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AN OVERVIEW OF SELECTED RISK FACTORS FOR HEALTH IN OECD COUNTRIES

Abstract:

The aim of this paper is to highlight the fundamental determinants of health in OECD countries between 2007 and 2017. The average level of life expectancy at birth was 80.6 years in 2017 in OECD countries. The tobacco and alcohol consumption decreased between 2007 and 2017 in several OECD countries. In the second part of our paper we are dealing with the health risk assessment among young people in Slovakia. The evaluation of socioeconomic impacts on the state of health is carried out in the form of open questions and based on the evaluation of the questionnaire. To test the statistical significance, we use the Pearson´s chi-square test of independency and the column proportions test. The results indicate that in the case of drinking alcohol, students who have part time job spend more money on an average on alcohol than students who do not work and the costs of alcohol per month are higher for men than women. We believe that the results can serve as a methodological platform for academics and policymakers for further setting of similar mapping of major health risks among the population.

Keywords:

health survey; health determinants; health risk; alcohol consumption; tobacco consumption

JEL Classification: I10, I15, I18

1 INTRODUCTION

Public health is considered to be a multidisciplinary system that encompasses several fields of science. An important part of this is the cooperation of medical and social fields, which contribute to the knowledge that health represents not only individual value but also social value. Quality of life, which is linked to the level of health in individual countries, often divides society both internally and internationally. Modern public health is an independent field of scientific research and social practice. It deals with the health of the population in the broadest sense, with emphasis on the development of the health potential of society. It draws attention to monitoring the health needs of the entire population, paying particular attention to the issue of inequality in the provision of healthcare to a particular community. An important part of public health is the issue of managing and providing healthcare with regard to its quality and economy (Janečková & Hnilicová, 2009). Public health is a specific area that uses and integrates the knowledge of various disciplines, such as legal sciences, philosophy, economics and finance, ethics, history, social psychology, demography, statistics and informatics. Each sub-area is used in the health sector in order to know the determinants of health and improve the health of the population. The difference between medical and public health care is understood in the fact that medical care deals with an individual's health, with the object of interest being the human body, its disorders, its relationship and its response to the environment. But looking at public health, we see it solves problems that affect the health of society as a whole. Demography is one of the main sources of information for the assessment of health. It deals with the description and characteristics of the population and collects data on its structure and development. An expression of the social development of society is the improvement of the health indicators of the population. The underlying demographic-statistical indicators include: mortality by cause of death counted to 100,000 inhabitants, life expectancy at birth, infant mortality, morbidity, disease prevalence, etc. It is important to note that many areas outlined in this work are closely related to alcohol consumption and smoking.

According to the aim, the study is organized as follows. In section 2, we refer to the basic concepts of health assessment and main risk factors for health across the literary spectrum. The methodology is presented in the Section 3. In the Section 4 we present the main results and key findings of the analysis. In the last part of the paper we conclude main findings and suggestions for future research in the field of health care determinants and main health risk factors.

2 LITERATURE REVIEW

The main objective of many research papers in population studies is to highlight, through demographic statistics, the causal relationships and events between selected variables. This means that demographic research is increasingly seeking to address causative mechanisms creating trends and differences in basic demographic processes of birth rate, mortality, migration and impact on other social and economic aspects of the population (Engelhardt et al., 2009; OECD/EU, 2018; OECD, 2019a). Janečková & Hnilicová (2009) characterize health determinants as personal, social, economic and environmental factors that influence each other and significantly determine the state of health of an individual or group of people. The determinants of health are environmental factors, among which we include: climate change, the environment, the location of the work and social activities of individuals. Another determinant is genetic equipment that determines differences in male and female health, intelligence levels, tendencies towards certain diseases and disorders. Other determinants include lifestyle, effectiveness and quality of health

care, the level of education, attitudes towards self-care, eating habits, alcohol consumption and smoking, physical activity. Some of the environmental factors mentioned above and poverty, education, unemployment, social security, lifestyle, are referred to as social determinants of health.

Böckenhoff et al. (2013) monitor socio-economic characteristics through an analysis of the ageing population in Berlin (BASE-II)[1] as well as a view on the interlinkage of multiple health factors, taking into account other social and economic characteristics of the population. Berger et al. (2013) emphasize that alcohol surveys are an effective mechanism for monitoring alcohol consumption among the population. The associations between alcohol and tobacco consumption are also presented by Khlat et al. (2014) and Blecher (2015). Alcohol consumption and smoking can also be reduced by introducing or increasing excise duties. However, even a higher level of tax burden may not ultimately limit alcohol consumption and smoking. These findings are also cited by Gehrsitz et al. (2020), who claim that an increase in alcohol prices caused by higher taxes may lead to a significant substitution effect and avoidance of behaviour of the population, which ultimately limits the reduction of alcohol consumption. The authors emphasize the substitution effect that leads to the cheaper products. Arni et al. (2020) point out to relative health perception biases based on population surveys. They empirically report that people who overestimate their health are less likely to have higher physical activity and a higher level of sleep, while on the other hand, they are more likely to eat unhealthy and drink alcohol at a higher rate on a daily basis. Oikawa (2020) analyses the impact of the education level of the population on the results of the change (reform) of health checkups in Japan. The author points to changes in behaviour in the population with higher education levels (university graduates), who during the reporting period increased physical activity and achieved significant reductions in the BMI index, respectively in general are more likely to respond to a health checkup diagnosis to improve their health. The author believes that the cognitive functioning may be a key determinant, which explains this type of heterogeneity of response by population. Other authors also deal with health checkups, such as Hackl et al. (2015), Iizuka et al. (2017), Kim et al. (2019) and Inui et al. (2017). These conclusions are in line with Bijwaard et al. (2016).

3 DATA AND METHODOLOGY

Our work is divided into two main areas. In the first area, we are looking at the state of play of smoking, alcohol, basic health indicators and health expenditure among OECD countries overall between 2007 and 2017. Using scatter plots, we compare developments between above-mentioned indicators between 2007 and 2017. In the second part of our analysis we point to the current issue and state of alcohol and tobacco consumption among the selected population in Slovakia by a questionnaire survey. This questionnaire was carried out by the author back in 2016, but its conclusions are highly topical and relate to social problems and fundamental health risks. In this context, we provide a basic insight into the results obtained from a survey[2] among university students and their attitudes to smoking and alcoholism. Using contingency tables (crosstabs), Pearson´s chi-square test of independence and column proportions tests, we test the hypotheses about individual student attitudes towards alcohol and smoking and statistically evaluate the validity of individual responses. The Pearson´s chi-square test of independence is a non-parametrical test

[1] For more details, please see Bertram et al. (2014). Further information on the BASE-II study can be found on the program website, located at https://www.base2.mpg.de.

[2] The results presented in this paper represent a shortened version of the results of the entire survey. The detailed version is intended for publication in a selected journal.

by which we test whether two or more categorical variables are independent or related. We are setting out a null and an alternative hypothesis:

- H_0: $Variable\ 1\ is\ independent\ of\ Variable\ 2.$
- H_1: $Variable\ 1\ is\ not\ independent\ of\ Variable\ 2.$

The test statistic for the chi-square test of independence is computed as:

$$\chi^2 = \sum_{i=1}^{R} \sum_{j=1}^{C} \frac{(o_{ij} - e_{ij})^2}{e_{ij}} \quad (1)$$

Where o_{ij} represents the observed cell count in the i_{th} row and j_{th} column of table; e_{ij} represents the expected cell count in the i_{th} row and j_{th} column of table calculated as

$$e_{ij} = \frac{\text{row } i \text{ total} * \text{col } j \text{ total}}{\text{grand total}} \quad (2)$$

The quantity $(o_{ij} - e_{ij})$ is the residual of cell (i, j) referred as r_{ij}. The χ^2 value is then compared to the critical value from the χ^2 distribution table with degrees of freedom $df = (R-1)(C-1)$ and chosen confidence level. If the calculated χ^2 value is greater than critical χ^2 value, then we reject the null hypothesis. In our analysis, Pearson´s chi-square test was used to test the independence between row and column variables. Pearson´s chi-square test requires a large sample. It is important to note that not more than 20% of expected cells should be less than 5, and none of the expected cells should be less than 1. We used then the z-test to statistically compare the proportion of column pairs to each other according to the selected variables. The column proportions test assigns a letter key (A, B, C, D) to each category of the column variables. For each pair of columns, the column proportions are compared using a z-test. To adjust the significant values, we used Bonferroni adjustments. For each statistically significant pair, the key of the smaller category is placed under the category with the larger proportion (Agresti & Kateri, 2011).

4 RESULTS AND DISCUSSION

Population ageing highlights the importance of a number of changes in health systems, from focusing on hospitals with acute care to more specific and integrated care targeted at people in the community and regions. Population ageing is linked to an increasing need for healthcare in the recent years, in particular the need for long-term care. The European Commission foresees a stronger increase in longer-term care expenditure over the coming years compared to public spending on health care (OECD/EU, 2018).

4.1 Trends in avoidable mortality and main risk factors for health in OECD countries

The avoidable mortality rates and infant mortality rates provide a better look at the level of the health status of the population from an international perspective. Table 1 below provides a comparison of avoidable mortality rates between 2007 and 2017 and infant mortality rates in selected period in OECD countries. Avoidable mortality consists of two types of mortality: treatable and preventable. Both indicators refer to premature mortality under age 75. Until 2018, the term amenable mortality was used instead of treatable mortality. However, the agreement on a common methodology between the OECD and the European Commission already uses only treatable mortality. According to OECD (2019b) preventable mortality includes causes of death that can be mainly avoided through effective public health and primary prevention interventions (i.e. before the onset of diseases/injuries, to reduce incidence).

Table 1 Avoidable mortality and infant mortality rates in 2007 and 2017

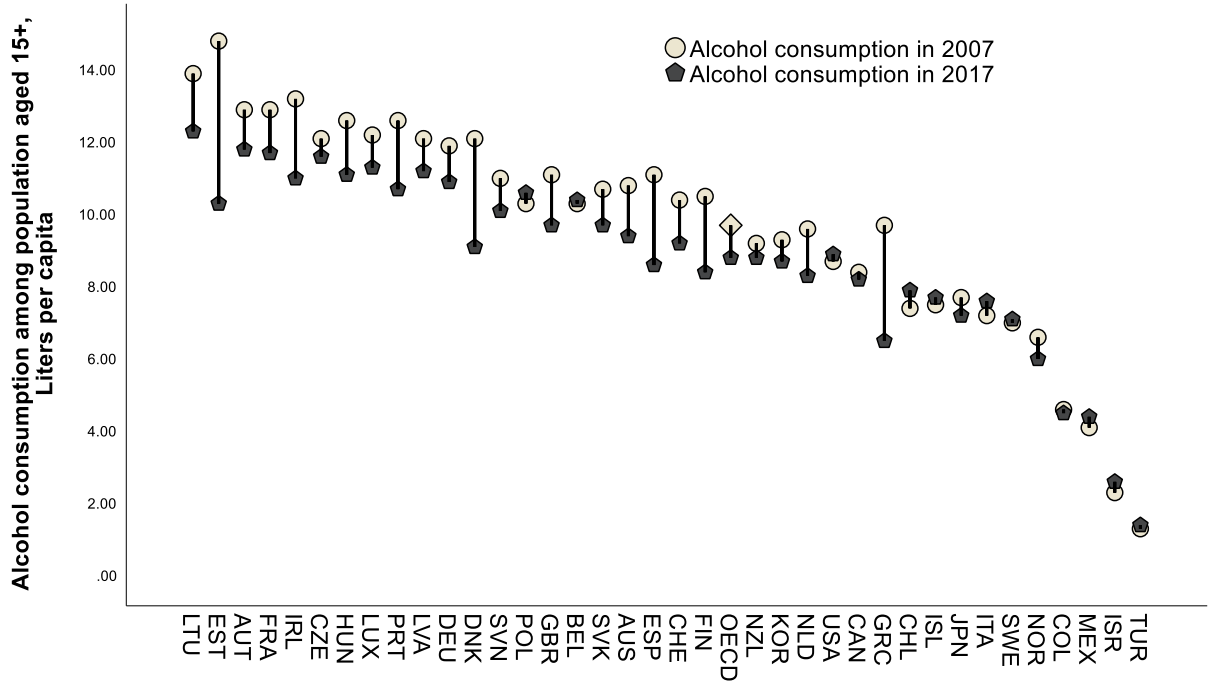
		Preventable mortality*			Treatable mortality*			Infant mortality**		
	Country	2007	2017	% change	2007	2017	% change	2007	2017	% change
AUS	Australia	106	95	-10.4%	62	49	-21.0%	4.1	3.3	-19.5%
AUT	Austria	141	116	-17.7%	72	57	-20.8%	3.7	2.9	-21.6%
BEL	Belgium	141	116	-17.7%	72	54	-25.0%	3.9	3.6	-7.7%
CAN	Canada	131	114	-13.0%	72	59	-18.1%	5.1	4.5	-11.8%
CHL	Chile	159	128	-19.5%	91	78	-14.3%	8.3	7	-15.7%
COL	Colombia	191	147	-23.0%	120	97	-19.2%	19.6	16.8	-14.3%
CZE	Czech Republic	190	149	-21.6%	128	95	-25.8%	3.1	2.7	-12.9%
DNK	Denmark	159	123	-22.6%	83	59	-28.9%	4	3.8	-5.0%
EST	Estonia	309	197	-36.2%	158	103	-34.8%	5	2.3	-54.0%
FIN	Finland	161	124	-23.0%	74	58	-21.6%	2.7	2	-25.9%
FRA	France	123	105	-14.6%	59	48	-18.6%	3.6	3.9	8.3%
DEU	Germany	130	119	-8.5%	80	66	-17.5%	3.9	3.3	-15.4%
GRC	Greece	113	113	0.0%	74	75	1.4%	3.5	3.5	0.0%
HUN	Hungary	316	251	-20.6%	169	136	-19.5%	5.9	3.5	-40.7%
ISL	Iceland	106	96	-9.4%	64	44	-31.3%	2	2.7	35.0%
IRL	Ireland	137	106	-22.6%	84	65	-22.6%	3.2	3	-6.3%
ISR	Israel	94	72	-23.4%	81	62	-23.5%	3.9	3.1	-20.5%
ITA	Italy	108	88	-18.5%	63	55	-12.7%	3.1	2.7	-12.9%
JPN	Japan	115	87	-24.3%	60	51	-15.0%	2.6	1.9	-26.9%
KOR	Korea	175	111	-36.6%	69	47	-31.9%	3.5	2.8	-20.0%
LVA	Latvia	346	269	-22.3%	214	157	-26.6%	8.5	4.1	-51.8%
LTU	Lithuania	399	244	-38.8%	206	141	-31.6%	6.3	3	-52.4%
LUX	Luxembourg	136	99	-27.2%	67	51	-23.9%	1.8	3.2	77.8%
MEX	Mexico	219	213	-2.7%	153	155	1.3%	15.7	12.1	-22.9%
NLD	Netherlands	114	99	-13.2%	69	52	-24.6%	4.1	3.6	-12.2%
NZL	New Zealand	129	110	-14.7%	85	66	-22.4%	4.8	4.3	-10.4%
NOR	Norway	116	96	-17.2%	67	47	-29.9%	3.1	2.3	-25.8%
POL	Poland	219	169	-22.8%	130	99	-23.8%	6	4	-33.3%
PRT	Portugal	129	109	-15.5%	82	69	-15.9%	3.4	2.7	-20.6%
SVK	Slovak Republic	238	193	-18.9%	171	129	-24.6%	6.1	4.5	-26.2%
SVN	Slovenia	180	143	-20.6%	83	66	-20.5%	2.8	2.1	-25.0%
ESP	Spain	116	93	-19.8%	67	53	-20.9%	3.4	2.7	-20.6%
SWE	Sweden	108	89	-17.6%	65	51	-21.5%	2.5	2.4	-4.0%
CHE	Switzerland	107	84	-21.5%	53	40	-24.5%	3.9	3.5	-10.3%
TUR	Turkey	136	145	6.6%	100	113	13.0%	16.5	9.2	-44.2%
GBR	United Kingdom	136	118	-13.2%	88	69	-21.6%	4.7	3.9	-17.0%
USA	United States	179	172	-3.9%	97	88	-9.3%	6.8	5.8	-14.7%
OECD	OECD Average	165	132	-19.8%	95	76	-20.6%	5	4	-21.7%

Note: * Deaths per 100,000 population; ** Deaths per 1,000 population

Source: Prepared by authors

Treatable mortality includes causes of death that can be mainly avoided through timely and effective health care interventions. Health care interventions include secondary prevention such as screening and treatment. Between 2007 and 2017, on average, preventable mortality fell by more than 19% for OECD countries and treatable mortality fell by more than 20%. An almost 22% decrease can be seen in the case of infant mortality between OECD countries between 2007 and 2017. An almost 19% decrease can be seen in the case of preventable mortality in Slovakia (238 vs. 193) and treatable mortality fell by more than 24.6% (171 vs. 129). Infant mortality fell by more than 26% between 2007 and 2017 in Slovakia.

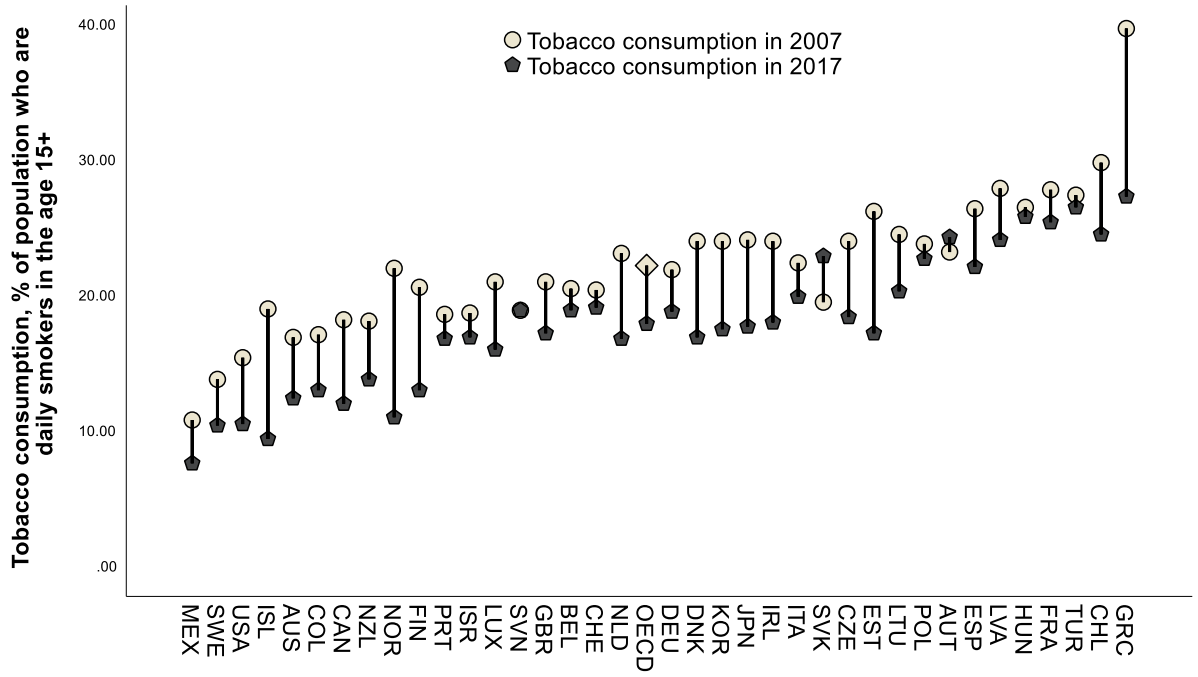
Figure 1 Alcohol consumption in selected countries in 2007-2017



Source: Prepared by authors

According to OECD/EU (2018) and OECD (2019a), the main health risk factors are: alcohol and tobacco consumption, opioids use, overweight and obesity among children and adults, air pollution and extreme temperatures. Figure 1 above shows alcohol consumption in OECD countries between 2007 and 2017. Average alcohol consumption among OECD countries decreased from 9.7 liters to 8.8 liters per capita between 2007 and 2017. However, more than half of OECD countries still have a higher alcohol consumption in 2017 than the OECD average. Figure 2 below refers to tobacco consumption in OECD countries between 2007 and 2017. Tobacco consumption refers to the share of the population who are daily smokers and aged 15 years and over. The average tobacco consumption for OECD countries decreased from 22.2 % to 17.9 % between the period. The most significant decrease between 2007 and 2017 was in the countries: Greece (from 39.7 % to 27.3 %), Iceland (from 19 % to 9.4 %), Norway (from 22 % to 11 %) Estonia (from 26.2 % to 17.2 %).

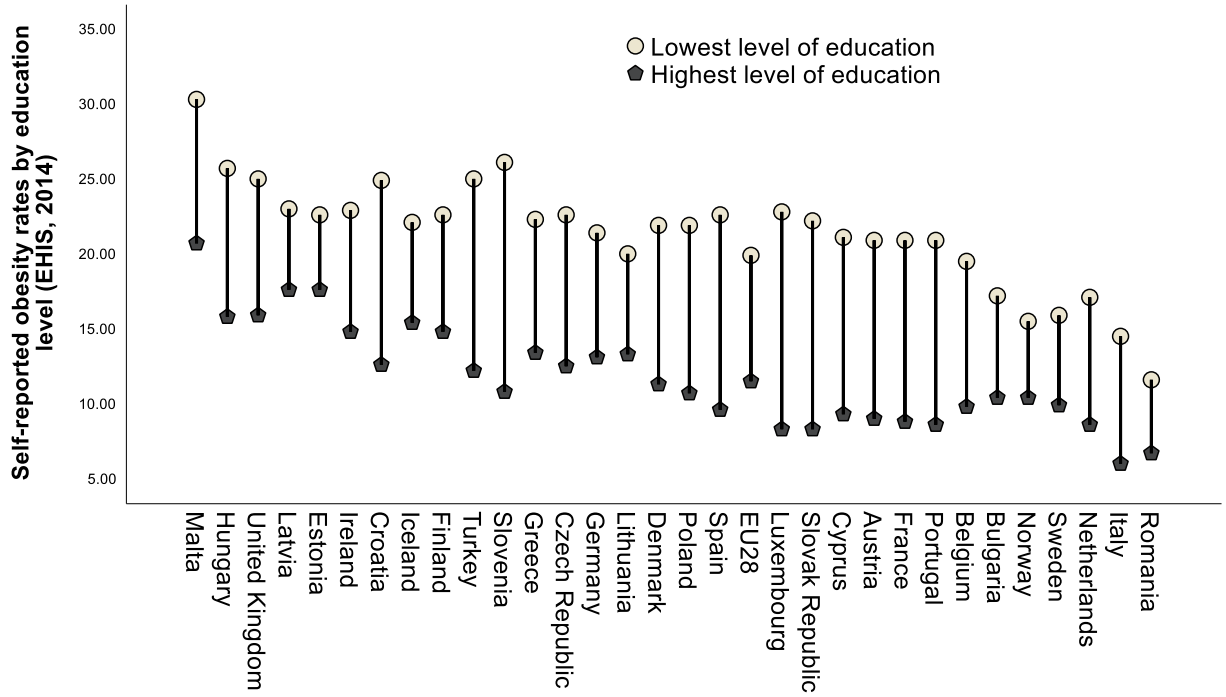
Figure 2 Tobacco consumption in selected countries in 2007-2017



Source: Prepared by authors

OECD (2019a) and Forouzanfar et al. (2016) report that alcohol and smoking have contributed most to the share of healthy life lost in several OECD countries in recent years. At the same time, they report that obesity has decreased in selected EU countries depending on educational attainment.

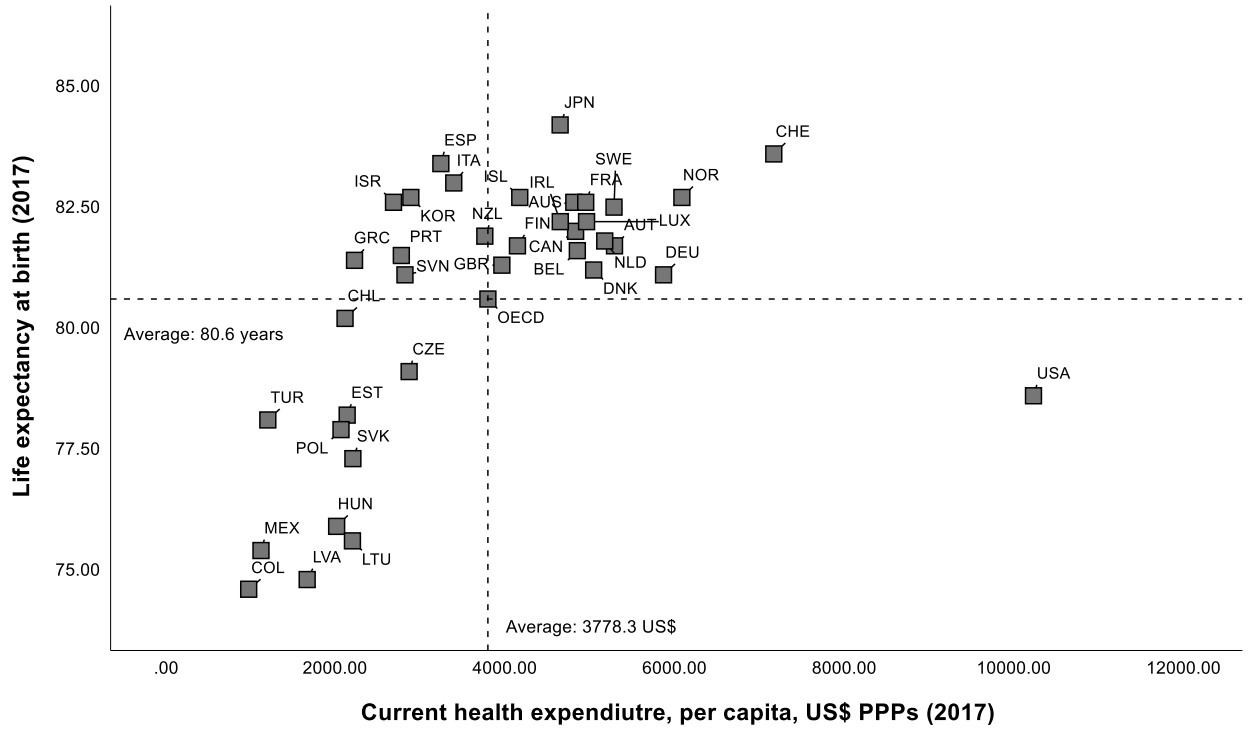
Figure 3 Self-reported obesity rates by education level in selected countries



Source: Prepared by authors

Thus, the population with higher education is less obese than the population with a lower level of education. However, these data are only available for 2014 (see Figure 3). According to the OECD/EU (2018) up to one-fifth of health expenditure is wasteful and could be efficiently use with better re-allocation. Health expenditure per capita in comparison with life expectancy at birth in 2017 for OECD countries can be seen in Figure 4. The average life expectancy at birth for OECD countries was 80.6 years in 2017. Average health expenditure per capita was at 3778.3 US$ in PPPs. With a closer look at Figure 4, the countries can be divided into four groups. The first group of countries is made up of the United States, as it is a country with the highest health expenditure in recent years compared to other countries. With high health spending (10.206.51 US$ per capita in 2017), the USA does not even reach the average life expectancy at birth for OECD countries (78.6 years in 2017).

Figure 4 Life expectancy at birth and current health expenditure per capita in 2017



Source: Prepared by authors

The second group of countries is made up of GBR, CHE, SWE, NOR, NLD, LUX, JPN, ISL, IRL, FIN, FRA, DEU, DNK, AUS, AUT, BEL, CAN, in which health expenditures as well as life expectancy at birth are higher than the OECD average. The third group of countries comprises ESP, ITA, ISR, KOR, PRT, GRC, SVN, NZL, with lower levels of health spending in 2017, but comparable results of life expectancy at birth than for second group. The fourth group consists of CHL, CZE, TUR, EST, POL, SVK, HUN, LTU, MEX, COL and LVA. These countries reach below average levels of health expenditure and below average life expectancy at birth levels. Thus, the level of efficiency (effective allocation of financial resources) in these countries, as shown by Medeiros & Schwierz (2015), remains an open question.

4.2 Health risk assessment among young population in Slovakia

This section presents the results of the survey carried out on a sample of the young population (university students) in Slovakia. The sample consists of 774 respondents. After several adjustments the sample has been reduced to 728 respondents. The profile of the respondents can also be seen in Table 2 below. Males and females accounted for 39.3% and 60.7% of the total sample. More than 85% of students are under the age of 23, with more than 53% of the total being students who were in the first or second year of their studies at the university. The results presented in this paper represent a shortened version of the results of the entire survey. The detailed version is intended for publication in a selected journal.

Table 2 Profile of respondents

Demographics	N	%
Gender		
Female	442	60.7
Male	286	39.3
Age		
20 or below	217	29.4
21-23	409	56.2
24-26	96	13.2
27 and more	6	0.8
Study year		
1. year	208	28.6
2. year	183	25.1
3. year	141	19.4
4. year	82	11.3
5. year	103	14.1
6. year	11	1.5
Total monthly disposable income of both parents		
Up to 499.99 €	44	6.0
500-899.99 €	219	30.1
900-1299.99 €	225	30.9
1300 € and more	233	32.0
Missing	7	1.0

Source: Prepared by authors

The questionnaire consisted of more than 40 questions, which were divided into several areas. In the first part we asked respondents about basic data about them (personal status and general information). The second area was focused on the issue of smoking, the third on the issue of alcohol, and in the fourth part we focused on monitoring socio-economic factors, trying to take into account at which university students study, the situation in their family and, ultimately, their financial situation. With this research, we try to find answers to the questions as to whether men have more experience of alcohol consumption than women, whether smoking occurs more among men than women, whether working students drink and smoke less than non-workers, and whether men try the cigarettes and alcohol at an earlier age than women, and whether men spend more on alcohol and smoking than women.

As we mentioned in the Section 3, we use the Pearson´s chi-square test of independency for the evaluation of the answers. In the case, that two variables are related, we approached proportional column testing using z-test. The results of the column proportions test can also be seen in the Table 3 and Table 4.

Table 3 Health risk factors among young population (part 1)

Questions		Gender	
		Male	Female
		(A)	(B)
X^2	Sig.	28.993	0.000***
Q1. At what age (if at all) did you decide to smoke your first cigarette for the first time?	9 or below	B	
	10		
	11		
	12		
	13		
	14		
	15		
	16 and more		
	Never		
X^2	Sig.	17.530	0.004**
Q2. How old were you when you were first drunk?	9 or below		
	10-12	B	
	13-15		
	16-18		
	18 and more		A
	I have never been drunk.		
X^2	Sig.	48.479	0.000***
Q3. What are your approximate monthly cost of alcohol (in €)?	0 €		A
	max 4 €		A
	4-10 €		A
	11-17 €		
	18-35 €	B	
	36-53 €	B	
	54-71 €	B	
	72-107 €	B	
	108 € and more	B	

Note: X^2 refers to Chi-square statistic. Sig. (p-value) refers to the two-sided asymptotic significance of the chi-square statistic. Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction. Significance level for upper case letters (A, B, C): 0.05*; 0.01 **; 0.001 ***.

Source: Prepared by authors

In the Table 3 we observe differences in answers to questions Q1-Q3 between men and women. The answers to questions Q1-Q3 are presented in the row variables. In a column proportions test, a key letter A is assigned to the male population and key letter B to the female population. X^2 represents Pearson chi-square statistic value and Sig. represents p-value. If the significance value is less than 0.05, we can conclude that there is a statistically significant dependence between the two variables. For the column proportions test associated with the Q1 with the age of respondents 9 or below and the gender, the key letter B appears in the column “Male”. Since the two-sided asymptotic significance adjusted by Bonferroni correction is less than 0.05 (X^2=28.993, Sig. (p-value) is 0.000), we can conclude that the proportion of male population who decided to smoke their first cigarette for the first time at the age 9 or below is greater than the proportion of female population at this age. So in general we can conclude that men tried a cigarette earlier in life than women. We also asked students at what age they were first drunk (Q2). There is statistical difference between men and women. Based on the column proportions test (X^2=17.530, Sig.=0.004), we can say that there is a statistically significant dependence between male and female responses. A key letter B in the column “Male” in the row 10-12 years refers, that the

proportion of men who were first drunk in the age 10-12 is statistically greater than the proportion of female. On the other hand, in later age (18 and more), the key letter A appears in the column "Female" and we can conclude that the proportion of women who were first drunk at that age is statistically significant and greater than the proportion of men. Based on the results we can conclude that women were first in the drunk state at a later age than men. There are also statistically significant differences between men and women for the monthly cost of alcohol (Q3). For the column proportions test in the case of the answers to the Q3 (alcohol costs: 18€ and more) the B key appears in the column "Male" in the all cases and the A key appears in the column "Female" in the cases with alcohol costs less than 11€ per month. Based on the significance values (X^2=48.479, Sig.=0.000) we can conclude that the proportion of men who have higher alcohol costs per month is statistically greater than the proportion of women. In other words, the proportion of women who spend less amount of monthly alcohol costs is statistically greater than the proportion of men.

Table 4 Health risk factors among young population (part 2)

Questions		Do you have a part-time job (or temporary job)?	
		Yes	No
		(A)	(B)
X^2	Sig.	12.091	0.017*
Q4. At what age (if at all) did you choose to smoke cigarettes every day?	13 or below		
	14		
	15	B	
	16 and more		
	Never		A
X^2	Sig.	20.031	0.003**
Q5. In how many cases (if at all) have you had the opportunity to drink any alcohol in the last twelve months?	0		
	1-2		A
	3-5		A
	6-9		
	10-19		
	20-39		
	40 and more	B	

Note: X^2 refers to Chi-square statistic. Sig. (p-value) Refers to the two-sided asymptotic significance of the chi-square statistic. Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction. Significance level for upper case letters (A, B, C): 0.05*; 0.01 **; 0.001 ***.

Source: Prepared by authors

In the Table 4 above we observe the differences in answers to questions Q4 and Q5 and the question if the students have a part-time job (or temporary job). We want to find out which group of students has worse habits. Regarding to Q4 we want to find out at what age the students decided for daily smoking. According to the p-value (Sig.=0.017) we can conclude that between students are significant differences in answers. In the case of students who decided to smoke cigarettes every day at the age 15, the B key appears in the column "Yes". It means, that the proportion of students who have a part time job and decided to smoke cigarettes every day at the age 15 is significantly greater than the proportion of students who do not have a part time job. Regarding the Q5 we want to find out in how many cases (if at all) students had the opportunity to drink alcohol in the last year. For the column proportions test the B key appears in the column "Yes" in the case of students who had the most opportunities to drink alcohol in the last twelve months. Based on significance values (X^2=20.031, Sig.=0.003) we can conclude that the proportion of students who

have a part time job is significantly greater than the proportion of students who do not have a temporary job. The survey shows that despite their job, students do not want to quit smoking. Even in the case of drinking alcohol, students who have part time job spend more money on an average on alcohol than students who do not work. The costs of alcohol per month are higher for men than women. At the same time, men were drunk for the first time and smoked cigarettes for the first time earlier than women. We believe that the results can be used today and they can serve as a methodological platform for academics and policymakers for further setting of similar mapping of major health risks among the population.

5 CONCLUSIONS

Demography serves as an important determinant in assessing the relationship between the health status of the population depending on the healthcare provided. There is a direct link between the health of the population and the health system. For example, health problems resulting from communicable diseases require a system that emphasizes public health measures such as improved hygiene and immunization. Poor sanitation and care, which are a function of housing problems, require a proper health management and lifestyle system. The health system has a significant impact on the health of the population. A highly developed healthcare supply system should (but not always) result in a higher health standard. Demographic characteristics of the population form a complex relationship with the health system. For example, the age structure affects the provision of healthcare. The young population requires different health services from older ones. Today, health systems are aggressively trying to reduce the mortality rate of the population, which is increasingly older and is dominated numerically by women (Pol & Thomas, 2013). We now see health care as a modern, comprehensive social system that provides health services, protects citizens' health and puts emphasis on sufficient prevention. A certain degree of foresight, stability and innovation is important for the efficient functioning of the health system. The flexibility to respond to the changing needs of all actors, patients, health professionals, politicians in the light of scientific advances in medicine is currently one of the major challenges for health policymakers. There are strong social, political and economic preferences and interests in the health sector. These scientific advances and expensive technologies are currently leading to high increases in the health costs (Janečková & Hnilicová, 2009; Engelhardt et al., 2009).

Our results in the first part of our analysis suffers from limitations due to incomplete data from the databases we used. In the case of missing data, we used the data that were available closest to the analyzed year according to Anderson et al. (2000). The potential weakness of our second part is that we are using the results of the questionnaire survey conducted in 2016. However, we believe that the results can be used today and they can serve as a methodological platform, in line with other studies reported by Oikawa (2020) and Arni et al. (2020). It is hoped that this study will lead to new insights for further setting of similar mapping of major health risks among the population.

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6 References

Agresti, A., & Kateri, M. (2011). *Categorical data analysis*. Springer: Berlin/Heidelberg, Germany.

Anderson, G. F., Hurst, J., Hussey, P. S., & Jee-Hughes, M. (2000). Health Spending And Outcomes: Trends In OECD Countries, 1960–1998: Do Americans get more from their health care system for the larger share of wealth they spend on health?. *Health Affairs*, *19*(3), 150-157.

Arni, P., Dragone, D., Goette, L., & Ziebarth, N. R. (2020). Biased Health Perceptions and Risky Health Behaviors: Theory and Evidence.

Berger, D., Williams, E. C., Bryson, C. L., Rubinsky, A. D., & Bradley, K. A. (2013). Alcohol questionnaires and HDL: screening scores as scaled markers of alcohol consumption. *Alcohol*, *47*(6), 439-445.

Bertram, L., Böckenhoff, A., Demuth, I., Düzel, S., Eckardt, R., Li, S. C., ... & Steinhagen-Thiessen, E. (2014). Cohort profile: the Berlin aging study II (BASE-II). *International journal of epidemiology*, *43*(3), 703-712.

Bijwaard, G. E., & Van Kippersluis, H. (2016). Efficiency of health investment: education or intelligence?. *Health economics*, *25*(9), 1056-1072.

Blecher, E. (2015). Taxes on tobacco, alcohol and sugar sweetened beverages: Linkages and lessons learned. *Social Science & Medicine*, *136*, 175-179.

Böckenhoff, A., Sassenroth, D., Kroh, M., Siedler, T., Eibich, P., & Wagner, G. G. (2013). The socio-economic module of the Berlin Aging Study II (SOEP-BASE): Description, structure, and questionnaire.

Engelhardt. H., Kohler. H. P., & Prskawetz. A. (2009). Causal analysis in population studies. In *Causal Analysis in Population Studies* (pp. 1-7). Springer. Dordrecht.

Forouzanfar, M. H., Alexander, L., Bachman, V. F., Biryukov, S., Brauer, M., Casey, D., ... & Astha, K. C. (2015). Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990-2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, *386*(10010), 2287-2323.

Gehrsitz, M., Saffer, H., & Grossman, M. (2020). *The Effect of Changes in Alcohol Tax Differentials on Alcohol Consumption* (No. w27117). National Bureau of Economic Research.

Hackl, F., Halla, M., Hummer, M., & Pruckner, G. J. (2015). The effectiveness of health screening. *Health economics*, *24*(8), 913-935.

Iizuka, T., Nishiyama, K., Chen, B., & Eggleston, K. (2017). *Is Preventive Care Worth the Cost? Evidence from Mandatory Checkups in Japan* (No. 23413). National Bureau of Economic Research, Inc.

Inui, T., Ito, Y., Kawakami, A., Ma, X. X., Nagashima, M., & Zhao, M. (2017). *Empirical Study on the Utilization and Effects of Health Checkups in Japan*. RIETI Discussion Paper Series 17-E-082.

Janečková. H., & Hnilicová. H. 2009. *Úvod do veřejného zdravotnictví.*1. vyd. Praha: Portál. 2009. 296 s. ISBN 978-80-7367-592-9.

Khlat, M., Sermet, C., & Le Pape, A. (2004). Increased prevalence of depression, smoking, heavy drinking and use of psycho-active drugs among unemployed men in France. *European journal of epidemiology*, *19*(5), 445-451.

Kim, H. B., Lee, S. A., & Lim, W. (2019). Knowing is not half the battle: Impacts of information from the National Health Screening Program in Korea. *Journal of health economics*, *65*, 1-14.

Medeiros, J., & Schwierz, C. (2015). *Efficiency estimates of health care systems* (No. 549). Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

OECD (2019a), *Health at a Glance 2019: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/4dd50c09-en.

OECD (2019b). Health Statistics 2019 – Definitions, Sources and Methods: Non-medical determinants of health. Available at: http://stats.oecd.org/wbos/fileview2.aspx?IDFile=17d36de2-b4ae-409a-9968-a27c7f2857e4.

OECD/EU (2018), *Health at a Glance: Europe 2018: State of Health in the EU Cycle*, OECD Publishing, Paris/European Union, Brussels, https://doi.org/10.1787/health_glance_eur-2018-en.

OECD/EU (2019). *Avoidable mortality: OECD/Eurostat lists of preventable and treatable causes of death (2019 version)*. Available at: https://www.oecd.org/health/health-systems/Avoidable-mortality-2019-Joint-OECD-Eurostat-List-preventable-treatable-causes-of-death.pdf.

Oikawa, M. (2020). *The effect of education on health policy reform: Evidence from Japan* (No. 20/08). HEDG, c/o Department of Economics, University of York.

Pol. L. G., & Thomas. R. K. (2013). *The demography of health and health care*. Springer Science & Business Media.