

Alcohol Consumption Trends in the EU Member States and their Association with Selected Socio-economic Indicators

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BACKGROUND: Harmful alcohol consumption has a negative impact on the health and social lives of individuals. **AIM:** The paper deals with the analysis of the status of, and trends in, the consumption of pure alcohol per capita in the EU countries between 1980 and 2015. Correlation analysis was conducted to detect the association between the per capita consumption of alcohol and some selected socio-economic indicators. **METHODS:** Statistical characteristics, such as average, median, range, standard deviation, and the coefficient of variation were used to describe the level of the per capita consumption of pure alcohol in the EU. Boxplot figures detected the extremely high/low levels of the indicators that were analysed. Index numbers were used to calculate the relative change in alcohol consumption. The existence of a linear relationship was discovered through correlation analysis. Useful figures helped to present the status or change in the per capita consumption of alcohol and the relationship between alcohol consumption and selected indicators. **RESULTS:** The trend of the per capita consumption of pure

alcohol in the EU was positive. The average per capita consumption of alcohol declined from 12.9 litres in 1980 to 10.4 litres in 2015. Not only did the average or median consumption decline, but also the variability of alcohol consumption per capita declined till 2010. The greatest reduction was found for the Mediterranean countries: Italy (-57.3%), Spain (-53.3%), Greece (-49.7%), and France (-37.4%). On the other hand, in some “new” EU countries an increase in the per capita consumption of alcohol occurred, the highest being in Estonia. On the EU level, no statistically significant correlation was discovered between the per capita consumption of alcohol and gross domestic product per capita or between alcohol consumption and countries’ unemployment rates. **CONCLUSIONS:** The decline in the per capita consumption of pure alcohol in the EU is a positive signal for health issues and for the social and private lives of the EU’s population. There are still reservations in this field but, it is hoped, the aim of people living longer and healthier lives will bring more and more successes by pushing down the harmful use of alcohol.

Keywords | Alcohol Consumption – European Union – Correlation – GDP – Unemployment Rate

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● 1 INTRODUCTION

Harmful alcohol consumption, smoking, and obesity are not only associated with a poorer quality of life but also contribute to the causes of premature mortality (OECD, 2019) and to geographical inequalities in mortality (Gavurova & Toth, 2019). Alcohol consumption is a health risk factor. The regular drinking of too much alcohol has a serious impact on health. Regular drinking over decades can lead to illnesses such as cancer, stroke, heart disease, liver cirrhosis, alcoholic hepatitis, brain damage, and damage to the nervous system and it can contribute to death and disability through accidents and injuries, violence, homicide, or suicide (NIAAA; NHS; OECD; Han, 2019). According to the World Health Organization (WHO), in 2016 three million deaths worldwide resulted from the harmful use of alcohol, which represents 5.3% of all deaths (WHO, 2018). Not only does alcohol consumption have negative consequences for health and health-related issues, but it also has a negative effect on the social and economic lives of individuals and societies.

● 2 DATA AND METHODOLOGY

For analytical purposes, the recorded per capita alcohol consumption (15+ years) in litres of pure alcohol over a calendar year in EU countries was used to define the states and trends in alcohol consumption in the EU between 1980 and 2015. The indicator comes from the Global Information System on Alcohol and Health tool and considers the consumption which is recorded from the production, import, export, and sales data in each of the countries that were analysed and is converted into litres of pure alcohol content (WHO). The main focus of the analysis was to discover the trend of the per capita alcohol consumption among the EU Member States. Elementary summary statistics such as average, quartiles (median, first and third quartiles, interquartile range), standard deviation, coefficient of variation, or index numbers were used to follow the changes in alcohol consumption. The paper deals with the trend in alcohol consumption and the association between the per capita alcohol consumption and selected socio-economic variables. The selected variables include the gross domestic product (GDP) per capita in purchasing power standards (PPS) and unemployment rates. Using correlation analysis, the relationship of per capita alcohol consumption and gross domestic product per capita, total unemployment rates, long-term unemployment rates, and very long-term unemployment rates were looked into. GDP per capita is a major indicator of the living standard of the population and, therefore, the GDP per capita in PPS was used to measure the association between the economic development of the EU countries and their alcohol consumption level. The loss of one's job is a very negative event in a person's life. Popovic and French (2013) and Bosque-Prous et al. (2015) found a positive and significant effect of unemployment on drinking behaviours. The analysis presented here does not focus on the analysis of individual items of data but on cumulative datasets of the per capita alcohol consumption and unemployment rates in the EU Member States. All of the analyses

were conducted on the EU country level and it is necessary to bear this in mind when dealing with the global results. Three different unemployment rates were used to check the relationship between alcohol consumption and unemployment. The overall total unemployment rate (UR) represents the number of people unemployed as a percentage of the labour force. The labour force is the economically active population and it is the sum of those people who are employed and unemployed. The long-term unemployment rate was used as the second UR and the very long-term UR as the third. The long-term UR is the percentage share of persons who have been unemployed for 12 months or more and the very long-term UR is the share of persons who have been unemployed for 24 months or more in the total labour force (Eurostat).

● 3 RESULTS AND DISCUSSION

The per capita consumption of pure alcohol in the EU Member States has changed in a positive way during the last four decades. While in 1980 the per capita consumption was lower than 10 litres in only five EU countries, in 2015 alcohol consumption did not exceed 10 litres per capita in eleven countries altogether. The positive change was also discovered by comparing the number of countries where the per capita consumption of pure alcohol exceeded 12 litres. In 1980 the threshold of 12 litres per capita was exceeded in seventeen countries altogether, but in 2015 the same cut-off was only overstepped in three EU Member States. Malta, Cyprus, and Sweden were the countries with the lowest consumption of alcohol in 1980, while the best positions in 2015 belonged to Greece, Italy, and again Sweden. The highest alcohol consumption was a reality in Luxembourg, Spain, and France at the beginning of the period that was analysed and in the Czech Republic, Lithuania, and Estonia at its end. The change in the per capita consumption of pure alcohol in the EU countries is summarised in *Figure 1* and *Table 1*. In both cases a clear picture of changes in alcohol consumption is

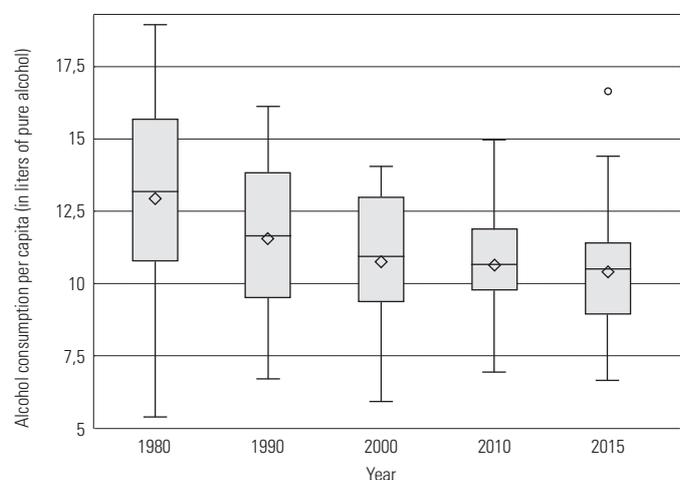


Figure 1 | Boxplot of alcohol consumption per capita in the EU (in liters of pure alcohol). Source: own calculations based on WHO Global Information System on Alcohol and Health

Analysis Variable: Alcohol consumption per capita (in liters of pure alcohol)

Year	Mean	Std Dev	Minimum	Maximum	Range	Lower Quartile	Median	Upper Quartile	Coeff. of Variation
1980	12.92	3.53	5.38	18.97	13.59	10.78	13.20	15.69	27.35
1990	11.53	2.91	6.72	16.15	9.43	9.50	11.66	13.85	25.24
2000	10.80	2.38	5.88	14.06	8.18	9.36	10.94	13.00	22.03
2010	10.69	1.79	6.95	14.97	8.02	9.81	10.65	11.91	16.74
2015	10.40	2.19	6.64	16.64	10.00	8.95	10.51	11.45	21.10

Table 1 | Summary statistics of alcohol consumption per capita in the EU (in liters of pure alcohol)
Source: own calculations based on WHO Global Information System on Alcohol and Health

visible. The boxplot figure identifies a significant change in the variability of alcohol consumption. To reflect the changes in alcohol consumption, ten-year intervals were chosen from 1980 till 2010. The last interval includes a time span of only five years because of the accessibility of the data.

In 1980 the highest average (12.92 litres), the median, and variability, including the range or coefficient of variation, were measured for the consumption of pure alcohol (see *Table 1*). After ten years the range declined from 13.6 litres to 9.4 litres. The lowest range (8.02 litres) and lowest coefficient of variation (16.74%) occurred in 2010. As a result of an extremely high level of per capita alcohol consump-

tion in 2015 in one EU country, which was discovered by the boxplot analysis (see *Figure 1*), the range and coefficient of variation increased in 2015 compared to 2010. The extremely high consumption presented in *Figure 1* as a solo point means that the per capita consumption of pure alcohol in Estonia was extremely high in comparison to the consumption in the other EU Member States. The overall average of the per capita consumption of pure alcohol declined from 12.92 litres in 1980 to 10.4 litres in 2015 and the median dropped from 13.2 litres to 10.51 litres in the same period. This decline in the per capita consumption of pure alcohol in the EU is a positive sign of the health, social, and economic outcomes for the population.

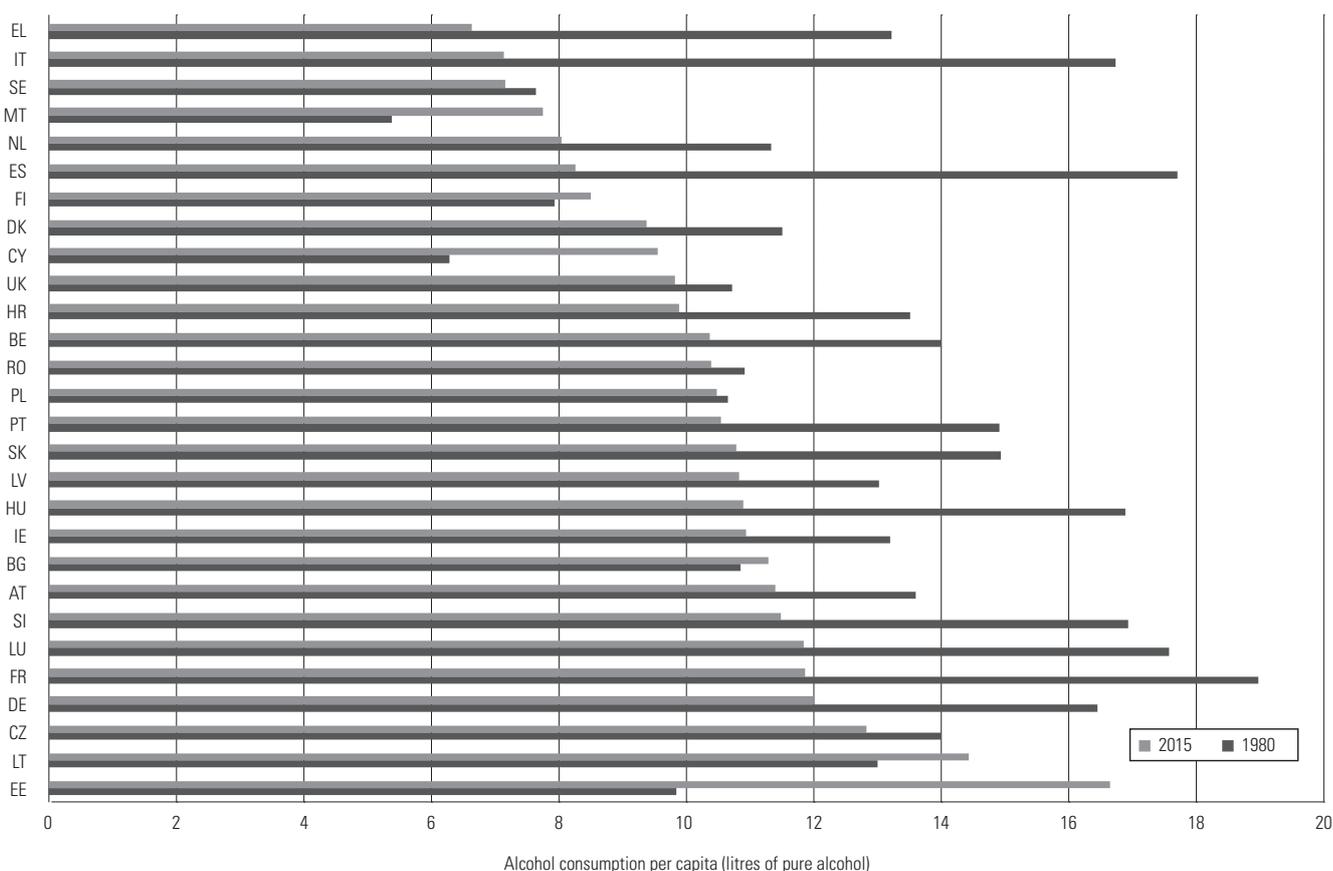


Figure 2 | Per capita alcohol consumption in EU countries (in litres of pure alcohol)

Source: authors' own calculations based on the WHO Global Information System on Alcohol and Health

Country codes: BE – Belgium, BG – Bulgaria, CZ – Czech Republic, DK – Denmark, DE – Germany, EE – Estonia, IE – Ireland, EL – Greece, ES – Spain, FR – France, HR – Croatia, IT – Italy, CY – Cyprus, LV – Latvia, LT – Lithuania, LU – Luxembourg, HU – Hungary, MT – Malta, NL – the Netherlands, AT – Austria, PL – Poland, PT – Portugal, RO – Romania, SI – Slovenia, SK – Slovakia, FI – Finland, SE – Sweden, UK – the United Kingdom

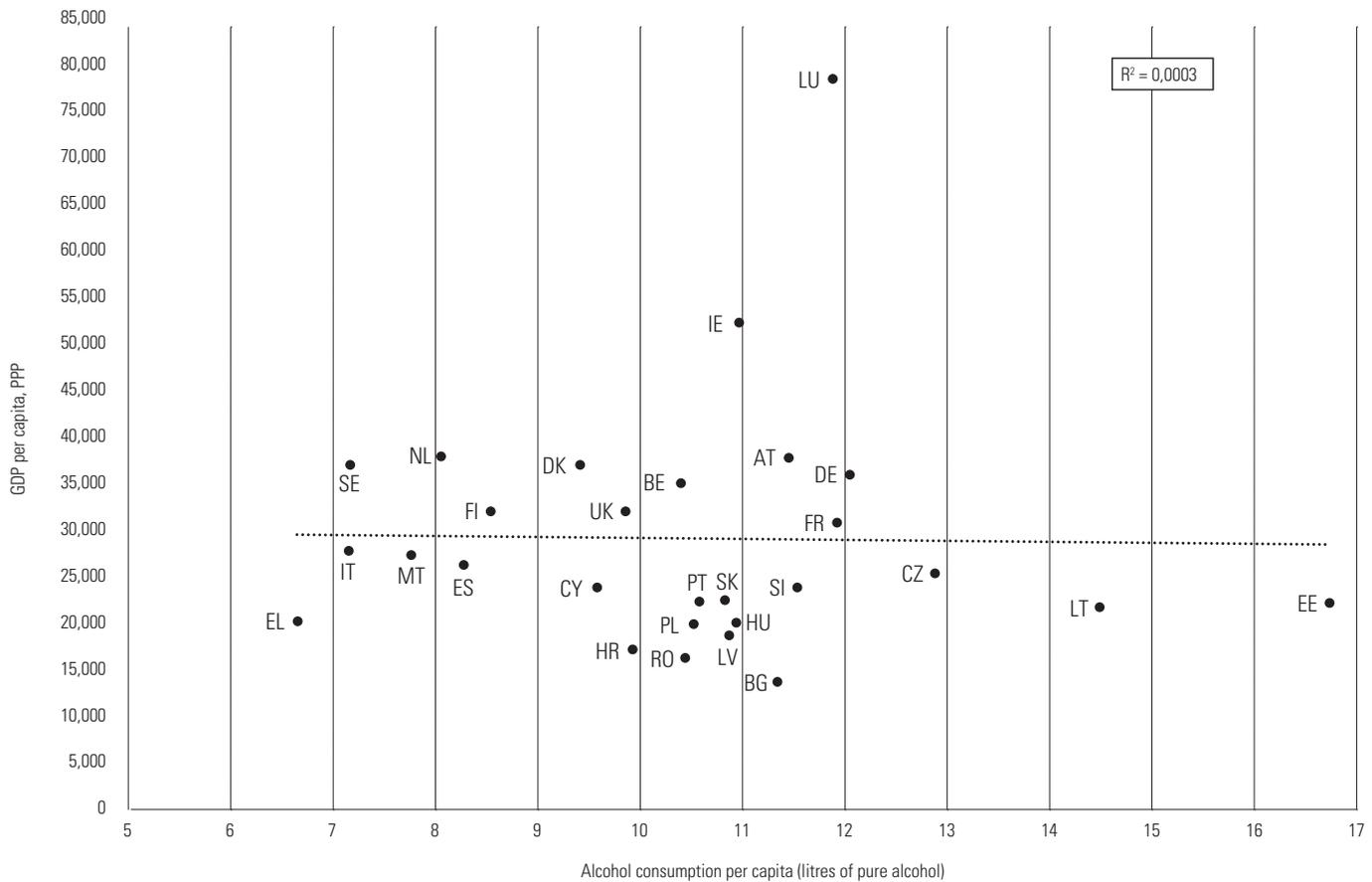


Figure 3 | Per capita alcohol consumption (in litres of pure alcohol) and GDP per capita (PPP) in EU countries (2015)

Source: authors' own calculations based on the WHO Global Information System on Alcohol and Health and Eurostat database

In some EU countries the decline in the per capita alcohol consumption between 1980 and 2015 was very strong (*Figure 2*). The three best countries, with the highest relative reduction in alcohol consumption, are Italy (-57.3%), Spain (-53.3%), and Greece (-49.7%). Italy, Spain, and France were the leaders, with the highest absolute decline in the per capita alcohol consumption in the same time span. A negative development in alcohol consumption as a result of an increase in the per capita consumption occurred in six countries: Bulgaria, Finland, Lithuania, Malta, Cyprus, and Estonia. It means that the increase mostly occurred in the “new” EU countries; only Finland was an EU member before the enlargement that began from 2004.

Correlation analysis was used to detect the linear relationship between the per capita consumption of pure alcohol and selected variables: GDP per capita in PPP and unemployment rates. The results of the correlation analysis are presented in *Table 2*.

In the EU in 2015 no statistically significant correlation existed between the per capita consumption of pure alcohol and GDP in PPP per capita ($r_{xy} = -0.017$, $p = 0.93$). The index of determination was as low as 0.0003 and, according to the plotted data, extremely high values of GDP per capita were achieved in Luxembourg (*Figure 3*). Because of some extreme values of GDP per capita (PPP), the logarithmic values of GDP per capita were also calculated and used for

Pearson Correlation Coefficients, N = 28
Prob > |r| under H0: Rho=0

	2015, Alcohol consumption per ca
2015, GDP per capita, PPP	-0.01707 0.9313
2015, GDP per capita, log	-0.08151 0.6801
2015, Unemployment rate, total	-0.41173 0.0295
2015, Long-term UR	-0.36518 0.0560
2015, Very long-term UR	-0.36051 0.0595

Table 2 | Correlation coefficients between alcohol consumption per capita and selected variables in EU (2015)

Source: own calculations based on WHO Global Information System on Alcohol and Health and Eurostat database

correlation analysis. But in this case too no statistically significant linear relationship between the logarithmic values of GDP per capita (PPP) and the per capita consumption of pure alcohol was discovered ($r_{xy} = -0.082$, $p = 0.68$).

The next analysis focused on the relationship between alcohol consumption in EU countries and the level of unemployment in these countries. Three unemployment

measures were used for the correlation analysis: the total unemployment rate, long-term UR, and very long-term UR. As shown in *Table 2*, a statistically significant correlation existed between the total unemployment rate and the per capita alcohol consumption in the EU in 2015. The correlation coefficient was negative, which means that in a country with a higher unemployment rate lower per capita alcohol consumption is expected and vice versa ($r_{xy} = -0.411$, $p = 0.03$). This result was unexpected. The regression line of the per capita alcohol consumption and the total unemployment rate is shown in *Figure 4*. However, it should be noted that in two countries extremely high unemployment rates occurred in 2015, namely in Greece (24.9%) and Spain (22.1%). On the other hand, in both countries lower per capita alcohol consumption was typical. Greece and Spain belong to the Mediterranean countries, which are also known thanks to the very good Mediterranean eating habits, involving the consumption of fresh fish, vegetables, and healthy fats, such as olive oil (Mayo Clinic). It means the consumption of food is oriented towards the consumption of fresh, high-quality, and healthy domestic food products. But this does not only concern food. The Mediterranean population is used to drinking low-strength wine instead of alcoholic drinks that contain more alcohol, for example instead of spirits. As the analysis is focused on the analysis of the association between the per capita alcohol consumption measured in litres of pure 100% alcohol the consumption of wine recalculated to pure alcohol consumption means

that in countries with a higher consumption of wine the total pure alcohol consumption is not as high as in countries with a higher consumption of spirits. Heavy consumption of spirits is especially dangerous for health. Drinks with higher concentrations of alcohol are able to cause drunkenness and/or alcohol poisoning more quickly and in smaller doses (Yerby, 2019). The correlation analysis was performed again with Greece and Spain excluded, because of their extremely high UR. The extremes of UR were checked and proven by boxplots. The repeated association analysis resulted in a non-statistically significant correlation coefficient ($r_{xy} = -0.183$, $p = 0.37$) and it means that no linear relationship exists between the consumption of pure alcohol and the unemployment rate in the EU. The next association analyses tried to answer the question whether a statistically significant correlation exists between alcohol consumption and long-term or very long-term unemployment rates. Both analyses ended with non-statistically significant results. In the case of correlation between the long-term UR and the consumption of pure alcohol the Pearson's correlation coefficient reached -0.365 ($p = 0.056$) and in the case of the correlation between the very long-term UR and the consumption of pure alcohol $r_{xy} = -0.361$ ($p = 0.06$). Because the boxplot analysis again detected one extreme value of the long-term unemployment rate for Greece (18.2%) and one extreme very long-term UR value, again for Greece (12.8%), the association analysis was repeated without the extremely high long-term and very long-term unemployment rates.

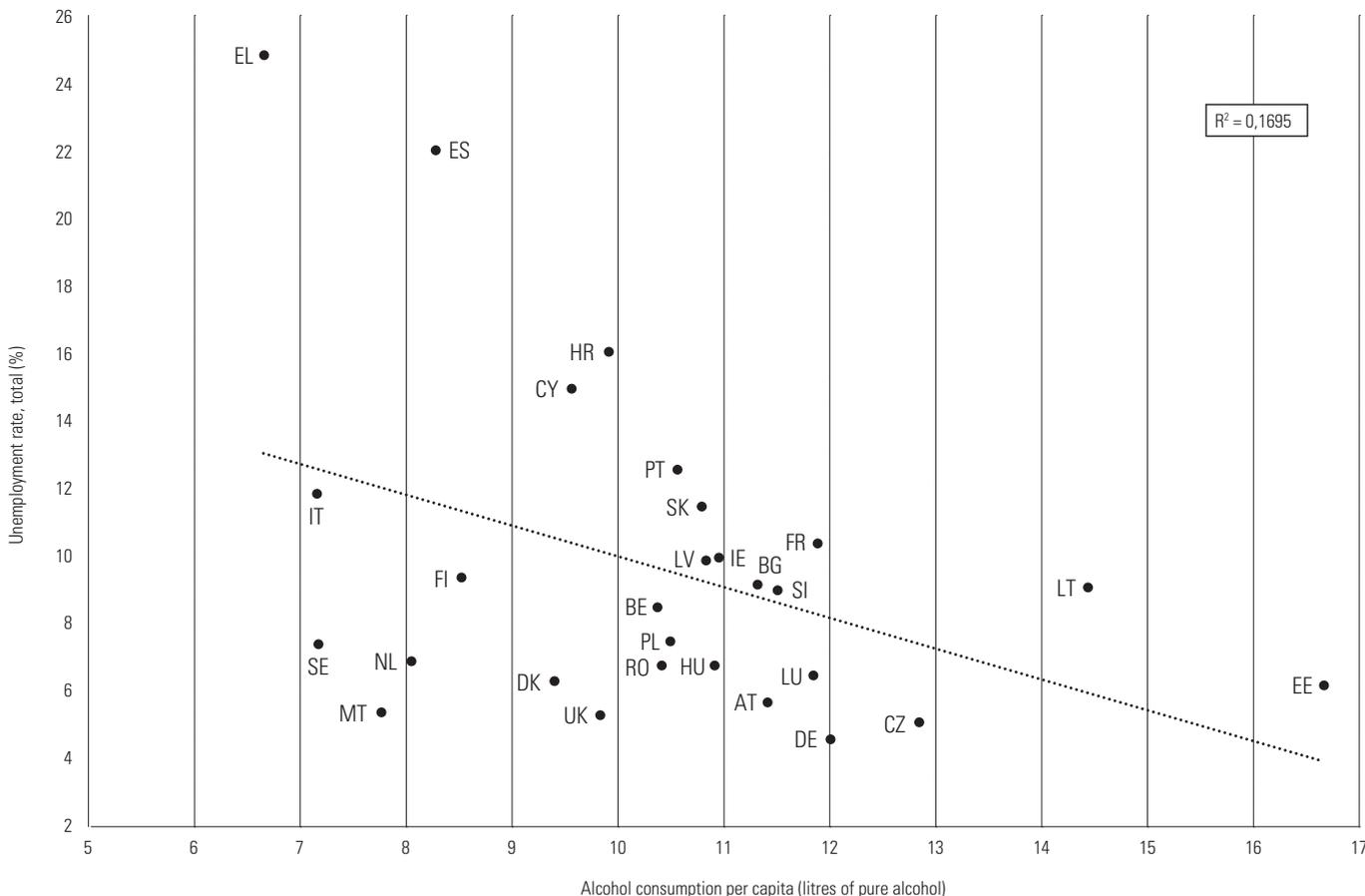


Figure 4 | Per capita alcohol consumption (in litres of pure alcohol) and total unemployment rate in EU countries (2015)
 Source: authors' own calculations based on the WHO Global Information System on Alcohol and Health and Eurostat database

The results of the analysis brought no surprises. In this case too no statistically significant linear relationship between the consumption of pure alcohol and the long-term UR ($r_{xy} = -0.191, p = 0.34$) and also no significant correlation between alcohol consumption and the very long-term UR ($r_{xy} = -0.183, p = 0.361$) was detected in the EU in 2015.

● 4 CONCLUSIONS

High consumption of alcohol is associated with poor health and the deterioration of the social or economic life of an individual. Unhealthy diet, harmful use of alcohol, insufficient physical activity, and tobacco use, but also air pollution, are the greatest risk factors for chronic diseases (PAHO/WHO IRIS) and death as a result of non-communicable diseases. The main aim of societies is to motivate their population to live more actively and to avoid risky behaviours. The consumption of alcohol is very dangerous and risky for human beings. The paper focused on the changing quantity of alcohol consumption in the EU Member States. The analysis of the trend in the per capita consumption of pure alcohol showed that a positive development was typical for most of the EU countries and for the overall EU average. The average per capita consumption declined from 12.9 litres in 1980 to 10.4 litres in 2015. The variability, measured by the coefficient of variation, was higher than 27% in 1980 and dropped to 21.1% at the end of the time span that was analysed. Per capita alcohol consumption lower than 10 litres was a reality in only five EU countries in 1980, but this number had increased to eleven by 2015. All these results that are mentioned and were achieved should be rated very positively. However, in some countries, namely in Bulgaria, Finland, Lithuania, Malta, Cyprus, and Estonia, an increase in the per capita alcohol consumption occurred. In Estonia the increase between 1980 and 2015 was as high as by 6.8 litres of pure alcohol per capita. This considerable increase was the main reason for the extremely high alcohol consumption in 2015 that was detected by the boxplot figure. The correlation analysis on the country level did not detect any statistically significant linear relationship between the per capita alcohol consumption and the selected indicators. No statistically significant correlation existed in 2015 between the GDP per capita in PPS and the per capita alcohol consumption. A negative and significant correlation was achieved between the unemployment rate and per capita consumption of pure alcohol before the extreme values were excluded. Due to an extremely high UR in Greece and Spain the correlation analysis was repeated without these

two EU countries. The repeated analysis discovered that there does not exist a statistically significant correlation between the pure alcohol consumption and unemployment rate in the EU. Nor was any significant linear association discovered between the long-term UR or very long-term UR and alcohol consumption. The results mean that no linear relationship between the per capita alcohol consumption and the selected socio-economic variables exists. These analyses were performed on the country levels and are not results of individual personal datasets.

Authors' contribution: Silvia Megyesiová and Vanda Lieskovská designed the study and proposed the study design. Silvia Megyesiová performed the statistical analysis; Silvia Megyesiová, Vanda Lieskovská, and Cyril Závadský participated in the interpretation of the data and the preparation of the manuscript. Silvia Megyesiová was in charge of the collection of the data necessary for the statistical analysis. Vanda Lieskovská and Cyril Závadský were responsible for the literature review and for drafting the introduction to the article. All the authors contributed to the article and approved the final version of the manuscript.

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