Jurnal Sains Kesihatan Malaysia 23 (2) 2025: 1-12
DOI : http://dx.doi.org/10.17576/JSKM-2025-2302-01

Factors Affecting Tobacco And Alcohol Consumption Of Countries According To Income Level

(Faktor-Faktor Yang Mempengaruhi Pengambilan Tembakau Dan Alkohol Negara Mengikut Tahap Pendapatan)

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Abstract

This study examined factors related to tobacco and alcohol consumption in low, lower middle, high middle, and high-income countries. The factors associated with tobacco and alcohol consumption of countries according to income level are discussed as the dollar price of the most consumed cigarette, happiness index, unemployment rate, and gross domestic product (GDP) of the countries. Factors related to tobacco and alcohol consumption were determined using a generalized linear model and regression analysis. The results showed that tobacco consumption in high-income countries is associated with alcohol consumption and cigarette prices, and alcohol consumption is related to tobacco consumption and, if the significance level (alpha) is accepted as 0.10, unemployment. It has been observed that for high middle-income countries, none of the factors considered are associated with alcohol consumption, while tobacco use is related to cigarette prices, happiness index, and GDP variables if alpha is taken as 0.10. For lower middle-income countries, it has been found that alcohol consumption is related to tobacco use and unemployment, while tobacco use is associated with alcohol consumption and unemployment. Considering low-income countries, it was observed that none of the factors considered are associated with alcohol consumption. Unemployment and GDP are related to tobacco use when alpha is taken as 0.10. The study sheds light on the complex relationship between tobacco and alcohol consumption and the factors related to tobacco and alcohol consumption, according to the income level of countries.

Keywords: tobacco use, alcohol consumption, income level of countries, GDP, regression

Abstrak

Kajian ini mengkaji faktor yang berkaitan dengan penggunaan tembakau dan alkohol di negara berpendapatan rendah, sederhana rendah, sederhana tinggi dan berpendapatan tinggi. Faktor-faktor yang dikaitkan dengan penggunaan tembakau dan alkohol di negara-negara mengikut tingkat pendapatan dibincangkan sebagai harga dolar bagi rokok yang paling banyak digunakan, indeks kebahagiaan, kadar pengangguran, dan keluaran dalam negara kasar (KDNK) negara. Faktor-faktor yang berkaitan dengan penggunaan tembakau dan alkohol telah ditentukan menggunakan model linear umum dan analisis regresi. Keputusan menunjukkan bahawa penggunaan tembakau di negara berpendapatan tinggi dikaitkan dengan penggunaan alkohol dan harga rokok, dan penggunaan alkohol berkaitan dengan penggunaan tembakau dan, jika tahap keertian (alfa) diterima sebagai 0.10, pengangguran. Telah diperhatikan bahawa bagi negara berpendapatan sederhana tinggi, tiada faktor yang dipertimbangkan dikaitkan dengan penggunaan alkohol, manakala penggunaan tembakau adalah berkaitan dengan harga rokok, indeks kebahagiaan dan pembolehubah KDNK jika alfa diambil sebagai 0.10. Bagi negara berpendapatan sederhana rendah, didapati bahawa penggunaan alkohol berkaitan dengan penggunaan tembakau dan pengangguran, manakala penggunaan tembakau dikaitkan dengan penggunaan alkohol dan pengangguran. Memandangkan negara berpendapatan rendah, diperhatikan bahawa tiada satu pun faktor yang dipertimbangkan dikaitkan dengan penggunaan alkohol. Pengangguran dan KDNK adalah berkaitan dengan penggunaan tembakau apabila alpha diambil sebagai 0.10. Kajian itu memberi penerangan tentang hubungan kompleks antara tembakau dan penggunaan alkohol dan faktor-faktor yang berkaitan dengan tembakau dan penggunaan alkohol, mengikut tahap pendapatan negara.

Kata kunci: penggunaan tembakau, penggunaan alkohol, tahap pendapatan negara, KDNK, regresi

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INTRODUCTION

The consumption of alcoholic beverages and tobacco has been common for centuries around the World (Rolfe 2011). Tobacco and alcohol consumption causes serious illnesses that can lead to death (World Health Organization (WHO) 2023a, 2023b; Omare et al. 2021; Esser et al. 2022).

In the global rise of tobacco consumption have been played a significant role by political, social, and economic factors. Changing social dynamics, societal pressures, and similar elements have greatly contributed to this proliferation, turning it into a major issue for individuals, families, communities, and nations (Khude et al. 2015).

The tobacco epidemic is one of the greatest public health threats facing the world, killing more than 8 million people annually worldwide. More than 7 million of these deaths are due to direct tobacco use, and approximately 1.3 million are due to exposure of non-smokers to second-hand smoke. Around 80% of the 1.3 billion tobacco users worldwide are concentrated in low- and middle-income nations, where tobacco-related illnesses and deaths impose the greatest burden. Tobacco consumption worsens poverty by reallocating household budgets from fundamental necessities like food and housing to tobacco expenditures. Because tobacco is so addictive, it is difficult to prevent this spending behavior (WHO 2023a).

In high-income countries, tobacco expenditures constitute only a small fraction of an individual's disposable income, whereas in low-income countries, they account for a significantly larger share. Hence, budgetary concerns may not exert sufficient pressure on individuals in high-income countries to reduce cigarette consumption or quit smoking (Wang et al., 2018). The socioeconomic differences in smoking behavior, which define the stages of the smoking epidemic, align with the theory of diffusion of innovation. Initially, smoking becomes widespread among individuals in higher socioeconomic strata. It subsequently extends to a broader population, including lower socioeconomic groups who adopt the habit later. This is followed by the onset of smoking cessation among higher socioeconomic groups, a persistent gender disparity with male dominance, and a rise in smoking rates among women. In the final stage, smoking prevalence decreases significantly among higher socioeconomic groups but remains high among those with lower socioeconomic status (Doku et al., 2010). Figure 1 shows the tobacco use prevalence of individuals over the age of 15 according to the income levels of the countries.

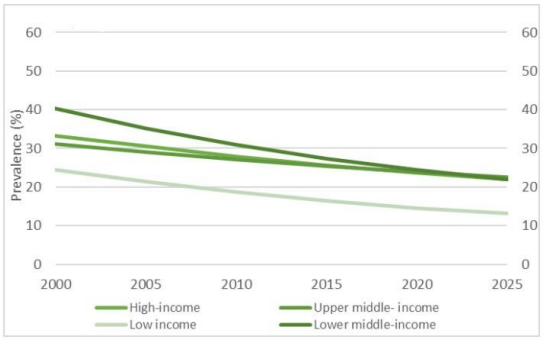

Figure 1 Trends in current tobacco use among people aged ≥15 years (WHO, 2019).

The prevalence of tobacco use tends to decrease over time in all country income groups. Currently, lower middle-income countries exhibit the highest average prevalence, but by 2025 these rates are expected to fall enough to match the average rates of high-income and high middle-income countries. Throughout the period from 2000 to 2025, low-income countries are expected to maintain the lowest average prevalence, projected to reach 13% by 2025; This is around two-thirds of the expected usage level for other country income groups (22%) (WHO 2019).

Alcohol, an addictive psychoactive substance, has been consumed across various cultures for centuries. The harmful use of alcohol is responsible for 3 million deaths annually, accounting for 5.3% of all fatalities. Globally, alcohol contributes to 5.1% of the total disease and injury burden, as measured by disability-adjusted life years (DALYs). Alcohol consumption causes disability and death relatively early in life. Approximately 13.5% of total deaths in people aged 20-39 are attributable to alcohol (WHO 2023b). Figure 2 shows the prevalence of alcohol use disorders according to income levels of countries.

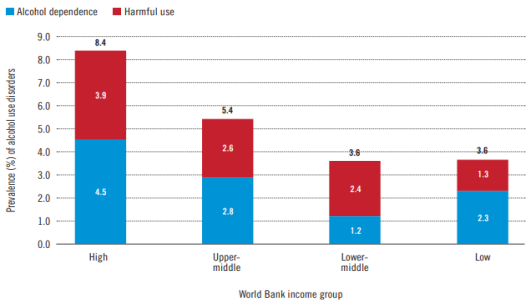

Figure 2 Prevalence (in %) of alcohol use disorders (AUDs), by income group, 2016 (WHO 2018).

The prevalence of alcohol use disorders also varies by economic wealth; It ranges from 3.6% in low-income countries to 3.6% in lower middle-income countries and 8.4% in high-income countries. This prevalence is shown in Figure 2 for

income groups. Similarly, alcohol harmful use and dependence were most prevalent in high-income countries (3.9% of adults engaged in the harmful use of alcohol while 4.5% of adults had alcohol dependence). Harmful use of alcohol was lowest in low-income countries (1.3% of adults), while alcohol dependence was lowest in lower middle-income countries (1.2% of adults) (WHO 2018).

A higher prevalence of smokers and drinkers can be found in high gross domestic product (GDP) areas: advertising is more developed in such areas, and the distance is shorter to the closest tobacco or alcohol shops, restaurants, bars, or fast-food outlets. Moreover, shops, bars, or restaurants may be open later in the evening in high-GDP areas. Such a consumerist context may influence food, alcohol, and tobacco consumption, and may particularly increase the prevalence of excessive consumption (Chaix & Chauvin, 2003).

Alcohol and tobacco use cause negative effects on human health, but also directly and indirectly cause an increase in the state's public expenditures such as health, justice, and security, thus affecting the entire society (Çetin and Özkan, 2018). The world has agreed on the harms of tobacco and alcohol consumption and has become aware of the need to combat this issue both within nations and at the international level (WHO 2023a, 2023b; Omare et al. 2021; Esser et al. 2022).

LITERATURE REVIEW

There are many studies conducted on tobacco and alcohol consumption. Some of these are given below. Su and Yen (2000) proposed a two-step estimation procedure and applied the procedure to a system of equations for wine consumption, beer, and cigarettes. Results suggest that consumption of wine, beer, and cigarettes is responsive to income changes but the elasticities are rather small. Education, personal physique, race, age, health, ethnicity, gender, region, and employment status, play significant roles in consumption.

Kalmijn et al. (2002) examined the relationship between cognitive performance and smoking and moderate alcohol consumption in a population-based cohort study of 1,927 randomly selected subjects, mostly middle-aged, aged 45–70 years, living in the Netherlands during cognitive testing. Findings indicated that current smokers had decreased psychomotor speed and decreased cognitive flexibility compared to non-smokers, after adjusting for gender, age, education, alcohol consumption, and cardiovascular risk factors. Among middle-aged individuals, current cigarette use was inversely related, and alcohol consumption was positively associated with cognitive flexibility and psychomotor speed.

Elegbede et al. (2012) identified the smoking habits of University Students in Ekiti State, Nigeria. 300 students were selected by multi-stage sampling technique. The results showed that the proportion of current smokers was 13.7%, and the proportion of students who had smoked before was 22.0%. Among the students who smoked, the largest proportion, 53.0%, smoked for pleasure. The average number of sticks smoked per day was 4.46 + 4.59 and the average age of starting smoking was 15.14 + 4.34. The majority of people who started smoking were siblings 18.1%, colleagues at school 33.3% and friends at home 48.6%. Factors positively associated with smoking habits include male gender, alcohol consumption, having a friend/relative who smokes, and not having received prior education about the dangers of smoking.

Nuevo et al. (2015) examined the patterns and frequency of alcohol consumption in older adults in different European countries, as well as the relationship between socioeconomic status and the gender of drinkers. According to the results, significant differences were found in alcohol consumption across countries. Most people in all countries consume moderate levels of alcohol in terms of quantity and pattern of consumption except for three countries in the eastern regions. However, there are clear gender differences, with higher intake in men, but these differences are relatively proportional across countries. After controlling for age, gender, health status, and the country's development level higher socioeconomic status is positively associated with alcohol consumption.

Easwaran et al. (2015) measured the determinants and prevalence of alcohol consumption among adult males in the coastal district of Pondicherry. The population of the research consisted of 500 men aged 18 and over. Findings show that the prevalence of alcohol consumption is 59.6%. Factors such as a family history of alcohol consumption, low literacy levels, and smoking are positively associated with alcohol consumption.

Yue et al. (2015) examined the relationship between smoking, depressive symptoms, and alcohol consumption among adolescents, focusing specifically on gender differences. A total of 19578 high and middle school students in Chongqing Province were surveyed to assess self-reported depressive symptoms, alcohol consumption, smoking, and family- and school-related factors. It was found that a total of 8.8% of adolescents smoked and tobacco use in boys was significantly higher than in girls. Approximately 23.5% of adolescents reported alcohol use, and consumption was significantly higher in boys than in girls. It was found that 9.1% of adolescents exhibited depressive symptoms, with boys reporting significantly fewer symptoms compared to girls. Multiple logistic

regression analysis results demonstrated that the association between depressive symptoms and alcohol consumption was weaker boys than girls. A significant association between smoking and depressive symptoms emerged only in girls.

Rathmann et al. (2016) determined whether educational differentiation was associated with socioeconomic disparities in adolescent smoking. Multilevel logistic regression was used to determine the association between daily smoking and early smoking initiation as predicted by educational differentiation, family affluence, and their interactions. Socioeconomic inequalities were larger in countries with lower levels of educational differentiation than in countries with higher levels of educational differentiation. Higher educational differentiation is not associated with greater relative inequalities in smoking.

Holmes and Anderson (2017) introduced two new summary indicators to better reflect the various aspects of convergence in overall alcohol consumption and the composition of beverage types. Countries were categorized based on their primary alcoholic consumption whether focused on beer, wine, or spirits in the early 1960s, as well as their real per capita incomes and geographic regions. In recent years, alcohol is compared with soft drink retail expenditure and expenditure data has been added and the difference it makes when unrecorded alcohol volumes are included as part of total alcohol consumption was shown.

Duko et al. (2019) evaluated the prevalence of smoking among Tabor secondary and preparatory school students in Hawassa City, Ethiopia, in 2018. It was found that the prevalence of smoking among students was 11%, of which 9.4% were current smokers. The smoking rate among female and male students was found to be 2.8% and 8.2%, respectively. Among students aged 18 and over, khat chewing, having friends who smoke, illegal or illicit drug use, and alcohol consumption were significantly associated with cigarette smoking.

Álvarez et al. (2020) measured the income, and price elasticities of demand for cigarette consumption for the Spanish cigarette market by applying a non-linear autoregressive dynamics lag model and using time series data from 1957 to 2016. This study introduces a new framework to examine the potential impact of asymmetries in economic shocks on cigarette consumption. The findings indicate a significant asymmetric relationship, with cigarette consumption rising during expansionary shocks. In contrast, cigarette consumption declines sharply during recessionary shocks, with the decrease being more pronounced in recession periods than in expansions. Increased cigarette prices are linked to a reduction in smoking, and economic recessions also contribute to lower cigarette consumption.

Yıldız (2020) examined the determinants of cigarette consumption in Turkey during the period 1960-2016 using the Autoregressive Distributed Lag bounds test approach. Real price of cigarettes, tobacco control, real gross domestic product (GDP) per capita, urban population, and tertiary school enrollment were fitted as independent variables. Results indicate that tobacco controls, real GDP per capita, and urbanization positively affect cigarette consumption, while education level and cigarette prices negatively affect smoking. Additionally, results reveal that educating people about the harmful effects of smoking and controlling cigarette prices are important policies to reduce cigarette consumption. However, tobacco regulation policies have not yet shown an effect in reducing cigarette consumption.

Alkan and Ünver (2022) determined the relationship between exposure to secondhand smoke and demographic and socioeconomic conditions of women aged 15 and over in Turkey. Generalized ordered logistic regression, ordered logistic regression, generalized ordered probit regression, and ordered probit regression, were used to identify factors associated with individual tobacco smoke exposure. Generalized ordered logistic regression produced the best model according to the comparison criteria. The model results showed that education level, age, average monthly net income, working conditions, alcohol consumption, psychosocial support conditions, general health status, and the respective survey year were efficient variables concerning tobacco smoke exposure.

Studies in the literature have addressed the effects of various demographic, socioeconomic, cultural, and personal factors on tobacco and alcohol consumption in different contexts (Kalmijn et al. 2002; Nuevo et al. 2015; Yue et al. 2015; Rathmann et al. 2016). However, most of these studies have focused on specific regions or certain demographic groups. Although the studies examined provide important information on individual and social factors related to tobacco and alcohol consumption, they do not fully address the differences in consumption in countries with different income levels. Therefore, the study aimed to examine the factors associated with tobacco and alcohol consumption, taking into account the income levels of the countries. Understanding and analyzing all these factors can help create and implement more effective smoking and alcohol control policies.

MATERIALS AND METHODS

Study design

This study employed an ecological research design. In the study, tobacco use and alcohol consumption,

as well as factors associated with tobacco and alcohol consumption, were examined according to the income levels of the countries. The World Bank, International Monetary Fund (IMF) publish reports and classifications on the development levels of the world's countries (World Population Review 2023; World Bank 2023). These reports are based on objective data that evaluates the socioeconomic indicators and development levels of countries. Thus, countries are divided into four groups according to their income levels: high, high middle, lower middle, and low-income. Countries by income level are listed in Annex 1. The countries included in the study are those that have data on the variables to be discussed in the study. The variables related to tobacco and alcohol consumption were determined by considering literature studies and the availability of data. Since 2018 is the year in which all data on the variables are available for the countries covered in the study, the data set was created from 2018 data. It was considered that factors related to tobacco consumption are the dollar price of the most consumed cigarette, happiness index, unemployment rate, and GDP of countries; factors associated with alcohol consumption are tobacco use, happiness index, unemployment rate, and GDP of countries. Just as the price of cigarettes was added to the study, the price of alcohol was also wanted to be added, but alcohol prices for all countries covered in the study could not be accessed. Therefore, it could not be included in the study. While these factors may have a single effect, they often interact with each other. For example, if an individual with a low happiness level also lives in an area with a high unemployment rate, his/her smoking and alcohol consumption may increase.

DATA SOURCES

The variables considered in the study and information about these variables are given in Table 1.

Table 1. Information on the variables used in the study

Variables	Explanation	Unit	Source
Alcohol consumption	recorded per capita (15+ years) consumption	in litres of pure alcohol	WHO; Global Health Observatory data repository https://apps.who.int/gho/data/node.main.A1039?lang=en%20Prevalence%20of%20current%20tobacco%20use%20(%%20of%20adults)
Tobacco use	Age-standardized estimates of current tobacco use, tobacco smoking, and cigarette smoking	Prevalence of current tobacco use among persons aged 15 years and older (age-standardized rate)	WHO; Global Health Observatory data repository https://apps.who.int/gho/data/node.main.TOBAGESTDCURR?lang=en
Cigarettes price	Retail price for a pack of 20 cigarettes Data by country	Premium brand of cigarettes - price in US$ at official exchange rates	WHO; Global Health Observatory data repository https://apps.who.int/gho/data/node.main.TOBRETAIL?lang=en
Happiness Index	Happiness Index	points 0 (unhappy) - 10 (happy)	TheGlobalEconomy.com https://www.theglobaleconomy.com/rankings/happiness/
Unemployment	Unemployment rate	percent	TheGlobalEconomy.com https://www.theglobaleconomy.com/rankings/Unemployment_rate/
Gross domestic product (GDP)	GDP per capita	current U.S. dollars, 2018	TheGlobalEconomy.com https://www.theglobaleconomy.com/rankings/GDP_per_capita_current_dollars/

The recorded alcohol per capita consumption, in litres of pure alcohol, is the recorded amount of alcohol consumed per capita (15+ years) in a country during a calendar year. It takes into account consumption recorded from production, sales, export, and import data, which are usually recorded through taxation (WHO, 2024a). Current tobacco use refers to the proportion of individuals aged 15 and older who use any form of tobacco, whether smoked or smokeless, either on a daily or occasional basis (WHO, 2024b).

DATA ANALYSIS

Descriptive statistics of variables are given as mean, standard deviation, median, minimum and maximum values. The suitability of variables for normal distribution was examined using the

Kolmogorov-Smirnov and Shapiro-Wilk tests. One-way analysis of variance (ANOVA) was used for group comparisons of variables showing normal distribution and the Kruskal Wallis Test was used for group comparisons of variables not showing normal distribution. Afterward, a generalized linear model (linear) and regression analysis were conducted to determine the factors associated with tobacco and alcohol consumption. Analyses were performed using the IBM SPSS Statistics 25.0 program and the significance level was taken as 0.05 and 0.10.

RESULTS

Descriptive statistics of the variables are given in Table 2. A one-way analysis of variance and the Kruskal Wallis test was performed to determine whether the tobacco and alcohol use of countries grouped according to income level in the study differed. In Table 3, descriptive statistics of tobacco and alcohol consumption according to the income levels of the countries and the p-value for the analysis result are given.

Table 2. Descriptive statistics of variables

	N	Mean	Standard deviation	Median	Minimum	Maximum
Alcohol consumption	128	5.107	3.704	4.505	0.00	13.20
Tobacco use	128	0.432	1.254	0.248	0.11	14.30
Cigarette price	128	3.799	3.456	2.700	0.35	16.31
Happiness Index	128	5.447	1.139	5.470	2.91	7.63
Unemployment rate	128	6.624	4.787	4.995	0.11	24.22
GDP	128	80661.172	730689.448	6301.505	232.06	8279284.00

In the study, considering the countries (N) analyzed for the year 2018, the average per capita alcohol consumption was 5.107 litres, the average tobacco use was 0.432 for individuals aged 15 and older. Cigarette prices across the countries ranged from 0.35 to 16.31 USD, with an average price of 3.799 USD. The average happiness index score was 5.447. Unemployment rates varied between 0.11% and 22.24%, with a mean rate of 6.624%. The GDP per capita values of the countries ranged from 232.06 to 8,279,284.00 USD, with an average GDP per capita of 80,661.172 USD.

Table 3. Comparison results of tobacco and alcohol consumption according to income levels of countries

	Group	N	Mean (sd)	Median (min-max)	p value
Alcohol consumption	High-income	42	8.33 (3.38)	9.19 (0.00-13.20)	<0.001*A
	High middle-income	35	4.89 (2.81)	4.77 (0.17-11.53)	
	Lower middle-income	35	2.55 (2.14)	2.58 (0.00-7.78)	
	Low-income	16	2.69 (2.42)	2.06 (0.02-7.25)	
Tobacco use	High-income	42	0.24 (0.08)	0.22 (0.12-0.53)	0.215K
	High middle-income	35	0.35 (0.24)	0.25 (0.11-0.97)	
	Lower middle-income	35	0.74 (2.36)	0.26 (0.11-14.30)	
	Low-income	16	0.43 (0.32)	0.24 (0.12-0.89)	

A: one-way analysis of variance, K: Kruskal Wallis test, sd: standard deviation, *: p<0.05

When Table 3 is examined, it is seen that there is a difference between alcohol consumption according to the income levels of the countries. While there was no difference in alcohol consumption between lower middle and low-income countries, there was a difference between other groups. While the alcohol consumption average of high-income countries is 8.33 ±3.38, the alcohol consumption average of lower middle-income countries is 2.55±2.14. No statistically significant difference was found in tobacco use based on the income levels of countries.

Generalized linear models were used to determine factors associated with tobacco and alcohol use without dividing countries into groups.

Table 4. Factors related to tobacco and alcohol use

	Dependent variable: **Alcohol consumption**G		Dependent variable: **Tobacco use**G	
	Beta (SE)	p value	Beta (SE)	p value
Intecept	-4.48 (1.57)	0.004	0.060 (0.68)	0.928
Tobacco use	0.07 (0.23)	0.764	-	-
Alcohol consumption	-	-	0.015 (0.03)	0.650

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Cigarette price	-	-	-0.400 (0.04)	0.362
Happiness Index	1.68 (0.26)	**<0.001***	-0.002 (0.13)	0.986
Unemployment	0.06 (0.06)	0.285	0.060 (0.02)	**0.003***
GDP	-2,8319E-7 (3,9711E-7)	0.476	4,304E-8	0.781

G: generalized linear model, SE: standard error, *: p<0.05

Looking at Table 4, as a result of the analysis conducted by considering data from 128 countries, it was seen that the factor associated with alcohol consumption was the happiness index, while tobacco use, unemployment, and GDP were not associated with alcohol consumption. It appears that the factor associated with tobacco use is unemployment. Alcohol consumption, cigarette price, happiness index, and GDP did not show a significant relationship with tobacco use. A one-unit increase in the happiness index is associated with an average increase of 1.68 units in alcohol consumption. A one-unit increase in unemployment is associated with an average increase of 0.06 units in tobacco use. The factors related to tobacco and alcohol use for countries grouped according to income level are given in Tables 5-8.

Table 5. Factors related to tobacco and alcohol use for high-income countries

	Dependent variable: **Alcohol consumption**[G]		Dependent variable: **Tobacco use**[R]	
	Beta (SE)	p value	Beta (SE)	p value
Intecept	-4.639 (5.89)	0.432	0.294 (0.120)	0.028
Tobacco use	19.004 (6.44)	**0.003***	-	-
Alcohol consumption	-	-	0.010 (0.003)	**0.003***
Cigarettes price	-	-	-0.009 (0.004)	**0.023***
Happiness Index	1.090 (0.77)	0.160	-0.017 (0.021)	0.425
Unemployment	0.230 (0.18)	0.187	0.007 (0.004)	0.092#
GDP	-2,1072E-7 (3,6441E-7)	0.563	5,6839E-9 (0.00)	0.496

G: generalized linear model, R: regression analysis, SE: standard error, *: p<0.05, #:p<0.10

According to Table 5, it is seen that tobacco use is related to alcohol consumption in high-income countries. Alcohol consumption, cigarette prices, and if the significance level is accepted as 0.10, unemployment are associated with tobacco use. One unit increase in tobacco use is associated with an average increase of 19.004 units in alcohol consumption. A one unit increase in alcohol consumption is associated with an average increase of 0.01 units in tobacco use, and a one unit increase in unemployment is associated with an average increase of 0.007 units in tobacco use. One unit increase in the price of cigarettes is associated with an average change of -0.009 units in tobacco use.

Table 6. Factors related to tobacco and alcohol use for high middle-income countries

	Dependent variable: **Alcohol consumption**[R]		Dependent variable: **Tobacco use**[G]	
	Beta (SE)	p value	Beta (SE)	p value
Intecept	8.840 (5.37)	0.110	-0.553 (0.370)	0.143
Tobacco use	0.832 (2.27)	0.718	-	-
Alcohol consumption	-	-	0.015 (0.013)	0.267
Cigarettes price	-	-	0.047 (0.017)	**0.008***
Happiness Index	-1.135 (1.02)	0.278	0.169 (0.065)	**0.010***
Unemployment	-0.052 (0.10)	0.625	0.001 (0.007)	0.876
GDP	0.000(0.000)	0.718	-0.000031 (0.000017)	0.068#

G: generalized linear model, R: regression analysis, SE: standard error, *: p<0.05, #:p<0.10

DOI : http://dx.doi.org/10.17576/JSKM-2025-2302-01

For high middle-income countries, it was observed that none of the factors considered were associated with alcohol consumption. It has been found that tobacco use is related to cigarette prices, happiness index, and GDP variables if the significance level is taken as 0.10.

A one unit increase in cigarette price is associated with an average increase of 0.047 units in tobacco use, and one unit increase in happiness index is associated with an average increase of 0.169 units in tobacco use. One unit increase in GDP is associated with an average decrease of 0.000031 units in tobacco use.

Table 7. Factors related to tobacco and alcohol use for lower middle-income countries

	Dependent variable: **Alcohol consumption**[R]		Dependent variable: **Tobacco use**[G]	
	Beta (SE)	p value	Beta (SE)	p value
Intecept	6.690 (2.57)	0.014	-4.472 (2.65)	0.092
Tobacco use	0.466 (0.17)	**0.010**[*]	-	-
Alcohol consumption	-	-	0.440 (0.14)	**0.003**[*]
Cigarettes price	-	-	0.130 (0.23)	0.954
Happiness Index	-0.652 (0.54)	0.243	0.520 (0.51)	0.313
Unemployment	-0.202 (0.85)	**0.024**[*]	0.318 (0.06)	**<0.001**[*]
GDP	-0,000010(0.000)	0.967	0.000 (0.0002)	0.370

G: generalized linear model, R: regression analysis, SE: standard error, [*]: p<0.05

For lower middle-income countries, it has been found that alcohol consumption is associated with tobacco use and unemployment, while tobacco use is related to alcohol consumption and unemployment.

A one unit increase in tobacco use is associated with an average increase of 0.466 units in alcohol consumption, and a one unit increase in unemployment is associated with an average change of -0.202 units in alcohol use. One unit increase in alcohol consumption is associated with an average increase of 0.44 units in tobacco use. A one-unit increase in unemployment is associated with an average increase of 0.318 units in tobacco use.

Table 8. Actors related to tobacco and alcohol use for low-income countries.

	Dependent variable: **Alcohol consumption**[R]		Dependent variable: **Tobacco use**[G]	
	Beta(SE)	p value	Beta(SE)	p value
Intecept	4.220 (6.95)	0.556	1.113 (0.67)	0.098
Tobacco use	-1.876 (2.42)	0.456	-	-
Alcohol consumption	-	-	-0.044 (0.03)	0.156
Cigarettes price	-	-	-1.190 (0.15)	0.215
Happiness Index	-0.522 (1.77)	0.774	-0.160 (0.17)	0.335
Unemployment	0.024 (0.26)	0.927	-0.041 (0.02)	0.075[#]
GDP	0.002 (0.003)	0.601	0.001 (0.0004)	0.065[#]

G: generalized linear model, R: regression analysis, SE: standard error, [#]:p<0.10

Considering low-income countries, it was observed that none of the factors considered were associated with alcohol consumption. When the significance level is taken as 0.10, it can be said that unemployment and GDP are related to tobacco use.

A one unit increase in unemployment is associated with an average change of -0.041 units in tobacco use, and a one-unit increase in GDP is associated with an average increase of 0.001 units in tobacco use.

DOI : http://dx.doi.org/10.17576/JSKM-2025-2302-01

DISCUSSION

In the study, factors related to tobacco and alcohol consumption according to the income levels of the countries were examined. For tobacco use, the dollar price of the most consumed cigarette, happiness index, unemployment rate, and GDP of countries; for alcohol consumption, tobacco use, happiness index, unemployment rate, and GDP of countries were taken as independent variables.

Considering 128 countries, it has been seen that the factor associated with alcohol consumption is the happiness index, and the factor related to tobacco use is unemployment. When the factors were examined taking into account the income level of the countries, it was found that tobacco use was related to alcohol consumption in high-income countries, while alcohol consumption, cigarette prices, and unemployment were associated with tobacco use. For high middle-income countries, it was observed that none of the factors considered were associated with alcohol consumption. It has been found that tobacco use is related to cigarette prices, the happiness index, and GDP variables. For lower middle-income countries, it has been found that alcohol consumption is associated with tobacco use and unemployment, while tobacco use is related to alcohol consumption and unemployment. Considering low-income countries, it was observed that none of the factors considered were associated with alcohol consumption. It can be said that unemployment and GDP are related to tobacco use. When we look at the results in general, it can be said that while cigarette prices are the common variable associated with tobacco use in high and high middle-income countries, unemployment is related to tobacco use in low- and lower middle-income countries. A higher cigarette price reduces the demand for cigarettes (Viet Nguyen et al. 2021). Similarly in this study, increases in cigarette prices have been found to reduce tobacco use in high- income countries (Goodchild et al. 2018; Ahmed et al. 2019; Cui et al. 2019; Kjeld et al. 2023), while unexpectedly increasing consumption in high- middle-income countries. In addition, unlike other countries, the happiness index in these countries also increases tobacco consumption. Therefore, taking these results into consideration, a different analysis can be made by creating a panel data set for these countries. While tobacco use increases as unemployment increases in lower middle-income countries, it decreases in low-income countries. In regions or communities with high unemployment rates, factors such as hopelessness and low income may increase individuals' smoking and alcohol consumption (Popovici and French, 2013; Arcaya et al. 2014). These substances can be used to provide temporary escape or relief. However, as unemployment rates rise, individuals' incomes decrease and they are less likely to spend on luxury goods such as tobacco products. Spending money to meet basic needs can reduce tobacco use. The study results, in line with some studies in the literature, showed that cigarette prices and unemployment are related to tobacco use (Russel 1973; Hammarström and Janlert 1994; Scollo et al., 2003; Dinno and Glantz 2009; Kostova et al. 2014; Brook et al. 2014; Wang 2016; Kaiser et al. 2018; Álvarez et al. 2020; Yıldız 2020) and also tobacco use and unemployment is related to alcohol consumption (Kalmijn et al. 2002; Elegbede et al. 2012; Easwaran et al. 2015; Yue et al. 2015; Duko et al. 2019; Chen et al. 2021; Nkomo and Adanlawo 2024).

In line with these findings, within the scope of combating tobacco and alcohol consumption, high-income countries can restrict consumption by imposing higher taxes on tobacco products. High middle-income countries may consider stricter regulations and review taxes on alcohol and tobacco consumption (Scollo et al. 2003). Lower middle-income and low-income countries can reduce unemployment by developing job creation policies and expanding educational opportunities, and increased employment can negatively impact tobacco and alcohol consumption. These countries can also limit tobacco and alcohol consumption by developing policies. Economic development and fighting poverty can be an important part of efforts to reduce tobacco and alcohol consumption. Creating economic opportunities in these countries can help reduce tobacco and alcohol use (Nkomo and Adanlawo 2024). Each country has its own unique circumstances and needs, so policy recommendations should be tailored to local conditions and community needs (Hosseinpoor et al. 2011). In addition, the negative health effects of tobacco and alcohol should be emphasized through public health campaigns and education programs in all countries, so that health awareness can beincreased in society and tobacco and alcohol consumption can be reduced (Wang et al. 2018).

The study determined that the factors related to tobacco and alcohol consumption differ according to the income level of the countries. These findings indicate that intervention strategies need to be customized for each country. The limitations of this study include the constraint of data sources. Since data for the variables of the countries included in the study were only fully available for the year 2018, the dataset is based on 2018 data. Consequently, the data are not current, which may affect the generalizability of the results. Additionally, tobacco and alcohol policies

and regulations can vary significantly across different countries. The study does not address the policies of the countries or the effects of these policies.

CONCLUSION

This study reveals the complex and multifaceted relationship between tobacco and alcohol consumption and various socioeconomic factors in countries with different income levels. According to the findings, country-specific policies need to be developed to reduce tobacco and alcohol use. Policymakers should develop strategies according to the specific needs of each country by adapting interventions to the local context. They can utilize these findings to tailor interventions based on the economic realities of different countries, promoting healthier societies and economies.

REFERENCES

Ahmed, R, Diener, A. & Bahri, S. 2019. Retailer compliance as a predictor of youth smoking participant and consumption. *Journal of School Health* 89(2): 115-123.

Alkan, Ö. & Ünver, Ş. 2022. Tobacco smoke exposure among women in Turkey and determinants. *Journal of Substance Use* 27
(1): 43-49.

Álvarez, J.M.M., Golpe, A.A., Iglesias, J. & Ingelmo, R. 2020. Price and income elasticities of demand for cigarette consumption: what is the association of price and economic activity with cigarette consumption in Spain from 1957 to 2016?.
Public Health 185: 275-282.

Arcaya, M., Glymour, M.M., Nicholas, A.C., Kawachi, I. & Subramanian, S.V. 2014. Individual and spousal unemployment as predictors of smoking and drinking behavior. *Social Science & Medicine* 110: 89- 95.

Brook, J.S., Zhang, C., Burke, L. & Brook, D.W. 2014. Trajectories of cigarette smoking from adolescence to adulthood as predictors of unemployment status. *Nicotine & Tobacco Research* 16(12), 1559-1566.

Chaix, B. & Chauvin, P. 2003. Tobacco and alcohol consumption, sedentary lifestyle and overweightness in France: a multilevel analysis of individual and area-level determinants. *European Journal of Epidemiology* 18, 531-538.

Chen, Q., Ji, Z., Chen, L. & Huang, Q. (2021, September). Analysis of Relationship Between Alcohol Consumption and People's Unemployment. In 2021 International Conference on Financial Management and Economic Transition (FMET 2021) (pp. 579-584). Atlantis Press.

Cui, Y., Forget, E.L., Zhu, Y., Torabi, M. & Oguzoglu, U. 2019. The effects of cigarette price and the amount of pocket money on youth smoking initiation and intensity in Canada. *Canadian Journal of Public Health* 110, 93-102.

Çetin, M. & Özkan, E. 2018. Tax-Consumption Relationship in Turkey: A Survey on Alcohol and Tobacco Products. *Balıkesir University The Journal of Social Sciences Institute* 21 (40): 271-288.

Dinno, A. & Glantz, S. 2009. Tobacco control policies are egalitarian: a vulnerabilities perspective on clean indoor air laws, cigarette prices, and tobacco use disparities. *Social Science & Medicine* 68(8), 1439-1447.

Doku, D., Koivusilta, L., Rainio, S. & Rimpelä, A. 2010. Socioeconomic differences in smoking among Finnish adolescents from 1977 to 2007. *Journal of Adolescent Health* 47(5), 479-487.

Duko, B., Melese, Y. & Ebrahim, J. 2019. Determinants of cigarette smoking among adolescents in Ethiopia: a cross-sectional study. *Tobacco Induced Diseases* 17, 1-7.

Easwaran, M., Bazroy, J., Jayaseelan, V. & Singh, Z. 2015. Prevalence and determinants of alcohol consumption among adult men in a coastal area of *South India. Int J Med Sci Public Health* 4(3), 360-4.

Elegbede, O.E., Babatunde, O.A., Ayodele, L.M., Atoyebi, O.A., Ibirongbe, D.O. & Adeagbo, A.O. 2012. Cigarette smoking practices and its determinants among university students in Southwest, Nigeria. Cigarette Smoking Practices and Its Determinants Among University Students in Southwest, *Nigeria* 2(2), 1-10.

Esser, M.B., Leung, G., Sherk, A., Bohm, M.K., Liu, Y., Lu, H. & Naimi, T.S. 2022. Estimated deaths attributable to excessive alcohol use among US adults aged 20 to 64 years, 2015 to 2019. *JAMA Network Open*, 5(11), 1-8.

Goodchild, M., Sandoval, R.C. & Belausteguigoitia, I. 2018. Generating revenue by raising tobacco taxes in Latin America and the Caribbean. *Revista Panamericana de Salud Pública* 41, 1-7.

Hammarström, A. & Janlert, U. 1994. Unemployment and change of tobacco habits: a study of young people from 16 to 21 years of age. *Addiction* 89(12), 1691-1696.

Holmes, A.J. & Anderson, K. 2017. Convergence in national alcohol consumption patterns: New global indicators. *Journal of Wine Economics* 12(2), 117-148.

Hosseinpoor, A.R., Parker, L.A., Tursan d'Espaignet, E. & Chatterji, S. 2011. Social determinants of smoking in low-and middle-income countries: results from the World Health Survey. *PloS One* 6(5), 1-7.

Kaiser, M., Reutter, M., Sousa-Poza, A. & Strohmaier, K. 2018. Smoking and local unemployment: evidence from Germany. *Economics & Human Biology* 29, 138-147.

Kalmijn, S., Van Boxtel, M.P., Verschuren, M.W., Jolles, J., & Launer, L.J. 2002. Cigarette smoking and alcohol consumption in relation to cognitive performance in middle age. *American Journal of Epidemiology* 156(10), 936-944.

Khude, S., Pawar, R., Shivakumar, K.M., Patil, S., Suresh, K.V. & Kadashetti, V. 2015. Prevalence and pattern of tobacco related

habits among the college students of Satara district. *Journal of Indian Association of Public Health Dentistry* 13(2), 169-173.

Kostova, D., Tesche, J., Perucic, A.M., Yurekli, A., Asma, S. & GATS Collaborative Group. 2014. Exploring the relationship between cigarette prices and smoking among adults: a cross-country study of low-and middle- income nations. *Nicotine & Tobacco Research* 16(Suppl_1), S10-S15.

Kjeld, S.G., Jørgensen, M.B., Aundal, M. & Bast, L.S. 2023. Price elasticity of demand for cigarettes among youths in high-income countries: a systematic review. *Scandinavian Journal of Public Health* 51(1), 35-43.

Nkomo, N.Y. & Adanlawo, E.F. 2024. The impact of unemployment on alcohol consumption: A panel data analysis. International *Journal of Innovative Research and Scientific Studies* 7(4), 1365-1373..

Nuevo, R., Chatterji, S., Verdes, E., Naidoo, N., Ayuso-Mateos, J.L. & Miret, M. 2015. Prevalence of alcohol consumption and pattern of use among the elderly in the WHO European region. *European Addiction Research* 21(2), 88-96.

Omare, M.O., Kibet, J.K., Cherutoi, J.K. & Kengara, F.O. 2021. A review of tobacco abuse and its epidemiological consequences. *Journal of Public Health* 1-16.

Popovici, I. & French, M.T. 2013. Does unemployment lead to greater alcohol consumption?. *Industrial Relations: A Journal of Economy and Society* 52(2), 444-466.

Rathmann, K., Moor, I., Kunst, A.E., Dragano, N., Pförtner, T.K., Elgar, F. ., & Richter, M.2016. Is educational differentiation associated with smoking and smoking inequalities in adolescence? A multilevel analysis across 27 European and North American countries. *Sociology of Health & Illness* 38(7), 1005- 1025.

Rolfe, J. 2011. A Tale of Two Vices: An Applied Economic Analysis of Alcohol and Tobacco Consumption. *Inquiry Journal* 1-7.

Russell, M.A. 1973. Changes in cigarette price and consumption by men in Britain, 1946- 71: a preliminary analysis. *British Journal of Preventive & Social Medicine* 27(1), 1.

Scollo, M., Younie, S., Wakefield, M., Freeman, J. & Icasiano, F. 2003. Impact of tobacco tax reforms on tobacco prices and tobacco use in Australia. *Tobacco Control* 12(suppl 2), ii59-ii66.

Su, S.J.B. & Yen, S.T. 2000. A censored system of cigarette and alcohol consumption. *Applied Economics* 32(6), 729-737.

The Global Economy. https://www. theglobaleconomy.com. [02.08.2023]

Viet Nguyen, C., Le, T.T. & Nguyen, N.H. 2021. The impact of cigarette prices on smoking participation and tobacco expenditure in Vietnam. Plos one 16(12), 1-20.

Wang, Q. 2016. Unemployment Rate, Smoking And Drinking in China : Are They Related?. Current Politics and Economics of Northern and Western Asia 25 (2): 197.

Wang, Q., Shen, J.J., Sotero, M., Li, C.A. & Hou, Z. 2018. Income, occupation and education: Are they related to smoking behaviors in China?. *PloS One* 13(2), 1-17.

Yıldız, F. 2020. Determinants of cigarette consumption in Turkey: an ARDL bounds testing approach. *ADDICTA: The Turkish Journal on Addictions* 7 (2): 74-80.

Yue, Y., Hong, L., Guo, L., Gao, X., Deng, J., Huang, J., o & Lu, C. 2015. Gender differences in the association between cigarette smoking, alcohol consumption and depressive symptoms: a cross-sectional study among Chinese adolescents. *Scientific Reports* 5(1), 17959.

WHO. 2023a. https://www.who.int/news-room/fact-sheets/detail/tobacco. [18.09.2023]

WHO. 2019. WHO global report on trends in prevalence of tobacco use 2000-2025 third edition https://apps.who.int/iris/bitstream/handle/10665/330221/9789240000032-eng.pdf. [19.09.2023]

WHO. 2023b. https://www.who.int/news-room/fact-sheets/detail/alcohol. [18.09.2023]

WHO. 2024a. https://www.who.int/data/gho/indicator-metadata-registry/imr-details/462. [26.11.2024]

WHO. 2024b. https://www.who.int/data/gho/indicator-metadata-registry/imr-details/prevalence-of-current-tobacco-use-among-persons-aged-15-years- and-older-(age-standardized-rate). [26.11.2024]

WHO. 2018. Global status report on alcohol and health 2018 https:// apps. who. int/iris/ bitstream/handle/10665/274603/9789241565639-eng.pdf. [19.09.2023]

WHO. Global Health Observatory data repository. https://apps.who.int/gho/data/node.main. [02.08.2023]

World Bank. https://blogs.worldbank.org/en/opendata /world-bank-country- classifications-by-income-level-for- 2024-2025#:~:text=The%20World%20Bank%20Group%20assigns,of%20the%20previous%20calendar%20year. [02.08.2023]

World Population Review. https:// worldpopulationreview.com/country-rankings/high-income-countries. [02.08.2023]

DOI : http://dx.doi.org/10.17576/JSKM-2025-2302-01

Annex 1 Countries by income level are listed

High-income countries	High middle-income countries	Lower middle-income countries	Low-income countries
Australia,	Albania,	Algeria,	Burkina Faso,
Austria,	Argentina,	Bangladesh,	Burundi,
Bahrain,	Armenia,	Benin,	Chad,
Belgium,	Azerbaijan,	Bolivia,	Ethiopia,
Canada,	Belarus,	Cambodia,	Gambia,
Chile,	Belize,	Cameroon,	Liberia,
Croatia,	Bosnia and Herzegovina,	Comoros,	Madagascar,
Cyprus,	Botswana,	Egypt,	Mali,
Czech Republic, Denmark,	Brazil,	El Salvador,	Mozambique,
Estonia,	Bulgaria,	Ghana,	Niger,
Finland,	China,	Haiti,	Rwanda,
France,	Colombia,	India,	Sierra Leone,
Germany,	Costa Rica,	Indonesia,	Togo,
Hungary,	Dominican Republic,	Iran,	Uganda,
Iceland,	Fiji,	Kenya,	Yemen,
Ireland,	Georgia,	Kyrgyzstan,	Zambia
Israel,	Guatemala,	Lebanon,	
Italy,	Iraq,	Lesotho,	
Japan,	Jamaica,	Mauritania,	
Kuwait,	Jordan,	Mongolia,	
Latvia,	Kazakhstan,	Morocco,	
Lithuania,	Malaysia,	Nepal,	
Luxembourg,	Mauritius,	Nigeria,	
Malta,	Mexico,	Pakistan,	
Netherlands,	Moldova,	Papua New Guinea,	
New Zealand,	Montenegro,	Philippines,	
Norway,	Namibia,	Republic of the Congo,	
Panama,	Paraguay,	Senegal,	
Poland,	Peru,	Sri Lanka,	
Portugal,	Russia,	Tanzania,	
Qatar,	Serbia,	Tunisia,	
Romania,	South Africa,	Ukraine,	
Saudi Arabia, Singapore,	Thailand,	Uzbekistan,	
Slovenia,	Turkey,	Vietnam,	
Spain,	Turkmenistan	Zimbabwe	
Sweden,			
Switzerland,			
United Kingdom,			
United States, Uruguay.			