JOURNAL OF BEHAVIORAL HEALTH, 2019
VOL 8, NO. 1, PAGE 1–6
10.5455/jbh.20181030074213

ORIGINAL RESEARCH

Open Access

The effect of alcohol, cigarette consumption, and obesity on the life expectancy at birth

Gülnur İlgün, Murat Konca
Department of Health Management, Faculty of Economics and Administrative Sciences, Hacettepe University, Ankara, Turkey

ABSTRACT

Background: The main factors that affect the health statuses of individuals are classified as environment, behavior, healthcare services, and genetics/inheritance. Among such factors, behavioral factors cover alcohol and cigarette consumption, and obesity. This study analyzed the effect of behavioral factors on life expectancy at birth, as one of the health status indicator, specific to Japan.
Methods: Ordinary least squares regression was utilized to identify the effect of alcohol and cigarette consumption, and obesity on the life expectancy at birth.
Results: According to the analysis, alcohol and cigarette consumption, and obesity negatively affect the life expectancy at birth. A one-unit increase in the rate of alcohol, smoking, and obesity decreases the life expectancy at birth by 0.043, 0.038, and 0.054 years, respectively.
Conclusions: Although the related behavioral risk factors are individual choices; it is recommended that governments should take a number of measures against such risk factors since the protection and development of social health are considered as main duties of governments.

ARTICLE HISTORY

Received October 30, 2018
Accepted December 15, 2018
Published January 01, 2019

KEYWORDS

Health status; health behavior; ordinary least squares; Japan

Introduction

Blum [1] analyzed the main factors affecting the health statuses of individuals under four groups as environment, lifestyle, inheritance, and health services, which are considered as the main factors of health status. One of the topics that healthcare professionals are working on for years is to clearly understand the effect of lifestyle, one of the related main factors, and address it accordingly [2]. As the effects of behavioral risk factors have become known for the increase in the preventable morbidity and premature deaths, the public health professionals are focused on minimizing the negative factors and stimulating the positive behaviors affecting the health behavior. They also concentrated on developing strategies for the individuals, particularly to encourage healthy lifestyle and reflect, as well as maintain health behaviors for improving their health [3]. Health behavior is the behaviors of people displayed instinctively or deliberatively with the purpose of mitigating the potential health risks and environmental threats [4]. The assessment of health behaviors is important for the improvement of social health conditions and maintenance of healthy status for a lifetime [5,6]. Health behaviors positively affect, particularly cognitive performance, morbidity, mortality, and disability results [7–9]. Hence, studies must be performed in order to better reflect the developments caused by the health behaviors on health status. Consequently, this study aims to express the effect of behaviors such as tobacco use (logtobacco), alcohol consumption (logalcohol), and obesity (logobesity) that might negatively affect health on the life expectancy at birth (logle).

Method

Ordinary least squares (OLS) regression was utilized to identify the effect of alcohol and cigarette consumption, and obesity on the life expectancy at birth. The data of Japan covering the years of 1985–2016 constituted the data of this study.

Contact Gülnur İlgün ✉ gulnurharmanci@gmail.com Department of Health Management, Faculty of Economics and Administrative Sciences, Hacettepe University, Ankara, Turkey.

Table 1. Study variables.

Dependent variable	Abbreviation
Life expectancy at birth	logle
Independent variables	
Tobacco use rate in adult population	logtobacco
Alcohol consumption for the age 15 and older, per capita, liter	logalcohol
Obesity rate in adult population	logobesity

First of all, logarithmic transformation was applied on variables to ensure data normality. Then, the variables that were applied with logarithmic transformation were checked whether they were stable. Although in reality there was no statistically significant relation between the variables as seen in time series analyses, it is possible to obtain a high R^2 value. This misleading situation is defined as spurious regression. The related higher R^2 value is obtained due to the result of a similarity in trend tendency rather than the real relation between the variables. In order to eliminate such error, the series should be checked whether they are stable [10,11]. Therefore, within the scope of this study, the stability of variables applied with logarithmic transformation was analyzed with Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. Upon the findings, Lagrange Multiplier (LM) statistics of all variables are lower than the critical values of the KPSS test at 5% significance level. Hence, it is possible to consider all variables as stable.

Table 1 presents the dependent and independent variables used within the framework of this study. The data of the study were obtained from Organization for Economic Co-Operation and Development (OECD) Health Data Base and the analyses were performed with EViews 9 software. The confidence levels of analyses utilized under this study were determined as 95%.

Results

Within the scope of the study, the model was tested whether it provides the presumption of normality, has multicollinearity, autocorrelation and heteroscedasticity problems, and whether the model pattern has accuracy and the model has a structural break.

The tests that were conducted showed that the model only has the structural break problem. The structural break was caused due to 2004 and dummy variable was introduced into the model in order to eliminate such problem. Upon the introduction of a dummy variable, the existence of all abovementioned problems was investigated and the related problem was found as non-existent anymore. Additionally, residuals of the model were checked and their average was found as zero. Table 2 shows the tests that were used to investigate the existence of such results and the associated test results.

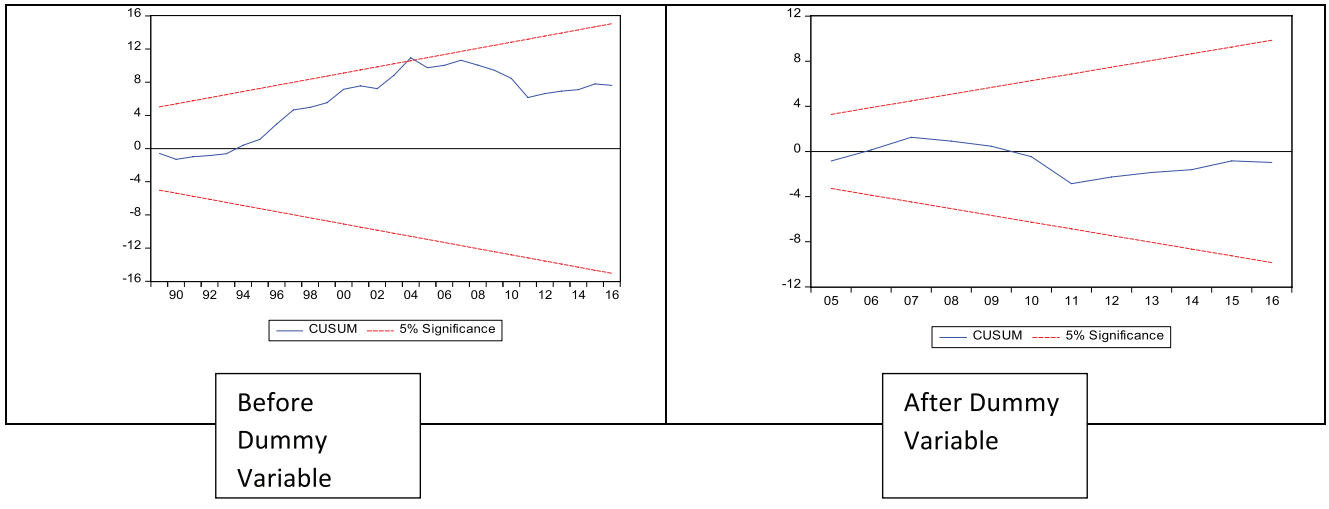
Moreover, all lag lengths of the model (16 lags) were checked whether they have autocorrelation problem, which no autocorrelation problem was identified in all lag lengths (Graph 1 in Appendix). As seen in Graph 1, the pillars belonging to the lags do not exceed line boundaries, which mean there is no autocorrelation and partial correlation between the variables.

Graph 2 reflects the change in the structural break before and after the introduction of dummy variable into the model. As seen, the break encountered in 2004 was eliminated as a result of introducing a dummy variable into the model.

Table 3 presents the results of OLS regression regarding three independent variables that affect the life expectancy at birth in Japan [alcohol consumption at the age of 15 and older (log alcohol), the obesity rate in the adult population (log

Table 2. Tests on model developed within the scope of the study.

Tests on model	Used test, test result, and value	Result
Normality test	Jarque-Bera = 0.37, $p = 0.83 > 0.05$	Residuals distribution is normal.
Multicollinearity test	Centered Variance Inflation Factor (VIF) values for logalcohol, logobesity, and logtobacco are 1.28, 3.92, and 3.63, respectively.	There is not any multicollinearity.
Autocorrelation test	Breusch-Godfrey = Obs * $R^2 = 0.04$, Prob. Chi-Square (1) = 0.83 > 0.05	There is not any autocorrelation between residuals.
Heteroscedasticity test	Breusch-Pagan-Godfrey = Obs * $R^2 = 2.10$, Prob. Chi-Square = 0.71 > 0.05	There is not any variance problem in residuals.
Ramsey reset test	F statistics = 3.06, $p = 0.09 > 0.05$	Model pattern is established correct; there is not any description error.



Graph 2. Cumulative Sum Graph (CUSUM) results before and after the introduction of a dummy variable.

obesity), and tobacco consumption rate in the adult population (log tobacco)].

Pursuant to Table 3, 95.3% of the life expectancy at birth is explained with alcohol, tobacco, and obesity variables, and the model is significant in general (F = 156.526; p < 0.001). The d coefficient showing whether there is autocorrelation in the model is 1.879, and the values between 1.5 and 2.5 show that there is not any autocorrelation. In consideration with the comparison of d value and R^2 value, the developed model has not any spurious regression as $d > R^2$.

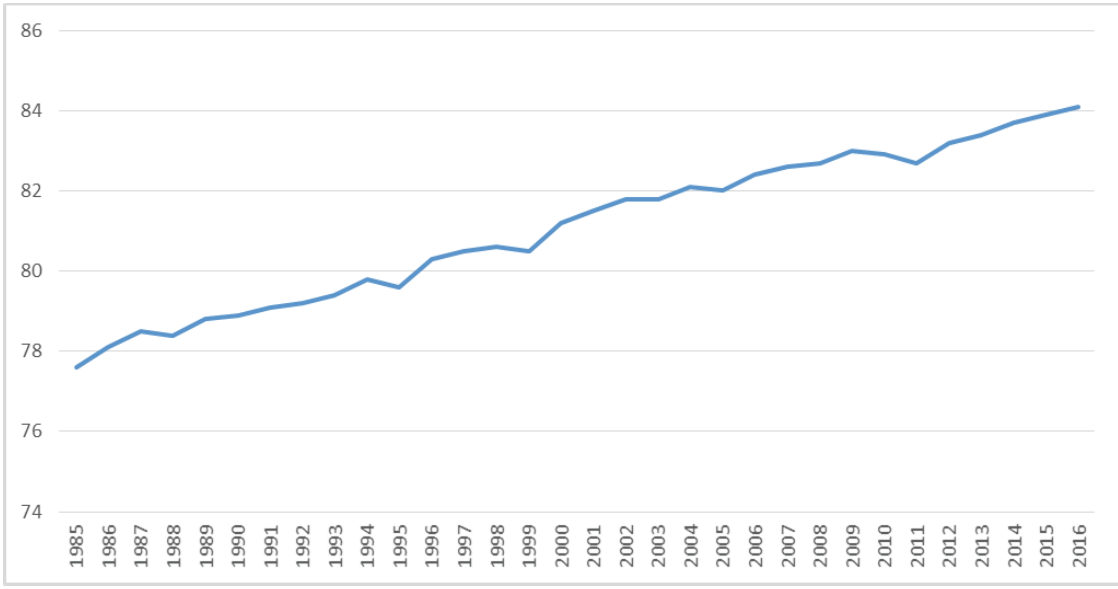
According to the generated regression model, the variables of alcohol consumption at the age of 15 and older per capita, the obesity rate in the adult population, and tobacco consumption in adult population have a statistically significant effect on the life expectancy at birth ($p \leq 0.05$).

Considering the beta coefficients, the variable of obesity rate in the adult population (−0.054) has a higher effect on the life expectancy at birth than other variables.

Following the in-depth analysis on the effects of independent variables that were found significant within the model, the life expectancy at birth shows a falling tendency with the increase in alcohol and tobacco consumption and obesity rate among the individuals in the society. Therefore, a negative relation was identified between three variables and life expectancy at birth. According to the results of the study, the one-unit increase in alcohol consumption among individuals over 15 years of age decreases the life expectancy at birth by 0.043 years. Likewise, the one-unit increase in smoking among adults decreases the life expectancy at birth by 0.038 years. Finally, when the relationship

Table 3. OLS regression results.

Variable	β coefficient	Std error	*t*-statistic	Prob.
logalcohol	−0.043	0.012	−3.617	0.001
logobesity	−0.054	0.007	−7.662	0.000
logtobacco	−0.038	0.009	−4.403	0.000
Dummy	0.013	0.005	2.433	0.022
Constant	4.550	0.043	104.652	0.000
R-squared (R^2)	0.959	Mean dependent var		4.395
Adjusted R^2	0.953	SD dependent var		0.024
SE of regression	0.005	Durbin Watson (d)		1.879
Sum squared resid	0.001			
Log-likelihood	125.881			
F-statistic	156.526			
Prob (*F*-statistic)	0.000			



Graph 3. Life expectancy at birth, according to the years.

between obesity and life expectancy at birth is examined, the one-unit increase in the obesity rate among adults decreases the life expectancy at birth by 0.054 years.

There is an upward trend in life expectancy at birth in Japan according to the years (Graph 3). According to the results of this study, alcohol, cigarette consumption, and obesity have negative effects on this trend.

Discussion and Conclusion

Although it is not possible to bring all factors affecting the health statuses of individuals into one single variable, such factors can be listed based on their priorities. Consequently, there are mainly four but also a number of factors for health status. Lifestyles of individuals (behavior) are one of those four main factors, which constitute the main reason for the tendency whether to avoid behaviors negatively affecting the health in individual lifestyles. For instance, individuals decide on behaviors such as smoking, alcohol consumption, unhealthy eating, and disobedience to doctor recommendations, based on their lifestyles. While lifestyles affect the health status of individuals at the micro level, they affect the health status of societies at the macro level. Hence, this study aims to identify the effect of lifestyle on health status at the macro level concerning the effect of health behavior (cigarette, alcohol consumption, and obesity status) on the life expectancy at birth through the axis of Japan.

As a result of the analysis conducted within the scope of research, the obesity rate in the adult population ($\beta = -0.054$) was found as the variety that affects the life expectancy at birth at the most. Therefore, the life expectancy at birth decreases as the obesity rate in the society increases. The study performed by Walls et al. [12] indicated that the life expectancy at birth decreases as obesity increases. Similarly, the study of Preston and Stokes [13] on the individuals between the ages of 50 and 89 in America showed that obesity decreases the life expectancy at birth with 1.54 years. Pursuant to the study of Stewart et al. [14], obesity shortens the life expectancy at birth.

The analysis under this research reflected that alcohol consumption at the age of 15 and older per capita affects the life expectancy at birth ($p = 0.001$); hence, the life expectancy at birth decreases with the increase in alcohol consumption. In consideration with the study of Westman et al. [15] regarding the effect of alcohol use on the life expectancy at birth in Denmark, Finland, and Sweden, it was found that alcohol shortens the life expectancy at birth. The study by Makela [16] showed that the alcohol consumption has a negative effect on the life expectancy at birth while the study by Wood et al. [17] indicated that alcohol use has an effect of decreasing the life expectancy at birth.

Another finding of the study is that the life expectancy at birth decreases as the tobacco consumption increases. The study by Renteria et al. [18] conducted with the data of nine countries between

the years 1980 and 2010 indicated that smoking has a diminishing effect on the life expectancy at birth. Similarly, the study by Ferrucci et al. [19] concluded that life expectancy at birth decreases as cigarette use increases. Moreover, the study by Sakata et al. [20] conducted on Japan reflected that cigarette use decreases the life expectancy at birth with 8 years in males and 10 years in females. The study by Peltonen et al. [21] showed that cigarette has a negative effect on the life expectancy at birth.

In accordance with the findings of this study, alcohol and tobacco consumption and obesity status have a negative effect on the life expectancy at birth. From this perspective, countries should make macro-level policy changes, as well as develop a number of awareness raising practices in society in terms of individual aspect in order to improve their health indicators such as life expectancy at birth, such as producing public service announcements with regard to the harms of cigarette and alcohol on health, introducing rigid restrictions on cigarette and alcohol use, and providing healthy eating trainings.

References

[1] Blum HL, Knollmueller RN. Planning for health; development and application of social change theory. USA: LWW, p. 1388, 1975.

[2] Gochman DS. Handbook of health behavior research II: provider determinants. USA: Springer Science & Business Media, 2013.

[3] Jo H, Lee S, Ahn MO, Jung SH. Structural relationship of factors affecting health promotion behaviors of Korean urban residents. Health Promot Int 2003; 18(3):229–36.

[4] Kirscht JP. Preventive health behavior: a review of research and issues. Health Psychol 1983; 2(3):277.

[5] U.S. Department of Health, Education, and Welfare. Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention. Washington, DC: Government Printing Office, p. 3, 1979.

[6] Belloc NB, Breslow L. Relationship of physical health status and health practices. Preventive Medicine 1972;1(3):409-421. 1972; 1:409–21.

[7] Blumenthal JA, Emery CF, Madden DJ, Schniebolk S, Riddle MW, Cobb FR, et al. Effects of exercise training on bone density in older men and women. J Am Geriatr Soc 1991; 39(11):1065–70.

[8] Hawkins N, Anderson R. The effect of exercise on cognitive functioning among the elderly. TCA J 1996; 24(2):18–26.

[9] McGinnis JM, Foege WH. Actual causes of death in the United States. JAMA 1993; 270(18):2207–12.

[10] Granger CWJ, Newbold P. Spurious regressions in econometrics. J Econ 1974; 2:117.

[11] Gujarati DN. Basic Econometrics. Tata McGraw-Hill Education, New Delhi, India, 2009

[12] Walls HL, Backholer K, Proietto J, McNeil JJ. Obesity and trends in life expectancy. J Obes 2012; (2012) 1–4.

[13] Preston SH, Stokes A. Contribution of obesity to international differences in life expectancy. Am J Public Health 2011; 101(11):2137–43.

[14] Stewart ST, Cutler DM, Rosen AB. Forecasting the effects of obesity and smoking on US life expectancy. N Engl J Med 2009; 361(23):2252–60.

[15] Westman J, Wahlbeck K, Laursen TM, Gissler M, Nordentoft M, Hällgren J, et al. Mortality and life expectancy of people with alcohol use disorder in Denmark, Finland and Sweden. Acta Psychiat Scand 2015; 131(4):297–306.

[16] Makela PIA. Alcohol-related mortality by age and sex and its impact on life expectancy: estimates based on the Finnish death register. Eur J Public Health 1998; 8(1):43–51.

[17] Wood AM, Kaptoge S, Butterworth AS, Willeit P, Warnakula S, Bolton T, et al. Risk thresholds for alcohol consumption: combined analysis of individual-participant data for 599 912 current drinkers in 83 prospective studies. Lancet 2018; 391(10129):1513–23.

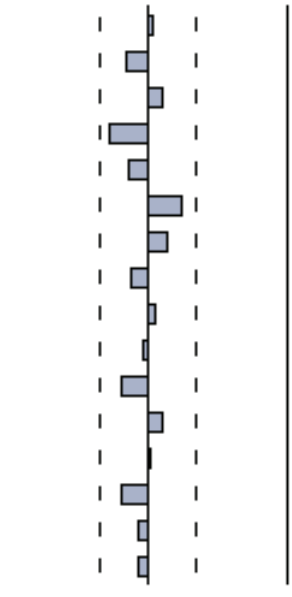
[18] Rentería E, Jha P, Forman D, Soerjomataram I. The impact of cigarette smoking on life expectancy between 1980 and 2010: a global perspective. Tob Control ; 2016;25:551-557.

[19] Ferrucci L, Izmirlian G, Leveille S, Phillips CL, Corti MC, Brock DB, et al. Smoking, physical activity, and active life expectancy. Am J Epidemiol 1999; 149(7):645–53.

[20] Sakata R, McGale P, Grant EJ, Ozasa K, Peto R, Darby SC. Impact of smoking on mortality and life expectancy in Japanese smokers: a prospective cohort study. BMJ 2012; 345:e7093.

[21] Peltonen R, Ho JY, Elo IT, Martikainen P. Contribution of smoking-attributable mortality to life expectancy differences by marital status among Finnish men and women, 1971–2010. Demogr Res 2017; 36:255.

Appendix



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.034	0.034	0.0412	0.839
		2	-0.163	-0.165	1.0085	0.604
		3	0.106	0.122	1.4323	0.698
		4	-0.282	-0.334	4.5121	0.341
		5	-0.151	-0.076	5.4340	0.365
		6	0.250	0.161	8.0402	0.235
		7	0.134	0.156	8.8231	0.266
		8	-0.134	-0.179	9.6408	0.291
		9	0.063	0.016	9.8285	0.365
		10	-0.036	-0.007	9.8910	0.450
		11	-0.194	-0.027	11.843	0.376
		12	0.113	0.023	12.538	0.404
		13	0.012	-0.107	12.547	0.483
		14	-0.189	-0.142	14.702	0.399
		15	-0.077	-0.158	15.077	0.446
		16	-0.072	-0.113	15.434	0.493

Graph 1. Autocorrelation and partial correlation graph of OLS analysis.