https://dergipark.org.tr/tr/pub/ijhmt Doi Number: 10.31201/ijhmt.1123098

Int Journal Of Health Manag. And Tourism 2022, 7(2), 217-230

IJHMT Editorial

International Journal Of Health Management And Tourism

THE EFFECTS OF HEALTH BEHAVIORS ON SELECTED HEALTH INDICATOR

Ümit ÇIRAKLI[*], Emine ÇETİN ASLAN [**]

[*] Assoc. Prof., İzmir Bakırçay University, Turkey
umit.cirakli@bakircay.edu.tr
ORCID Number: 0000-0002-3134-8830
[**] Assist. Prof,, İzmir Bakırçay University, Turkey
emine.aslan@bakircay.edu.tr
ORCİD Number: 0000-0003-4326-2070
Received:29.05.2022
Accepted: 01.07.2022
Research Article

Abstract

Aim: This study was conducted with the aim of investigating the effects of health behaviors on health indicators.

Methods: In this context, data of 38 OECD countries between 2005-2018 were analyzed by Panel ARDL cointegration analysis. Crude mortality rate, infant mortality rate, cancer mortality rate and low birth weight rate were used as health indicators, while calorie, protein, sugar and fat supply and alcohol consumption were used as independent variables.

Results: As a result of the analysis, it was found that calorie supply affected positively the cancer mortality and low birth weight rate and the crude mortality rate negatively; protein supply affects crude mortality rate positively and others negatively; sugar supply positively affects all 4 health indicators; fat supply affects cancer mortality and low birth weight rate negatively and infant

Corresponding author: Ümit Çıraklı, Faculty of Health Sciences, Izmir Bakırçay University, İzmir, Turkey, e-mail:umit.cirakli@bakircay.edu.tr

mortality rate positively; alcohol consumption negatively affects crude mortality and infant mortality rates, and positively affects cancer mortality and low birth weight rates.

Conclusion: As a result, it was concluded that the effects of health behaviors on health indicators, except for sugar supply, are mixed.

Keywords: Health Behaviors, Health indicators, OECD countries, Panel ARDL Model

INTRODUCTION

Individual and community health is the common result of many factors expressed as determinants of health (WHO, 2017). Determinants of health can be defined as personal, social, economic and environmental factors that affect a person's health (Healthy People, 2022). Whether people are healthy or not is affected by the conditions they live in, their environment and their behavior. Behavioral determinants of health are risky personal behaviors that can affect health and have lifelong implications. Behavioral determinants of health include tobacco use, alcohol use, drug use, lack of exercise, nutrition, (Adler et al., 2016; Denton & Walters, 1999; Healthy People, 2022) and risky sexual behaviors (Barton et al., 2019). The impact of these factors on health is greater than the frequently examined factors such as access to and use of health service (Adler et al., 2016; McGinnis et al., 2002; WHO, 2017). Although the USA is among the richest countries in the world and allocates more resources to health than other countries, the fact that it has more negative outcomes than many countries is associated with not focusing enough on the social and behavioral causes of health (Barton et al., 2019).

Focusing on the determinants of health can improve health outcomes and ultimately reduce health expenditures (Adler et al., 2016; Barton et al., 2019). Adopting healthy behaviors (e.g., eating healthy, exercising, avoiding tobacco and avoiding alcohol) and using preventive health services (e.g., going to the doctor, monitoring and treating blood pressure, and monitoring cholesterol) can prevent chronic diseases and contribute to the effective management of existing chronic diseases (Pickens et al., 2019). However, behavioral determinants of health other than alcohol and cigarettes are often overlooked and not monitored in health practices. On the other hand, various studies evaluate the effects of social and behavioral determinants on health as equal and sometimes higher than clinical indicators such as genetic factors and high blood pressure (Adler & Stead, 2015). Approximately 40% of deaths in the USA in 1990 (McGinnis et al., 2002) and half in 2000 (Mokdad et al., 2004) are due to behavioral patterns that can be changed by preventive interventions.

Behavioral determinants of health affect individual and public health in various ways. Excessive alcohol consumption can cause exogenous and chronic health problems. Depending on alcohol consumption; alcohol poisoning, injuries and accidents (Pickens et al., 2019), deaths from violence, injury and suicide are increasing (Wilkinson & Marmot, 2003). In addition, there is an increased risk of high blood pressure and liver damage in sexually transmitted diseases and unplanned pregnancies (Pickens et al., 2019). According to Mokdad et al. (2004), 3.5% of deaths in the USA in 2000 were due to alcohol-related causes (Mokdad et al., 2004).

A balanced and adequate diet is very important in promoting health and well-being (Wilkinson & Marmot, 2003). Healthy and adequate nutrition is very important in every period of life for different reasons. It is necessary for development during pregnancy, childhood and adolescence, when growth is the fastest (Adler et al., 2016). Good nutrition in adulthood plays a role in preventing premature deaths from cardiovascular diseases and cancers. In the old age, energy needs decrease due to less physical activity. For this reason, the food of elderly people should be rich in micronutrients (World Health Organization Regional Office for Europe, 2001). Improper nutrition causes an increase in disease prevalence and worsening of chronic diseases (Berkowitz et al., 2018). Inadequacy and lack of diversity in food cause malnutrition and related diseases. Conversely, excess food intake (a type of malnutrition) may facilitate/cause the development of cardiovascular diseases, diabetes, cancer and degenerative eye diseases, obesity, and dental caries (Na et al., 2022; Wilkinson & Marmot, 2003). Food-borne health problems, particularly malnutrition, obesity and related NCDs, place an enormous burden on society, especially the most vulnerable. Accordin to the results of a preliminary analysis from the Swedish Institute of Public Health shows that in European Union countries, 4.5% of disability adjusted life years (DALYs) are lost due to malnutrition and 3.7% due to obesity (World Health Organization Regional Office for Europe, 2001).

Nutritional health problems increase the use of health services. Those who are malnourished make more outpatient and emergency visits, more hospitalizations and longer hospital stays (Berkowitz et al., 2018; Clancy et al., 2022). Due to the high health service use of these people, the society requires the highest health expenditure (Berkowitz et al., 2018).

Changes in nutrition quality due to social and economic conditions contribute to health inequalities. In many countries, the poor are replacing fresh food with cheap processed food. Malnutrition, saturated fats and sugar cause more obesity. Obesity has become more prevalent in the poor than in the rich. The nutritional aim of prevention of chronic diseases should be directed towards more fresh fruits, vegetables and grains, less processed starchy foods, refined sugar and salt (Wilkinson & Marmot, 2003).

Although a certain amount of fat is required in the diet, too much fat can lead to heart disease, cancer, obesity and other health problems (Binukumar & Mathew, 2005). Products containing unsaturated fat should be preferred in the diet. Saturated fatty acids are now known to play a role not only in the prevention of cardiovascular diseases through their effects on serum lipids, but also because they directly affect a number of other risk factors in various ways and directly affect atherogenesis (Wahrburg, 2004).

The primary role of dietary proteins is for use in the various anabolic processes of the body. Proteins form the main structural component of muscle and other tissues in the body and are important for human health as they are used to produce hormones, enzymes and hemoglobin (Hoffman and Falvo, 2004).

Negativeness in behavioral determinants of health, as in other determinants, not only affects the current health of the person, but also accumulates and negatively affects the health of the future periods (Adler et al., 2016). In addition, while each of the determinants of health may have an important and independent impact on health, their interactions can also play an important role. For this reason, it is expected that the effects of behavioral determinants on health, monitoring and taking necessary precautions will contribute to public health (Denton & Walters, 1999). In this study, the relationship between the parameters from which healthy data can be obtained from the behavioral determinants of health and some selected health indicators was examined.

2. 2. RESEARCH METHODOLOGY

2.1. Study Design

To investigate the effects of health behaviors on health indicators, Panel ARDL cointegration analysis (Panel ARDL Pooled Mean Group estimator) which were proposed by Pesaran, Shin and Smith (1999) were used. This model allows intersection points, short-term coefficients and error variants to change freely between groups, but keeps the long-term coefficients the same. PMG estimator enables us to investigate long term homogeneity without implementing the homogeneity of the parameter in the short term (Pesaran et al., 1999). Panel ARDL general equation can be shown as the following regression:

$$Y_{1,it} = \alpha_{1i} + \gamma_{1,i}Y_{1,it-1} + \sum_{l=2}^{k} \gamma_{1i}X_{1,it-1} + \sum_{j=1}^{p-1} \sigma_{1,ij}\Delta Y_{1,it-j} + \sum_{j=0}^{q-1}\sum_{l=2}^{k} \sigma_{1,ij}\Delta X_{1,it-j} + \mu_{1,it}$$

Where "i" is the number of units in the panel, "α" is the constant component of the model, "Δ" is the first difference operator, and "k" is the the number of lags, "μ_{it}" is error term with zero mean and variance constant within each unit.

Stationarity of series is essential for the cointegration analysis (Çıraklı & Yıldırım, 2019). Therefore, stationary tests, which are unit root tests, for time series were firstly performed. Then, Pedroni Panel Residual Cointegration test (Pedroni, 1999), which has 7 different tests and 11 different statistics under the assumption that there is no cross-sectional dependency (Cirakli et al., 2021), were performed to decide a cointegration relation between the variables. After detecting cointegration relationship between series, we conducted Panel ARDL analysis to estimate long run and short run relations between series. We used four different ARDL models as in the following equations:

Model 1.

$$\begin{aligned} \Delta InCrude_{it} = \ & \beta_0 + \sum_{j=1}^{pi} \lambda_{ij}\, \Delta InCrude_{i,t-j} + \sum_{j=0}^{qi} \delta_{ij}\, \Delta InCalorie_{i,t-j} + \sum_{j=0}^{qi} \emptyset_{ij}\, \Delta InProtein_{i,t-j} \\ & + \sum_{j=0}^{qi} \varphi_{ij}\, \Delta InSugar_{i,t-j} + \sum_{j=0}^{qi} \Theta_{ij}\, \Delta InFat_{i,t-j} + \sum_{j=0}^{qi} \ddot{\Theta}_{ij}\, \Delta InAlcohol_{i,t-j} \\ & + \gamma_1 InCrude_{i,t-1} + \gamma_2 InCalorie_{i,t-1} + \gamma_3 InProtein_{i,t-1} + \gamma_4 InSugar_{i,t-1} \\ & + \gamma_5 InFat_{i,t-1} + \gamma_6 InAlcohol_{i,t-1} + \varepsilon_{it} \end{aligned} \quad (1)$$

Model 2.

$$\begin{aligned} \Delta InInfant_{it} = \ & \beta_0 + \sum_{j=1}^{pi} \lambda_{ij}\, \Delta InInfant_{i,t-j} + \sum_{j=0}^{qi} \delta_{ij}\, \Delta InCalorie_{i,t-j} + \sum_{j=0}^{qi} \emptyset_{ij}\, \Delta InProtein_{i,t-j} \\ & + \sum_{j=0}^{qi} \varphi_{ij}\, \Delta InSugar_{i,t-j} + \sum_{j=0}^{qi} \Theta_{ij}\, \Delta InFat_{i,t-j} + \sum_{j=0}^{qi} \ddot{\Theta}_{ij}\, \Delta InAlcohol_{i,t-j} \\ & + \gamma_1 InInfant_{i,t-1} + \gamma_2 InCalorie_{i,t-1} + \gamma_3 InProtein_{i,t-1} + \gamma_4 InSugar_{i,t-1} \\ & + \gamma_5 InFat_{i,t-1} + \gamma_6 InAlcohol_{i,t-1} + \varepsilon_{it} \end{aligned} \quad (2)$$

Model 3.

$$\Delta InCancer_{it} = \beta_0 + \sum_{j=1}^{pi} \lambda_{ij}\, \Delta InCancer_{i,t-j} + \sum_{j=0}^{qi} \delta_{ij}\, \Delta InCalorie_{i,t-j} + \sum_{j=0}^{qi} \emptyset_{ij}\, \Delta InProtein_{i,t-j} + \sum_{j=0}^{qi} \varphi_{ij}\, \Delta InSugar_{i,t-j} + \sum_{j=0}^{qi} \Theta_{ij}\, \Delta InFat_{i,t-j} + \sum_{j=0}^{qi} \ddot{\Theta}_{ij}\, \Delta InAlcohol_{i,t-j} + \gamma_1 InCancer_{i,t-1} + \gamma_2 InCalorie_{i,t-1} + \gamma_3 InProtein_{i,t-1} + \gamma_4 InSugar_{i,t-1} + \gamma_5 InFat_{i,t-1} + \gamma_6 InAlcohol_{i,t-1} + \varepsilon_{it} \quad (3)$$

Model 4.

$$\Delta InLBR_{it} = \beta_0 + \sum_{j=1}^{pi} \lambda_{ij}\, \Delta InLBR_{i,t-j} + \sum_{j=0}^{qi} \delta_{ij}\, \Delta InCalorie_{i,t-j} + \sum_{j=0}^{qi} \emptyset_{ij}\, \Delta InProtein_{i,t-j} + \sum_{j=0}^{qi} \varphi_{ij}\, \Delta InSugar_{i,t-j} + \sum_{j=0}^{qi} \Theta_{ij}\, \Delta InFat_{i,t-j} + \sum_{j=0}^{qi} \ddot{\Theta}_{ij}\, \Delta InAlcohol_{i,t-j} + \gamma_1 InLBR_{i,t-1} + \gamma_2 InCalorie_{i,t-1} + \gamma_3 InProtein_{i,t-1} + \gamma_4 InSugar_{i,t-1} + \gamma_5 InFat_{i,t-1} + \gamma_6 InAlcohol_{i,t-1} + \varepsilon_{it} \quad (4)$$

In the above equations, "β_0" is the constant component of the model, "Δ" is the first difference operator, "In" is the logarithm of the series, and "ε_{it}" is error term with zero mean and variance constant within each unit. Regarding the supply of calories, sugar and fat, which are variables related to health behaviors, we assumed that an increase in the supply of these products in a country means an increase in consumption in that country. We used the logarithm of series in the analysis, because it is possible to interpret the results as elasticity when the logarithms of the series are used, and also it helps solve the extreme value problem.

2.2. Data and Analysis

The data of the study were obtained as yearly data for 38 OECD countries spanning 14 years from 2005 through 2018. Variables of study are shown in Table 1. Selection of data dates are made according to the criteria of having full data for these years. Eviews 9.5 package program were used for analyzes.

Table 1. Variables and Abbreviations

Variables	**Abbreviation**
Total Calory Supply (Kilocalories per capita per day)	Calori
Total Protein Supply (Grams per capita per day)	Protein
Sugar Supply (Kilos per capita per year)	Sugar
Total Fat Supply (Grams per capita per day)	Fat
Crude Mortality Rate (per 100,000)	Crude
Alcohol Consumption (Liter per Capita)	Alcohol
Infant Mortality Rate (per 1,000)	Infant
Cancer Mortality Rate (per 100,000)	Cancer
Low Birth Weight (%)	LBR

3. FINDINGS

3.1. Results of Unit Root Tests

In this study, we used a variety of tests to determine the stationarity of the time series in panel datasets: Levin, Lin and Chu test (Levin et al., 2002), Im, Pesaran and Shin test (Im et al., 2003), ADF-Fisher Chi-square test (Maddala & Wu, 1999), and PP-Fisher Chi-square test (Choi, 2001). The results of unit root tests were shown in the Table 2. According to the unit test results, it is seen that all the variables meet the condition of being stationary in their level values or their first difference values.

Table 2. The Results of ADF Unit Root Test

Variables	**Levin, Lin & Chu t***		**Im, Pesaran and Shin W-stat**		**ADF - Fisher Chi-square**		**PP - Fisher Chi-square**	
	Level	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
Calori	0.901 (0.183)	**-17.287 (0.000)**	0.096 (0.538)	**-13.068 (0.000)**	77.653 (0.425)	**289.49 (0.000)**	329.24 (0.191)	**497.21 (0.000)**
Protein	**-5.437 (0.000)**	**-18.803 (0.000)**	**-2.022 (0.021)**	**-13.747 (0.000)**	104.83 (0.015)	**308.29 (0.000)**	**104.96 (0.015)**	**366.13 (0.000)**
Sugar	**1.815 (0.034)**	**-20.260 (0.000)**	0.149 (0.559)	**-15.564 (0.000)**	82.711 (0.280)	**338.98 (0.000)**	86.423 (0.194)	**421.57 (0.000)**
Fat	-0.586 (0.278)	**-19.598 (0.000)**	1.773 (0.962)	**-14.545 (0.000)**	73.678 (0.554)	**319.09 (0.000)**	80.020 (0.354)	**359.37 (0.000)**
Alcohol	**-5.503 (0.000)**	**-19.012 (0.000)**	**-2.221 (0.013)**	**-14.356 (0.000)**	**110.27 (0.006)**	**317.27 (0.000)**	**110.35 (0.006)**	**412.27 (0.000)**

Bold: The test indicates that the variable is stationary at least at 5%; p-values in squared parentheses

3.2. The Results of Panel Cointegration Tests

Pedroni Panel Residual Cointegration test (Pedroni, 1999) was used to decide the cointegration relationship between the variables. The Pedroni Panel Residual Cointegration test includes 7 different tests and 11 different statistics to determine the cointegration relationship between variables, under the assumption that there is no cross-sectional dependency (Pedroni, 1999).

The results of Pedroni Panel Residual Cointegration test were shown in Table 3. From the results shown in Table, 4 out of 11 different statistics for the models of crude and infant mortality rates, 5 for cancer mortality rate model, 6 for the models of low-birth-weight infant rate and health expectancy model show a significant long-run cointegration relationship between series. Therefore, we can conduct Panel ARDL analysis to estimate long-run and short coefficients.

Table 3. The Results of Pedroni Panel Residual Cointegration Tests

Included observations: 532			**Cross-sections included:** 38	
Null Hypothesis: No cointegration		**Trend assumption:** No deterministic trend		
User-specified lag length: 1	Newey-West automatic bandwidth selection and Bartlett kernel			
	CrudeMR	**InfantMR**	**CancerMR**	**LBR**
Panel v-Statistic	-2.90 (0.998)	**2.03 (0.020)****	-2.22 (0.986)	-2.08 (0.981)
Panel v-Statistic- Weighted	-2.14 (0.983)	3.45 (0.999)	-3.61 (0.999)	-3.57 (0.999)
Panel rho-Statistic	4.56 (1.000)	3.21 (0.999)	4.29 (1.000)	4.43 (1.000)
Panel rho-Statistic- Weighted	4.56 (1.000)	3.99 (1.000)	4.96 (1.000)	4.98 (1.000)
Panel PP-Statistic	**-2.94*** (0.001)**	**6.93*** (0.000)**	**9.86*** (0.000)**	**-7.30*** (0.000)**
Panel PP-Statistic- Weighted	**-4.84*** (0.000)**	**-10.02*** (0.000)**	**-7.73*** (0.000)**	**-7.63*** (0.000)**
Panel ADF-Statistic	4.04 (1.000)	0.40 (0.658)	1.79 (0.963)	**-6.58*** (0.000)**
Panel ADF-Statistic- Weighted	1.79 (0.963)	0.35 (0.638)	**2.08** (0.018)**	**-6.78*** (0.000)**
Alternative hypothesis: individual AR coefs. (Between-dimension)				
Group rho-Statistic	7.07 (1.000)	6.27 (1.000)	7.54 (1.000)	7.57 (0.985)
Group PP-Statistic	**10.97*** (0.000)**	**-22.18*** (0.000)**	**12.48*** (0.000)**	**12.65*** (0.000)**
Group ADF-Statistic	2.18 (0.985)	-0.44 (0.327)	-1.24 (0.106)	**-8.98*** (0.000)**

****** Significant cointegration relationship at 5%; ******* Significant cointegration relationship at 1%, p-values in squared parentheses.

3.3. The Results of Panel ARDL Analysis

Table 4 shows thhe results of Panel ARDL Analysis. The selection of the most appropriate ARDL model was made automatically by the Eviews 9.5 package program according to the Akaike information criterion and the maximum lag length of 1 with automatic selection.

Table 4. The Results of Panel ARDL Analysis

Variables (Logarithmic)		Crude	Infant	Cancer	LBR
Calorie	Coeff.	**-0.052*****	0.028	**0.209*****	**1.406*****
	p	**0.000**	0.092	**0.000**	**0.000**
Protein	Coeff.	**0.009*****	**-0.073*****	**-0.116*****	**-0.766*****
	p	**0.000**	**0.000**	**0.000**	**0.000**
Sugar	Coeff.	**0.650*****	**0.211****	**1.408*****	**7.960*****
	p	**0.000**	**0.044**	**0.000**	**0.000**
Fat	Coeff.	0.024	**0.268*****	**-1.056*****	**-5.499*****
	p	0.294	**0.000**	**0.000**	**0.000**
Alcohol	Coeff.	**-0.011*****	**-0.339*****	**0.106*****	**0.642*****
	p	**0.007**	**0.000**	**0.002**	**0.001**

******* Significant at 1%., ****** Significant at %5

From the results of Panel ARDL analysis in Table 4, it was found that the effect of calorie supply on crude mortality rate was significantly negative ($p<0.05$), while the effect of calorie supply on cancer mortality rate and low birth weight were significantly positive ($p<0.05$). On the other hand, there was no significant relationship between calorie supply and infant mortality rate ($p>0.05$).

According to the results of Panel ARDL analysis, the effect of protein supply on 3 out 4 health indicators (infant mortality rate, cancer mortality rate, low birth weight was significantly positive, while it was significantly negative on crude mortality rate.

From the findings of sugar supply, it was found that sugar supply has affected the health indicators of crude mortality rate, infant mortality rate, cancer mortality rate and low birth rate in significantly positive way.

When examining the coefficient of the total fat supply model, it was detected that there was a positive way significant relationship between fat supply and infant mortality rate, while the relationship between fat supply cancer mortality and low birth rate significantly negative.

For alcohol, it was found that alcohol consumption affected crude mortality rate and infant mortality rate in significantly negative and, it affected cancer mortality rate and low birth weight rate significantly positively.

4. DISCUSSION

The findings of this study shows that the increase in calorie supply will result an increase in cancer mortality rate and low birth weight rate, while it will result a decrease in crude mortality rate. O’Flanagan et al. (2017) states that excessive calori consumption is among the reasons of cancer, so that calorie restriction extends life span. On the other hand, our finding of low birth rate is opposite to the finding of Choudhary (2013), which found that increase in calorie intake decreases the low-birth-weight rate.

In this study, it was found that an increase in protein supply will cause a significant reduce in infant mortality rate, cancer mortality rate and low birth weight rate but significant increase in crude mortality rate. The primary role of proteins is for use in the various anabolic processes of the body. Proteins form the main structural component of muscle and other tissues in the body and are important for human health as they are used to produce hormones, enzymes and hemoglobin (Hoffman & Falvo, 2004).

This study reveals that the more sugar supplies the higher crude mortality, infant mortality, cancer mortality and low birth weight rate occur. Ahn and Park (2021) showed that there is a significant inverse relationship between the intake of sweetened beverages and bone mineral density in adults as a result of their meta-analysis. High sugar consumption is associated with the risk of diabetes, metabolic syndrome, cardiovascular diseases and obesity (Bray & Popkin, 2014). Added sugar consumption is generally associated with the development and/or prevalence of fatty liver, dyslipidemia, insulin resistance, hyperuricemia, cardiovascular disease and type 2 diabetes, independent of body weight gain or total energy intake (Lustig et al., 2012). Our result supports the view that sugar consumption is harmful to health.

Significanlty positive relationship between fat supply and infant mortality rate shows that increase in fat supply will result increase in infant mortality rate, while the significantly negative relationship between fat supply cancer mortality and low birth rate opposite. Due to the significant serum cholesterol-increasing effect of saturated fatty acids, it can cause many diseases, especially cardiovascular diseases (Wahrburg, 2004). Similarly, increases in total and saturated fat consumption have been associated with breast cancer (Binukumar & Mathew, 2005) and schizophrenia (Christensen & Christensen, 1988).

For alcohol supply, while the increase in alcohol consumption will decrease the crude death rate and infant mortality rate, it will increase the cancer death rate and low birth weight rate. Yılmaz and Atak (2014) states that there is a concencus in the literature that an increase in alcohol consumption increases the risk of cancer. Our study found a similar finding to this literature. Alcohol consumption causes an increase in traffic accidents and injuries, thus harming people other than the person himself. Moreover, it has been found to increase the risk of about 60 diseases such as cancer, neuropsychiatric disorders, diabetes, cardiovascular disease. In developed societies, 6.8% of the total disease burden consists of alcohol-related diseases (Room et al., 2005). Denton and Walters (1999) has been found that weekly alcohol consumption and perceived health level are associated with men. In addition, being a former smoker affects the perceived health level negatively in both men and women.

5. CONCLUSIONS AND RECOMMENDATIONS

This study was conducted to reveal the effects of health behaviors on selected health indicators. In this context, we analysed data between 2005-2018 for 14 OECD countries by Panel ARDL model. Data of the study include crude mortality rate, infant mortality rate, low birth weight and health expectancy at birth as dependent variables, and calorie cupply, protein supply, sugar supply, fat supply and alcohol consumption as dependent variables.

According to the results, while an increase in sugar and protein consumption will have a reducing effect on crude mortatliy rate, while an increase in calorie and alcohol consumption will have an increasing effect on crude mortality rate. On the other hand, fat supply was not assosiacted with crude mortality rate. For infant mortality rate, it was revealed that increase in sugar and fat supply will increase infant mortality rate, while increase in protein and alcohol quantity will reduce it. The results of cancer mortality rate model show that cancer mortality rate increase when the quantity of calorie, sugar and alcohol increase, but decrease when protein and fat supply increase. Looking at the results of low-birth-weight model, it is seen that low birth weigth rate is affected in a bad way from the increase in the quanity of calorie, sugar and alcohol. On the other hand, increase in protein and fat supply decreases the low-birth-weigth rate.

In conclusion, this study shows that the effects of health behaviors, such as calorie, protein and fat supply, and alcohol consumption, on crude death, infant mortality, cancer death, and low birth weight rates are mixed. On the other hand, it was concluded that sugar supply effecs negatively these selected health indicators of crude mortality rate, infant mortality rate, cancer mortality rate and low birth weight rate.

Conflict of Interest: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: This research was not supported by any institution.

This article does not contain any studies with human participants or animals performed by any of the authors.

References

Adler, N. E., Cutler, D. M., University, H., Fielding, J. E., & Koh, H. K. (2016). Addressing Social Determinants of Health and Health Disparities A Vital Direction for Health and Health Care About the Vital Directions for Health and Health Care Series. In *Perspectives*.

Adler, N. E., & Stead, W. W. (2015). Patients in context — EHR capture of social and behavioral determinants of health. *New England Journal of Medicine*, *372*(8), 698–701. https://doi.org/10.1056/NEJMp1413945

Ahn, H., & Kyoung Park, Y. (2021). Sugar-sweetened beverage consumption and bone health: a systematic review and meta-analysis. *Nutrition Journal*, *20*, 1–16. https://doi.org/10.1186/s12937-021-00698-1

Barton, L. R., Parke, K. A., & White, C. L. (2019). Screening for the Social and Behavioral Determinants of Health at a School-Based Clinic. *Journal of Pediatric Health Care*, *33*(5), 537–544. https://doi.org/10.1016/J.PEDHC.2019.02.002

Berkowitz, S. A., Seligman, H. K., Meigs, J. B., & Basu, S. (2018). Food Insecurity, Healthcare Utilization, and High Cost: A Longitudinal Cohort Study. *The American Journal of Managed Care*, *24*(9), 399–404.

Binukumar, B., & Mathew, A. (2005). Dietary fat and risk of breast cancer. *World Journal of Surgical Oncology*, *3*(1), 1–7. https://doi.org/10.1186/1477-7819-3-45/COMMENTS

Bray, G. A., & Popkin, B. M. (2014). Dietary sugar and body weight: Have we reached a crisis in the epidemic of obesity and diabetes?: Health be damned! Pour on the sugar. *Diabetes Care*, *37*(4), 950–956. https://doi.org/10.2337/dc13-2085

Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance*, *20*(2), 249–272. https://doi.org/10.1016/S0261-5606(00)00048-6

Choudhary, A. K., Choudhary, A., Tiwari, S. C., & Dwivedi, R. (2013). Factors associated with low birth weight among newborns in an urban slum community in Bhopal. *Indian Journal of Public Health*, *57*(1), 20–23. https://doi.org/10.4103/0019-557X.111362

Christensen, O., & Christensen, E. (1988). Fat consumption and schizophrenia. *Acta Psychiatrica Scandinavica*, *78*(5), 587–591.

Cirakli, U., Dogan, I., & Gozlu, M. (2021). The Relationship Between COVID-19 Cases and COVID-19 Testing: a Panel Data Analysis on OECD Countries. *Journal of the Knowledge Economy*. https://doi.org/10.1007/S13132-021-00792-Z

Çıraklı, Ü., & Yıldırım, H. H. (2019). The Impacts of Economic Crisis on The Public Health in Turkey: An ARDL Bounds Testing Approach. *Hacettepe Sağlık İdaresi Dergisi*, *22*(2), 259–280.

Clancy, H. A., Zhu, Z., Gordon, N. P., Kipnis, P., Liu, V. X., & Escobar, G. J. (2022). Prospective evaluation of social risks, physical function, and cognitive function in prediction of non-elective rehospitalization and post-discharge mortality. *BMC Health Services Research*, *22*(1), 1–11. https://doi.org/10.1186/S12913-022-07910-W

Denton, M., & Walters, V. (1999). Gender differences in structural and behavioral determinants of health: an analysis of the social production of health. *Social Science & Medicine*, *48*(9), 1221–1235. https://doi.org/10.1016/S0277-9536(98)00421-3

Healthy People. (2022). *Determinants of Health*. Healthy People 2020.

Hoffman, J. R., & Falvo, M. J. (2004). Protein – Which is Best? *Journal of Sports Science & Medicine*, *3*(3), 118.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, *115*(1), 53–74. https://doi.org/10.1016/S0304-4076(03)00092-7

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24. https://doi.org/10.1016/S0304-4076(01)00098-7

Lustig, R. H., Schmidt, L. A., & Brindis, C. D. (2012). The toxic truth about sugar. *Nature*, *482*, 27–29. https://doi.org/10.1038/482027a

Maddala, G. S., & Wu, S. (1999). A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. *Oxford Bulletin of Economics and Statistics*, *61*(S1), 631–652.

McGinnis, J. M., Williams-Russo, P., & Knickman, J. R. (2002). The case for more active policy attention to health promotion. *Health Affairs*, *21*(2), 78–93. https://doi.org/10.1377/hlthaff.21.2.78

Mokdad, A. H., Marks, J. S., & Stroup, D. F. (2004). Actual Causes of Death in the United States, 2000 Topic collections The Immediate vs the Important Related Letters. *Journal of the American Medical Association*, *291*(10), 1238–1245. https://doi.org/10.1001/jama.291.10.1238

Na, M., Dou, N., Liao, Y., Rincon, S. J., Francis, L. A., Graham-Engeland, J. E., Murray-Kolb, L. E., & Li, R. (2022). Daily Food Insecurity Predicts Lower Positive and Higher Negative Affect: An Ecological Momentary Assessment Study. *Frontiers in Nutrition*, *9*, 1–11. https://doi.org/10.3389/fnut.2022.790519

O'Flanagan, C. H., Smith, L. A., McDonell, S. B., & Hursting, S. D. (2017). When less may be more: Calorie restriction and response to cancer therapy. *BMC Medicine*, *15*(1), 1–9. https://doi.org/10.1186/s12916-017-0873-x

Pedroni, P. (1999). Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics*, *61*(S1), 653–670.

Pesaran, M. H., Shin, Y., Smith, R. P., & Hashem, M. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association*, *94*, 621–634. https://doi.org/10.1080/01621459.1999.10474156

Pickens, C. M., Pierannunzi, C., Garvin, W., & Town, M. (2019). Surveillance for Certain Health Behaviors and Conditions Among States and Selected Local Areas — Behavioral Risk Factor Surveillance System, United States, 2015. In *Morbidity and mortality weekly report. Surveillance summaries* (Vol. 67, Issue 9). Centers for Disease Control and Prevention (CDC). https://doi.org/10.15585/MMWR.SS6709A1

Room, R., Babor, T., & Rehm, J. (2005). Alcohol and public health. *The Lancet*, *365*(9458), 519–530. https://doi.org/10.1016/S0140-6736(05)17870-2

Wahrburg, U. (2004). What are the health effects of fat? *European Journal of Nutrition*, *43*(SUPPL. 1), 6–11. https://doi.org/10.1007/s00394-004-1103-9

WHO. (2017). *Determinants of health*.

Wilkinson, R., & Marmot, M. (2003). *Social determinants of health: the solid facts, 2nd ed (en).*

World Health Organization Regional Office for Europe. (2001). *The First action plan for food and nutrition policy : WHO European Region 2000-2005*.

Yılmaz, M. S., & Atak, N. (2014). The evaluation of risk of breast cancer from the perspective of nutritional factors. *Türkiye Halk Sağlığı Dergisi*, *12*(1), 51.