugary food, which is the main contributing factor of diabetes (Rehm et al., 2008; Bleich & Wang, 2011; Mullie, Aerenhouts & Clarys, 2012; Park et al., 2013; Zytneck et al., 2015; Pollard et al., 2016; Park et al., 2016; Xu, Park & Siegel, 2018). Rarely, if any, have researchers paid attention to Malaysia, a developing country with a rapid increase in diabetes prevalence. In light of this gap, the present study conducts a

comprehensive investigation of the influence of sociodemographic and lifestyle factors on the decisions of people to consume sugar-sweetened food. The present study stratifies the analysis by age group to compare the consumption behavior of sugar-sweetened food in young and old adults. The findings of any differences or similarities in the determining factors among various age groups of adults are an important contribution to the literature and policy, especially given that older adults have a higher risk of developing diabetes and are less likely to use blood glucose screening to prevent diabetes and invest in health than younger adults (Cheah & Goh, 2017; Grossman, 1972).

Methods

Data

Secondary data from the Malaysian Household Expenditure Survey (HES) 2014 are used (Department of Statistics Malaysia, 2014). The HES 2014 is conducted by the Department of Statistics Malaysia to obtain information on the expenditure pattern of Malaysian households. A two-stage stratified sampling is used. In the first stage, the selection is based on the Enumeration Blocks (EBs) designed for the Malaysian Population and Housing Census. Each EB comprises 80 to 120 living quarters (LQs). In the second stage, all households in the selected LQs are surveyed. Face-to-face interviews are conducted. There are several advantages of using the HES 2014. Firstly, it is nationally representative and has a large sample size ($n = 14838$). Secondly, it records the monthly household expenditure on various items. Thirdly, it has detailed information on households and household heads' sociodemographic profiles.

Variables

The dependent variable is the total monthly household expenditure on sugar-sweetened food (e.g., sugar, jam, honey, and confectionaries) [in Ringgit Malaysia (RM)] reported in the survey. Log is added to the dependent variable. The purpose of log transformation is to allow for non-linearity in the relationships between the consumption of sugar-added food, and sociodemographic and lifestyle factors. Moreover, log can suppress the variation of the dependent variable, which, in turn, reduces heteroskedasticity and makes the data more normal.

The independent variables consist of household heads' sociodemographic and lifestyle profiles [age (≤ 29 years, 30-39 years, 40-49 years, 50-59 years, ≥ 60 years), education (no formal education, primary-level education, secondary-level education, tertiary-level education), gender (male, female), ethnicity (Bumiputera, non-Bumiputera), marital status (single, married, widowed/divorced), employment status (employed, unemployed), smoking (smoker, non-smoker) and alcohol drinking (drinker, non-drinker)], household income (\leq RM1499, RM1500-2999, RM3000-4499, RM4500-5999, RM6000-7499, \geq RM7500), household size (small, medium, large), household region (Peninsular Malaysia, East Malaysia), and household location (urban, rural).

Household variables are as important as individual variables in determining the consumption of sugar-sweetened food. This is because consumption pattern is largely influenced by household and household heads. This hypothesis is made in light of the findings of Yen and Jensen (1996), Tan Yen and Nayga (2009), and Cheah et al. (2019), who found that household and household heads' sociodemographic factors are able to determine the household consumption of alcohol.

Statistical analyses

To examine the effects of sociodemographic and lifestyle factors on household expenditure on sugar-sweetened food and draw ceteris paribus conclusions, multiple linear regression is estimated using least square. This regression is estimated for the total sample and each age group (≤ 29 years, 30-39 years, 40-49 years, 50-59 years, ≥ 60 years). In an effort to ensure that the estimates are efficient, two diagnostic tests are performed. White test is conducted to detect the potential heteroskedasticity issue, while variance inflation factor (VIF) is calculated to identify whether there is a multicollinearity problem. The significance level of all the tests is based on $p < 0.05$.

Results

The majority of household heads aged 40-49 years (27.98%). The distribution of the monthly household income comprises 6.48-8.19% of \leq RM1499, 22.44-24.64% of RM1500-2999, 20.64-21.80% of RM3000-4499, 13.59-14.98% of RM4500-5999, 8.69-10.55% of RM6000-7499, and 22.30-24.63% of \geq RM7500. Of the total household heads and household heads aged ≤ 29 years, 30-39 years, 40-49 years, and 50-59 years, a large proportion have secondary-level education (56.69-65.77%), while only a very small proportion have no formal education (1.07-4.60%). The minority of households have a large household size (3.70-9.03%). More than half of household heads are male (77.15-87.95%), Bumiputera (63.96-75.30%), and employed (65.45-99.23%). The majority of household heads are married (76.71-86.44%), except for those aged ≤ 29 years (46.98%). About 66.69-75.34% and 57.67-75.82% of households reside in Peninsular Malaysia and urban areas, respectively. The majority of household heads do not smoke (51.16-63.76%) and drink (84.87-86.97%) (Table 1).

Table 1. Summary statistics of independent variables, by age group

Variables	Years					Total
	≤ 29	30-39	40-49	50-59	≥ 60	
Age						
≤ 29 years	-	-	-	-	-	1405 (9.47)
30-39 years	-	-	-	-	-	3362 (22.66)
40-49 years	-	-	-	-	-	4151 (27.98)
50-59 years	-	-	-	-	-	3503 (23.61)
≥ 60 years	-	-	-	-	-	2417 (16.29)
Income						
\leq RM1499	91 (6.48)	266 (7.91)	325 (7.83)	287 (8.19)	167 (6.91)	1136 (7.66)
RM1500-2999	336 (23.91)	783 (23.29)	1023 (24.64)	786 (22.44)	570 (23.58)	3498 (23.57)
RM3000-4499	290 (20.64)	719 (21.39)	905 (21.80)	750 (21.41)	524 (21.68)	3188 (21.49)
RM4500-5999	199 (14.16)	491 (14.60)	564 (13.59)	520 (14.84)	362 (14.98)	2136 (14.40)

RM6000-7499	143 (10.18)	292 (8.69)	386 (9.30)	339 (9.68)	255 (10.55)	1415 (9.54)
≥RM7500	346 (24.63)	811 (24.12)	948 (22.84)	821 (23.44)	539 (22.30)	3465 (23.35)
Education						
No formal	15 (1.07)	41 (1.22)	92 (2.22)	161 (4.60)	347 (14.36)	656 (4.42)
Primary	67 (4.77)	208 (6.19)	448 (10.79)	840 (23.98)	1046 (43.28)	2609 (17.58)
Secondary	853 (60.71)	2012 (59.85)	2730 (65.77)	1986 (56.69)	831 (34.38)	8412 (56.69)
Tertiary	478 (33.45)	1101 (32.75)	881 (21.22)	516 (14.73)	193 (7.99)	3161 (21.30)
Household size						
Small	1057 (75.23)	1960 (58.30)	1732 (41.72)	1971 (56.27)	1840 (76.13)	8560 (57.69)
Medium	296 (21.07)	1232 (36.64)	2044 (49.24)	1257 (35.88)	448 (18.54)	5277 (35.56)
Large	52 (3.70)	170 (5.06)	375 (9.03)	275 (7.85)	129 (5.34)	1001 (6.75)
Gender						
Male	1084 (77.15)	2921 (86.88)	3651 (87.95)	2979 (85.04)	1945 (80.47)	12580 (84.78)
Female	321 (22.85)	441 (13.12)	500 (12.05)	524 (14.96)	472 (19.53)	2258 (15.22)
Ethnicity						
Bumiputera	1058 (75.30)	2338 (69.54)	2801 (67.48)	2373 (67.74)	1546 (63.96)	10116 (68.18)
Non-Bumiputera	347 (24.70)	1024 (30.46)	1350 (32.52)	1130 (32.26)	871 (36.04)	4722 (31.82)
Marital status						
Single	720 (51.25)	618 (18.38)	261 (6.29)	132 (3.77)	62 (2.57)	1793 (12.08)
Married	660 (46.98)	2604 (77.45)	3588 (86.44)	3029 (86.47)	1854 (76.71)	11735 (79.09)
Widowed/divorced	25 (1.78)	140 (4.16)	302 (7.28)	342 (9.76)	501 (20.73)	1310 (8.83)
Employment status						
Employed	1394 (99.22)	3336 (99.23)	4079 (98.27)	3336 (95.23)	1582 (65.45)	13727 (92.51)
Unemployed	11 (0.78)	26 (0.77)	72 (1.73)	167 (4.77)	835 (34.55)	1111 (7.49)
Region						
Peninsular Malaysia	937 (66.69)	2441 (72.61)	2930 (70.59)	2536 (72.40)	1821 (75.34)	10665 (71.88)

East Malaysia	468 (33.31)	921 (27.39)	1221 (29.41)	967 (27.60)	596 (24.66)	4173 (28.12)
Location						
Urban	1059 (75.37)	2549 (75.82)	2892 (69.67)	2352 (67.14)	1394 (57.67)	10246 (69.05)
Rural	346 (24.63)	813 (24.18)	1259 (30.33)	1151 (32.86)	1023 (42.33)	4592 (30.95)
Smoking						
Smoker	679 (48.33)	1642 (48.84)	1944 (46.83)	1596 (45.56)	876 (36.24)	6737 (45.40)
Non-smoker	726 (51.67)	1720 (51.16)	2207 (53.17)	1907 (54.44)	1541 (63.76)	8101 (54.60)
Drinking						
Drinker	158 (11.25)	466 (13.86)	565 (13.61)	530 (15.13)	315 (13.03)	2034 (13.71)
Non-drinker	1247 (88.75)	2896 (86.14)	3586 (86.39)	2973 (84.87)	2102 (86.97)	12804 (86.29)
Observations	1405	3362	4151	3503	2417	14838

Note: The entries refer to frequency. Percentages in parentheses.

Source: Malaysian Household Expenditure Survey 2014, Department of Statistics Malaysia (2014)

The maximum VIF of all the regressions is less than ten, indicating that multicollinearity is not a problem (Wooldridge, 2013). The value of the White test for the regressions for 30-39 and ≥ 60 years is significant, and this implies that the models have heteroskedasticity. As such, robust standard errors are calculated for these two regressions. Since log is added to the dependent variable, the estimates are interpreted as the change in percentage of monthly household expenditure on sugar-sweetened food. Compared with households whose heads aged ≤ 29 years, those households with heads aged 40-49 years and 50-59 years spend 19.7% and 18% more on sugar-sweetened food, respectively. However, no significant differences are evidenced between the age of ≤ 29 and 30-39 years and between the age of ≤ 29 and ≥ 60 years. Among the total households and households headed by individuals aged ≥ 60 years, having heads with tertiary-level education increases household expenditure on sugar-sweetened food by 31.5-71.9%. Of all the age groups, medium and large households spend 30.7-67.4% and 37.5-122.6% more on sugar-sweetened food, respectively, than small households. Among all the households and households with heads aged ≤ 29 years, those whose heads are male spend 21.6-38.2% less on sugar-sweetened food compared with those headed by females (Table 2).

Table 2. Correlates of sociodemographic and lifestyle factors to monthly household expenditure on sugar-sweetened food (in RM) by age group

Variables	Years					Total
	≤ 29	30-39	40-49	50-59	≥ 60	
Constant	5.621 (5.320)	-10.427 (6.669)	-0.217 (9.160)	16.983 (15.483)	-2.628 (5.412)	0.797* (0.178)
Age (in years)	-0.333 (0.423)	0.704 (0.387)	0.068 (0.413)	-0.578 (0.572)	0.084 (0.155)	–
Age ² (in years)	0.007	-0.010	-0.001	0.005	-0.001	–

	(0.008)	(0.006)	(0.005)	(0.005)	(0.001)	
Age						
≤29 years	–	–	–	–	–	–
30-39 years	–	–	–	–	–	0.156 (0.084)
40-49 years	–	–	–	–	–	0.197* (0.084)
50-59 years	–	–	–	–	–	0.180* (0.087)
≥60 years	–	–	–	–	–	0.087 (0.101)
Income						
≤RM1499	–	–	–	–	–	–
RM1500-2999	0.089 (0.303)	-0.056 (0.169)	-0.072 (0.139)	-0.262 (0.154)	0.123 (0.196)	-0.069 (0.077)
RM3000-4499	0.303 (0.309)	0.022 (0.169)	0.106 (0.142)	-0.181 (0.156)	-0.076 (0.205)	0.001 (0.076)
RM4500-5999	0.296 (0.325)	-0.108 (0.176)	-0.011 (0.153)	-0.132 (0.165)	-0.156 (0.217)	-0.014 (0.082)
RM6000-7499	-0.128 (0.345)	0.046 (0.196)	-0.124 (0.165)	-0.254 (0.180)	-0.286 (0.244)	-0.119 (0.092)
≥RM7500	0.262 (0.303)	0.078 (0.166)	-0.149 (0.141)	-0.219 (0.154)	-0.010 (0.200)	-0.051 (0.077)
Education						
No formal	–	–	–	–	–	–
Primary	-0.783 (0.736)	-0.376 (0.289)	-0.042 (0.251)	0.204 (0.195)	0.037 (0.155)	0.065 (0.100)
Secondary	-0.490 (0.677)	-0.199 (0.255)	0.213 (0.236)	0.122 (0.191)	0.304 (0.172)	0.188 (0.097)
Tertiary	-0.705 (0.688)	-0.065 (0.267)	0.429 (0.247)	0.243 (0.211)	0.719* (0.241)	0.315* (0.106)
Household size						
Small	–	–	–	–	–	–
Medium	0.674* (0.170)	0.499* (0.081)	0.307* (0.075)	0.528* (0.083)	0.650* (0.119)	0.498* (0.040)
Large	0.782* (0.370)	0.801* (0.121)	0.375* (0.128)	0.992* (0.148)	1.226* (0.154)	0.787* (0.065)
Gender						
Male	-0.382* (0.184)	-0.145 (0.154)	-0.237 (0.132)	-0.170 (0.131)	-0.087 (0.217)	-0.216* (0.071)
Female	–	–	–	–	–	–

Ethnicity						
Bumiputera	0.297 (0.174)	0.455* (0.109)	0.259* (0.081)	0.381* (0.094)	0.505* (0.137)	0.369* (0.050)
Non-Bumiputera	–	–	–	–	–	–
Marital status						
Married	0.102 (0.158)	0.444* (0.130)	0.608* (0.148)	0.400* (0.206)	0.901* (0.457)	0.411* (0.080)
Widowed/divorced	-0.526 (0.535)	0.033 (0.272)	0.021 (0.194)	-0.063 (0.236)	0.381 (0.437)	-0.133 (0.111)
Single	–	–	–	–	–	–
Employment status						
Employed	0.433 (0.793)	-0.588 (0.251)	-0.150 (0.271)	0.430* (0.184)	0.370* (0.123)	0.358* (0.092)
Unemployed	–	–	–	–	–	–
Region						
Peninsular Malaysia	0.097 (0.153)	0.269* (0.093)	0.250* (0.079)	0.361* (0.089)	0.451* (0.125)	0.287* (0.044)
East Malaysia	–	–	–	–	–	–
Location						
Urban	-0.096 (0.165)	0.053 (0.093)	-0.050 (0.080)	-0.006 (0.089)	-0.255 (0.115)	-0.064 (0.042)
Rural	–	–	–	–	–	–
Smoking						
Smoker	-0.109 (0.145)	0.151 (0.085)	0.094 (0.071)	0.008 (0.079)	0.052 (0.110)	0.069 (0.040)
Non-smoker	–	–	–	–	–	–
Drinking						
Drinker	0.452* (0.231)	0.159 (0.141)	0.210* (0.107)	0.209 (0.117)	-0.016 (0.191)	0.194* (0.064)
Non-drinker	–	–	–	–	–	–
White	181.48	258.14	249.83	246.72	253.77	472.52
<i>p</i> -value	0.835	0.015	0.063	0.081	0.040	<0.001
Max. VIF	5.27	5.77	5.29	6.24	7.86	6.87
Observations	1405	3362	4151	3503	2417	14838

Note: The entries refer to estimates. Standard errors in parentheses. **p*-value < 0.05.

Source: Malaysian Household Expenditure Survey 2014, Department of Statistics Malaysia (2014)

Bumiputera households spend 25.9-50.5% more on sugar-sweetened food than non-Bumiputera households, except those headed by individuals aged ≤ 29 years. Among all the households and households with heads aged 30-39 years, 40-49 years, 50-59 years, and ≥ 60 years, if their heads are married instead of single, their sugar-sweetened food expenditure increases by 40-90.1%. Having employed household heads increases the household expenditure on sugar-sweetened food by 35.8-43% among total households and households with heads aged 50-59 years and ≥ 60 years. Compared with households in East Malaysia, households in Peninsular Malaysia with heads of all the age groups (except ≤ 29 years) spend 25-45.1% more on sugar-sweetened food. Households whose heads are a drinker and aged ≤ 29 years and 40-49 years spend 45.2% and 21% more on sugar-sweetened food, respectively, than their counterparts headed by non-drinkers. Of the overall households, those headed by drinkers spend 19.4% more on sugar-sweetened food than those headed by non-drinkers.

In addition, the correlations between marital status, employment status, and education are examined. The correlation coefficients between these variables are small, indicating no multicollinearity problem between these variables (Table 3).

Table 3. Correlations between marital status and employment status, and education

Variables	Marital status	
	Widowed/divorced	Single
Employment status		
Employed	-0.217*	0.079*
Unemployed	0.217*	-0.079*
Education		
Primary	0.079*	-0.106*
Secondary	-0.055*	0.002
Tertiary	-0.091*	0.120*

Note: * p -value < 0.05 .

Discussion and Conclusion

Households headed by older individuals consume more sugar-sweetened food than households headed by younger individuals, which is in contrast to the findings of previous studies that older people are less likely to consume sugar-added drinks than younger people (Rehm et al., 2008; Bleich & Wang, 2011; Mullie et al., 2012; Park et al., 2013; Zytneck et al., 2015; Pollard et al., 2016; Park et al., 2016; Xu et al., 2018). Since healthy eating behavior is a health investment as people need to forgo the satisfaction generated from sugary food in exchange for health benefits, older people are less likely to engage in it than younger people because they face higher costs of health investment (Grossman, 1972).

Our finding on education appears to contradict the evidence of previous studies that the level of education reduces the consumption of sugary drinks (Rehm et al., 2008; Zytneck et al., 2015; Park et al., 2016; Xu et al., 2018; Thompson et al., 2009; Friis et al., 2014). In addition, we find that when household heads are young, education does not play an important role in affecting household consumption of sugar-sweetened food. Furthermore, the effect of employment status is found to

be only significant in the age groups of 50-59 years and ≥ 60 years. In particular, households headed by employed individuals spend more on sugar-sweetened food than households headed by unemployed individuals. Taken together, it can be concluded that old household heads with better socioeconomic status are more likely to consume sugar-sweetened food than their counterparts with poorer socioeconomic status.

Household size is a significant predictor of household expenditure on sugar-sweetened food among households with all age groups of heads. We highlight that the largest marginal effect of household size is evidenced in the oldest age group, while the smallest marginal effect is evidenced in the age group of 40-49 years. Therefore, if the policy aims to reduce sugar-sweetened food consumption among large households, the focus should be given to those headed by the elderly.

Our findings show that households headed by males spend less on sugar-sweetened food than households headed by females, which are in contrast to the findings of previous studies (Rehm et al., 2008; Park et al., 2013; Zytznick et al., 2015; Pollard et al., 2016; Friis, Lyng & Lasgaard, 2014). The gender difference in the consumption of sugar-sweetened food is, however, not evidenced in the households that are headed by individuals aged 30 years or more. A conclusion that can be reached here is that gender is an important predictor of sugar-sweetened food consumption among young people.

The effects of ethnicity on sugar-sweetened food consumption are significant in all age groups, except for ≤ 29 years. Bumiputera households seem to spend more on sugar-sweetened food than non-Bumiputera households. Our findings lead to the conclusion that religious and cultural factors can determine the consumption behavior of sugar-sweetened food. This can be an area to explore for a future qualitative study when information on religion and culture is available.

Married household heads consume more sugar-sweetened food than their single counterparts. When the age of household heads increases from 30-39 years to ≥ 60 years, the marginal effect of marital status increases more than double. The relationship between marital status and consumption of sugar-sweetened food is also evidenced by Park et al. (2013) and Xu et al. (2018), but their findings show otherwise; unmarried individuals are more likely to consume sugary drinks than married individuals.

Households in Peninsular Malaysia, especially those headed by individuals aged 30 years or more, consume more sugar-sweetened food than households in East Malaysia. In addition, our findings show that alcohol consumption is positively associated with consumption of sugar-sweetened food among households with heads aged ≤ 29 years and 40-49 years. This means that people in these age groups with alcohol drinking behavior have a high tendency to consume sugar-sweetened food. Perhaps, this is because alcohol drinkers are less aware of their health than non-drinkers. This finding calls for the policy attention to these groups of people and households if the goal of reducing the prevalence of consumption of sugar-sweetened food is to be achieved.

One of the main limitations of this study is that the causality between the consumption of sugar-sweetened food and diabetes cannot be well-identified because of cross-sectional data. The correlations between sociodemographic factors and diabetes cannot be examined as well given that the data are a household expenditure survey, instead of a health survey which has information on

illnesses. Another limitation is that due to the absence of a dataset collected on individuals, household variables are used. Despite these limitations, the data used in the present study are nationally representative and have a large sample size. Furthermore, the present study is the first, to our knowledge, to examine how the effects of sociodemographic and lifestyle factors on the consumption of sugar-sweetened food change across age groups in Malaysia.

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