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Research Article

# Red and White Wine-Related Mortality Rates Due to Circulatory and Cancer Diseases in 33 European Countries

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**Abstract**

There is a lack of scientific data on a high number of populations to differentiate between the effects of red and white wines on mortalities related to circulatory and cancer diseases. We statistically compared the actual Age-Adjusted Death Rates (AADR) of circulatory and cancer diseases in 33 European countries due to the predominantly red or white wine consumption completed with the aspects of economic health (gross domestic product, GDP) and life expectancy. In the countries with higher red wine consumption, the circulatory mortality was significantly less than that in the white wine countries (355 *versus* 407, p= 0.021). Concerning cancers, this positive red wine effect was not found. However, the good red wine results concerning circulation did not improve life expectancy alone. The high GDP values significantly correlated with reducing both circulatory and cancer mortalities, with better life expectancy and increased wine consumption. There was a significant difference in the mortality rates of circulatory diseases between the countries with dominantly red and white wine consumption. However, only the high GDP values were found to decrease the mortality rates for circulatory and cancer diseases and improve life expectancy. The novelty of this study is shown in the simultaneous and complex investigation of crucial factors of wine consumption, which can determine its health effects on the most frequent mortalities in Europe depending on the types of wines and economic background approached from the aspect of life expectancy. A significant part of observations was already known, but the large European population gives them a significant impact. However, we also present the potential and individual dangers of uncontrolled wine consumption. Therefore, we recommend moderated forms of wine drinking, as well as stimulation of wine – type – specific wine research. These data are valid only for this population (generation) of Europe.

**Keywords**: Mortality; Circulatory Diseases; Cancer Diseases; Gross Domestic Product; Life Expectancy; Red Wine; White Wine

## Introduction

Global alcohol consumption has increased in the past two decades. Its further elevation is projected as a consequence of the growing population and better economic health, which is characterized by the value of "gross domestic product (GDP) in a country [1,2]. Alcoholic drinks, in general, but especially the various wines, have been substantial factors in the nutritional traditions of mankind [3]. However, there are great diversities in the interpretation of the main effects of alcohol because alcoholic drinks have toxic properties, too [4]. This uncertain state also appears concerning the wine-related morbidity and mortality data of circulatory and cancer diseases, which are Europe's two most common illnesses [5]. A long list of publications can be drawn showing

contradictory results on the effects of alcoholic drinks on these two types of diseases or the recommended, tolerable volumes of consumption [6-9]. These contrasting views are often generating sharp debates. At the same time, a rather extraordinary series of publications provided evidence about the preventive effects of red wine consumption on cardiovascular health in the last decades [10-17]. However, much fewer publications appeared on the health effects of white wines [18]. A recent review presented that wine consumption had an inverse relationship to cardiovascular mortality, not only to cardiovascular diseases [19]. A study from Taiwan [20] and the USA [21] published data about the positive effects of modest drinking on life expectancy and mortality risks. Some years ago, we also started to deal with the age-adjusted death rates of circulatory and cancer diseases in four Hungarian wine regions, producing either red or white wines dominantly in the period 2000-2010. Cardiovascular mortalities showed a negative correlation with the hardness of drinking water and a positive correlation with the underdeveloped socio – economic state [22]. Concerning cancers, it was a surprise that the lowest mortality rates were found in the Tokaj region, where the unique white wines affected by *Botrytis cinerea* dominated [23]. In the present work, we aim to extend this mortality-related study to 33 European countries, looking for significant statistical associations with the actual consumption of dominantly red and white wines, GDP values, and life expectancy. We are aware of the fact that the collected data are valid only for this population (generation) of Europe, which was born about 70-90 years ago and represented still a dominating white genetic background, similar religion, culture and life style.

## Materials and Methods

### *Search Strategy*

First, the available actual statistical data were collected on the values of age – adjusted death rates (AADR) of circulatory and cancer mortalities in 33 European countries representing about 560 million inhabitants, completed with the analysis of Gross Domestic Product (GDP) and life expectancy. Then, these data were evaluated from the aspect of the dominant consumption of red or white wines in a country. The number of countries was 33 because the available statistical data comprised these countries in this composition.

The comparisons occurred between the two groups as follows: Group 1.) 18 countries with dominating red wine consumption; Group 2.) 11 countries with dominating white wine consumption. Four countries were not analyzed, where the consumption was about 50-50 per cent. Any positive or negative preconceptions were excluded.

The investigation focused on the demonstration of statistically significant correlations and associations among the data of mortality, circulatory diseases, cancer diseases, gross domestic product, life expectancy, and red and white wines.

### *The sources of data were as follows*

The necessary references and international statistical data for the study were collected from the newest official results of Eurostat, International Monetary Fund (IMF) databases, Europe – Landgeist and Euronews. All data were taken over directly without any changes from the international databases, tables, and figures. These data are commonly available. For the statistical analysis the suitable, traditionally accepted methods were used.

a.) Age-adjusted death rates for circulatory diseases are shown in the Table of Eurostat „Causes of death – diseases of the circulatory system, residents 2019." https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Causes_of_death_%E2%80%93_diseases_of_the_circulatory_system,_residents,_2019_Health2022.png

b.) Age – adjusted cancer death rates from the Table of Eurostat "Deaths caused by malignant neoplasms residents"2020.https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fec.europa.eu%2Feurostat%2Fstatisticsexplained%2Fimages%2F1%2F10%2FCancer_statistics_Health2023_05.xlsx&wdOrigin=BROWSELINK

c.) The results of "Gross Domestic Products (GDP)" were expressed in US dollars (USD/capita) in Europe. They were found in the "List of sovereign states in Europe by GDP (PPP) per capita – "IMF WEO October 22 Edition (GDP) (PPP) capita – international dollars" https://www.imf.org/en/Publications/WEO/weo-database/2022/October. These data were taken from the actual Table valid for these 33 countries.

d.) The data on wine consumption (l/capita) were available from the file "Wine consumption l/capita (2022) in Europe – Landgeist "wine consumption/country". https://landgeist.com/2022/03/25/wine-consumption-in-Europe/.

e.) Counting the percentage of red and white wine consumption required additional calculations from the list of "total wine consumption/country: Google database" https://www.statista.com/markets/415/consumer-goods-fmcg/ However, it was possible to estimate roughly whether the percentage of dominantly red or white consumption was over or below 50% in a country. Only this approach allowed scientific comparisons because the percentage of red and white types of consumption was not available numerically. Only the "dominant character of wine" was found in a country. Thus, we used the following categories for red wines: > 50 %, < 50%, and 50-50%.

f.) Data on life expectancy were available from the following document: https://www.euronews.com/next/2023/07/22/life-expectancy-where-in-europe-do-people-live-the-shortest-and-the-longest In the original Tables only the figures of whole expected life spans were presented. To demonstrate statistically significant differences, we created and used a new formula for the expected life span: "65+ years."

### *Statistics*

The statistical analysis of data and the counting of correlation coefficients occurred using Spearman's rho (r) for the next variables: AADR circulatory, AADR cancer, GDP (USD) per capita, and wine consumption (l/capita) dominating red wine consumption, dominating white wine consumption in a country. Correlations were significant at 0.01 level (2-tailed) and 0.05 level (2-tailed). The widely accepted Mann – Whitney test [24]. was used to compare the data of two groups of countries: a.) ones with dominating red wines, and b.) ones with dominating white wines as follows: AADR of circulatory diseases in countries with dominating red and white wines; AADR of cancer diseases in countries with dominating red and white wines; GDP values in countries with dominating red and white wines; life expectancy ("years+65") in countries with dominating red and white wines. The IBM SPSS ver.24 program (IBM Corp. Armonk N.Y. USA) was used for the calculations.

## Results

### *Total numbers and values of age-adjusted mortality rates of circulatory and cancer diseases, gross domestic products and per cent of red or white wine consumption in 33 European countries*

Table 1 presents the total numbers of age – adjusted mortality rates (AADR) of circulatory and cancer diseases, the values of GDP (USD/capita) (USD is USA dollar), the volumes and per cent of red or white wine consumption (l/capita) in 33 European countries. These data showed a significant difference in the AADR circulatory values between the two groups of countries. In the countries with dominantly red wines (355), the mortality was significantly less than that of white wines (407) (p=0.021). This is the first demonstration of this significant statistical difference. On the other hand, there was no significant difference between the AADR values of cancers in the red (236.1) and white (243.5) wine countries (p= 0.63).

| Countries | AADR circulatory | GDP/capita USD | Wine consumption l/ capita/year | Red wine % | AADR cancer |
|---|---|---|---|---|---|
| **France** | **190.4** | **56199** | **54** | **>50** | **226.6** |
| **Spain** | **214.5** | **46551** | **29** | **>50** | **214.5** |
| **Norway** | **208.4** | **78127** | **19** | **>50** | **223.5** |
| **Denmark** | **215.4** | **69845** | **34** | **>50** | **271.0** |
| **Belgium** | **228.5** | **62065** | **28** | **>50** | **223.2** |
| ***Netherlands*** | ***236.9*** | ***69714*** | ***24*** | ***<50*** | ***261.3*** |
| **Luxembourg** | **237.4** | **141587** | **39** | **>50** | **203.1** |
| **Switzerland** | **232.9** | **84468** | **36** | **>50** | **196.2** |
| **Portugal** | **276.6** | **42066** | **50** | **>50** | **240.5** |
| **Cyprus** | **271.2** | **49504** | **23** | **>50** | **205.6** |
| **Italy** | **270.7** | **51061** | **40** | **>50** | **227.0** |
| **Sweden** | **272.0** | **63877** | **28** | **>50** | **214.1** |
| ***Liechtenstein*** | ***322.1*** | ***167877*** | ***39*** | ***<50*** | ***182.9*** |
| **Ireland** | **258.4** | **131034** | **24** | **>50** | **255.5** |
| **Iceland** | **273.8** | **66466** | **18** | **>50** | **224.9** |
| ***Greece*** | ***327.6*** | ***36465*** | ***22*** | ***<50*** | ***240.8*** |
| **Malta** | **298.6** | **56337** | **20** | **>50** | **212.5** |
| ***Finland*** | ***310.9*** | ***58659*** | ***13*** | ***<50*** | ***211.4*** |
| ***Slovenia*** | ***393.6*** | ***49967*** | ***44*** | ***<50*** | ***290.7*** |
| ***Germany*** | ***349.8*** | ***63834*** | ***25*** | ***<50*** | ***240.3*** |
| ***Turkey*** | ***358.9*** | ***38759*** | ***1*** | ***<50*** | ***167.6*** |
| ***Austria*** | ***362.9*** | ***66680*** | ***31*** | ***<50*** | ***230.5*** |
| **Poland** | **492.5** | **42465** | **7** | **>50** | **279.7** |
| **Croatia** | **572.6** | **37549** | **29** | **>50** | **303.9** |
| ***Estonia*** | ***570.3*** | ***46125*** | ***16*** | ***<50*** | ***265.0*** |
| ***Czechia*** | ***529.5*** | ***48918*** | ***23*** | ***<50*** | ***267.2*** |
| Slovakia | 567.8 | 38620 | 17 | 50 | 301.8 |
| **Serbia** | **816.3** | **23534** | **14** | **>50** | **283.0** |
| ***Hungary*** | ***714.8*** | ***42132*** | ***28*** | ***<50*** | ***320.9*** |
| Romania | 830.0 | 38096 | 28 | 50 | 260.3 |
| Latvia | 770.6 | 38123 | 14 | 50 | 296.5 |
| Lithuania | 731.7 | 46158 | 7 | 50 | 276.5 |
| **Bulgaria** | **1051.8** | **29177** | **14** | **>50** | **245.3** |
| **Values from countries with dominating red wines**<br>***Values from countries with dominating white wines***<br>Values from countries with 50-50% red and white wines | | | | | |

**Table 1:** Total numbers and values of age-adjusted mortality rates of circulatory and cancer diseases, gross domestic products and per cent of red or white consumption in 33 European countries

***Correlations among the values of age-adjusted death rates of circulatory and cancer diseases, gross domestic products and wine consumption related to dominantly red or white wines in 33 European countries***

In Table 2, the correlations among the AADR values for circulatory and cancer diseases, GDP/capita, and wine consumption (l/capita) are related to red or white wines dominantly in 33 countries of Europe. Significant *positive* correlations were found for the countries as follows: AADR circulatory – AADR cancer (r=0.563, p=0.001); GDP – wine consumption (r=0.399, p= 0.021) [n=33]; furthermore, concerning the white wine countries [n=11]: AADR cancer – AADR circulatory (r=0.636, p=0.035). On the other hand, significant *negative* correlations were found as follows: AADR circulatory – GDP ( r = -0.711, p=0.000); AADR circulatory – wine consumption (r= -0.467, p= 0.006); AADR cancer – GDP (r= -0.482, p=0.004) [n=33]; whereas in red wine countries [n=18]: AADR circulatory – GDP (r = -0.620, p=0.006); and AADR circulatory –wine consumption (r= -0.520 p=0.027). These results showed a significant negative correlation between larger wine consumption and the mortality of circulatory diseases, especially in those 18 countries where red wine consumption dominated. The positive effects of high GDP values were found in the reduction of mortalities in both illnesses and the increase in wine consumption.

| **Correlation coefficients (n=33,18,11)** | | | **AADR circulatory** | **GDP/ capita USD** | **Wine/ l/capita/year** | **AADR cancer** |
|---|---|---|---|---|---|---|
| **AADR circulatory** | 33 | Both wines | | *-0.711 **(0.000)* | *-0.467 **(0.006)* | *0.563 **(0.001)* |
| | **18** | **Red wines** | 1.000 | ***-0.620 **(0.006)*** | ***-0.520 *(0.027)*** | **0.420 (0.083)** |
| | ***11*** | ***White wines*** | | ***-0.491 (0.125)*** | ***0.136 (0.689)*** | ***0.636 *(0.035)*** |
| **GDP/ capita USD** | 33 | Both wines | *-0.711 **(0.000)* | | *0.399 *(0.021)* | *-0.482 **(0.004)* |
| | **18** | **Red wines** | ***-0.620 **(0.006)*** | 1.000 | **0.240 (0.338)** | **-0.404 (0.097)** |
| | ***11*** | ***White wines*** | ***-0.491 (0.125)*** | | ***0.527 (0.096)*** | ***-0.209 (0.537)*** |
| **Wine/ l/capita/year** | 33 | Both wines | *-0.467 **(0.006)* | *0.399 *(0.021)* | | -0.133 (0.460) |
| | **18** | **Red wines** | ***-0.520 *(0.027)*** | **0.240 (0.338)** | 1.000 | **-0.194 (0.440)** |
| | ***11*** | ***White wines*** | ***0.136 (0.689)*** | ***0.527 (0.096)*** | | ***0.327 (0.326)*** |
| **AADR cancer** | 33 | Both wines | *0.563 **(0.001)* | *-0.482 **(0.004)* | -0.133 (0.460) | |
| | **18** | **Red wines** | **0.420 (0.083)** | **-0.404 (0.097)** | **-0.194 (0.440)** | 1.000 |
| | ***11*** | ***White wines*** | ***0.636 *(0.035)*** | ***-0.209 (0.537)*** | ***0.327 (0.326)*** | |
| **Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed) | | | | | | |

**Table 2:** Correlations among the values of age-adjusted death rates of circulatory and cancer diseases, gross domestic products and wine consumption related to dominantly red or white wines in 33 European countries

***The values of life expectancy due to the dominating red or white wine consumption in 33 European countries***

Table 3 shows the order of countries in terms of life expectancy (starting with the highest values and also showing the values of "years + 65"), GDP values, and types of dominating wines. There were no significant differences in the averages of "years + 65" values in the red (15.85) and white (14.80) (p=0.29) wine countries. Furthermore, the average GDP values of red (62884 USD) and white (62648 USD) (p=0.98) wine regions did not differ either. This was a very important observation suggesting the role of wine type specific differences in the mortalities. Besides, these results showed that the significantly lower mortality rates in the red wine countries were not enough to improve the values of life expectancies alone. Whereas, the higher GDP values reflected significantly positive correlations with longer life spans in both the red (r=0.6574, p=0.003) and white (r=0.7545, p=0.009) wine countries.

| Order | Countries | Years | 65+ years | GDP/capita USD |
|---|---|---|---|---|
| 1 | **Switzerland** | **83.8** | **18.8** | **84468** |
| 2 | **Iceland** | **83.1** | **18.1** | **66466** |
| 3 | **Spain** | **82.8** | **17.8** | **46551** |
| 4 | **Norway** | **82.5** | **17.5** | **78127** |
| 5 | **Sweden** | **82.7** | **17.7** | **63877** |
| 6 | **Ireland** | **82.5** | **17.5** | **131034** |
| 7 | **Italy** | **82.5** | **17.5** | **51061** |
| 8 | **Luxembourg** | **82.4** | **17.4** | **141587** |
| 9 | **Malta** | **82.4** | **17.4** | **56337** |
| 10 | **France** | **82.3** | **17.3** | **56199** |
| ***11*** | ***Finland*** | ***82.0*** | ***17.0*** | ***58659*** |
| 12 | **Cyprus** | **82.0** | **17.0** | **49504** |
| ***13*** | ***Liechtenstein*** | ***81.7*** | ***16.7*** | ***167877*** |
| 14 | **Denmark** | **81.6** | **16.6** | **69845** |
| ***15*** | ***Netherlands*** | ***81.4*** | ***16.4*** | ***69714*** |
| ***16*** | ***Austria*** | ***81.3*** | ***16.3*** | ***66680*** |
| 17 | **Portugal** | **81.3** | **16.3** | **42066** |
| 18 | **Belgium** | **81.2** | **16.2** | **62065** |
| ***19*** | ***Germany*** | ***81.0*** | ***16.0*** | ***63834*** |
| ***20*** | ***Greece*** | ***80.9*** | ***15.9*** | ***36465*** |
| ***21*** | ***Slovenia*** | ***80.6*** | ***15.6*** | ***49967*** |
| ***22*** | ***Estonia*** | ***78.2*** | ***13.2*** | ***46125*** |
| ***23*** | ***Czechia*** | ***77.9*** | ***12.9*** | ***48918*** |
| ***24*** | ***Turkey*** | ***77.7*** | ***12.7*** | ***38759*** |
| 25 | **Croatia** | **77.4** | **12.4** | **37549** |
| 26 | **Poland** | **76.1** | **11.1** | **42465** |
| 27 | **Serbia** | **76.1** | **11.1** | **23534** |
| 28 | Slovakia | 76.0 | 11.1 | 38620 |
| ***29*** | ***Hungary*** | ***75.1*** | ***10.1*** | ***42132*** |
| 30 | Lithuania | 74.7 | 9.7 | 46158 |
| 31 | Latvia | 74.5 | 9.5 | 38123 |
| 32 | Romania | 73.6 | 8.6 | 38096 |
| 33 | **Bulgaria** | **72.7** | **7.7** | **29177** |
| **Values from countries with dominating red wines**<br>***Values from countries with dominating white wines***<br>Values from countries with 50-50% red and white wines | | | | |

**Table 3:** The values of life expectancy due to the dominating red or white wine consumption in 33 European countries.

## Discussion

These results present data on the first concurrent, red and white wine – type – related statistical investigations on circulatory and cancer mortalities in 33 countries of Europe. The summary of results is as follows: a.) The larger wine consumption (also representing higher red wine per cent) showed a significantly negative association with the mortalities of circulatory diseases in these European countries, b.) Especially in those 18 where red wine consumption dominated; c.) Higher GDP values reduced the mortalities in both illnesses. d.) Although circulatory mortality was significantly lower in the red wine countries, it was not enough to improve life expectancy alone. e.) A significant difference was found between the circulatory effects of red and white wines. f.) Higher GDP values could significantly increase the life expectancies in both groups. g.) Higher GDP values resulted in greater wine consumption. The advantage of this objective approach was the collection of actual, available, official, statistical data on the circulatory and cancer "mortalities" and not only on "morbidities." They better reflected the "final outcomes" of the effects that lead to death. Concerning red wines, earlier, preventive and protecting impacts were found on cardiac morbidities [10-17]. This work confirms this tendency statistically on the level of mortality, too, as it was published already before [19]. The mortality and morbidity-decreasing effects of economic growth (GDP values) were also recognized earlier [25]. The present observations confirmed that higher GDP values can involve increased wine consumption [2], preferring red wines, like in Luxemburg. The investigation of life expectancy added a new aspect to the study. They showed that the significantly decreasing effect of high red wine consumption on the mortality of circulatory diseases alone did not have such a significant impact on the elongation of life expectancy as the higher values of GDP. Besides, high GDP values decreased the mortalities of both circulatory and cancer diseases. These are the most important observations in this study, presenting that in the evaluation of the health effects of any type of wine, a complex approach is required.

It should be stressed that these mortality results characterized that population (generation) of Europe, which was born about 70-90 years ago. Therefore, these data are valid only for this still almost entirely white population of Europe and for this period. (Eventually, the population of Turkey can mean some ethnic difference). This study is a statistical cross-section of data characterizing 33 European countries in terms of circulatory and cancer mortalities, red and white consumptions, GDP values, and life expectancy during this period. Besides, we are aware of the weaknesses of this work concerning the role of other types of alcoholic drinks (beer, other beverages) [1] or differences in genetics, psychologic states, diabetes mellitus, kidney diseases, infections, autoimmune diseases [8], furthermore, tobacco smoking, occupational and environmental (climate) factors, overweight, diet, etc. [18], or the adherence to Mediterranean diet [26]. The strong effects of social, historical, political and religious differences also could appear in these results. Our data originated only from 33 of 41 countries of Europe, but they contained a total of 27 countries of the European Union. (We found grouped data only on these 33 countries. Thus, the results from Great Britain were absent). Yet, four countries deserved special attention, which reached No.1 places as follows: France (AADR circulatory, wine consumption/capita), Turkey (AADR cancers), Liechtenstein (GDP/capita) and Switzerland (life expectancy). Table 4. shows these four counties with No.1 places and their places concerning the additional factors. In terms of the best result of life expectancy in Switzerland, the good values of the additional three factors contribute a lot, not to mention their exceptionally good historical and socio-economic backgrounds. Turkey deserves special attention. Here, life expectancy is relatively short despite the very good mortality rate for cancers, very low wine (alcohol) consumption, but modest GDP value. It is almost by the place of their GDP value. However, further studies are needed to elucidate the reason(s) for this good cancer result. (Ethnic or genetic reasons?) In Liechtenstein, the high GDP values can provide a general social well-being. In France, the low AADR circulatory value was first proven statistically, possibly related to the great consumption of red wines. Still, this positive effect was not reflected in the value of life expectancy, which had a better correlation with the place of GDP. Besides, the No. 1. GDP value in Lichtenstein is not enough to reach the best place of life expectancy because their AADR circulatory value is rather high. At the same time, the places of AADR circulatory and cancer diseases, GDP and wine consumption are among the best 10 in Switzerland, representing an advanced harmony of development that provides the best chance of a long life span. High GDP is a necessary but not sufficient factor for longevity. It is also worthy of note that the almost alcohol-free lifestyle, together with the low rates of cancer mortalities, as can be seen in Turkey, is not enough to extend the life span. At the same time, in the case of cancers, the low Turkish data can confirm the results of an earlier European study on the strong association of high alcohol consumption with increased cancer mortality rates in an inversed form [27]. Although there were not remarkable wine (color) type related differences in the summarized data of places, there were numerous individual differences among the results of various factors tested in a country.

| Countries | AADR circulatory | AADR cancer | GDP/capita USD | Wine consumption l/ capita/year | Life expectancy | ∑ |
|---|---|---|---|---|---|---|
| **France** | **1.** | 13. | 15. | **1.** | 10. | 40 |
| ***Turkey*** | 20. | **1.** | 26. | 33. | 24. | 104 |
| ***Liechtenstein*** | 17. | 2. | **1.** | 5. | 13. | 38 |
| **Switzerland** | 6. | 3. | 4. | 7. | **1.** | 21 |

∑ = summa
**Red wine country**
***White wine country***

**Table 4.** Comparison of the places of additional factors in the four countries with No.1. place

These results encourage the analysis of different biological effects of red and white wines separately. Concerning red wines, we are now in favor of further investigating polyphenols and, as a new trend, peroxidases [28]. Two earlier studies brought new aspects in the research of red wines: a.) sharp biological differences were found between two types of red wines [29], b.) positive biological effects of an "alcohol – free red wine" were observed [30].

Life expectancy, life span, and ageing are multifactorial phenomena, where only one positive nutritional factor (like red wine consumption) cannot compensate for the group of other potential disadvantages. The nine main factors affecting longevity were determined as follows: 1. gender, 2. genetics, 3. prenatal and childhood conditions, 4. education, 5. socio-economic status, 6. marital status, 7. ethnicity/migrant status, 8. lifestyle, 9. medical technology [31]. In this series of factors, the nutritional elements appear only among the lifestyle components (point 8.), representing an important but not dominating part. On the other hand, the involvement of GDP values can be strongly engaged in points No. 3, 4, 5, 7, 8, and 9 [25]. The GDP values can reflect the developmental levels of socio-economic and political backgrounds well, significantly determining the life spans and ageing processes. After all, only points 1, 2, and 6 are factors of health and ageing processes independent of GDP values to a certain extent. Thus, even high GDP values are necessary but not sufficient factors for a longer life span.

However, the existence of these nine determining factors does not decrease the importance of the "nutritional elements represented among the lifestyle factors." It can be true that as "only one" factor alone, even an outstanding nutritional state cannot extend life span. Still, together with "the other good factors," it can already improve life expectancy.

The strict new results of this study were as follows: a significant negative statistical correlation was demonstrated between the circulatory mortality rates and wine consumption in those countries of Europe where the consumption of red wines dominated. Still, this positive effect did not appear in life expectancy values. High GDP values reduced the mortality rates of both circulatory and cancer diseases and increased life expectancy and wine consumption. However, these observations and data are only valid for this population of Europe and this period. Using traditional statistical methods, they should be used as documents of a statistical cross – section of mortality data of circulatory and cancer diseases counted and composed from actual, available and official data due to red and white wine consumption, GDP values and life expectancy. They contain some new observations but do not declare any definitive "eternal truth" in the very complicated territory of the health and social effects of alcohol. However, they can encourage larger and more complex systemic studies on the general health and social effects of wine consumption related to red or white wines separately, as it was suggested by Luceron–Luca–Torres and coworkers earlier, but warning, that increasing wine taking might be harmful to individuals who are vulnerable to alcohol because of age, medication or other pathologies [19]. This synthesizing publication represents a very great impact because recognizes the reducing effect of red wine consumption on the cardiac mortality, besides, demonstrates the dangers of addiction, as well. The complexity of phenomenon can be shown by the following two publications. In older men and women, regular but moderate alcohol consumption increased the "quality of life" in California [32]. Whereas, it is a new tendency that in the alcohol, mainly of wine drinking of youngest generation a decrease appeared [33]. At the same time, the potential beneficial health effects also of white wines should not be forgotten either, as hundreds of molecules with antiviral, anti-inflammatory and anticancer activity were identified in the white wines from Hungary's Tokaj region [34]. These data can be in accordance with our earlier observation that in this Tokaj region, producing also white wines affected with *Botrytis cinerea* (Aszu, Szamorodni, late harvested furmints), all cancer mortality rates were significantly less than that in the populations of the other four wine regions died within 2000-2010 [23]. Last but not least, it is worth considering the fresh Guideline of the Parliament of the United Kingdom about "the j-shaped curve showing that light and moderate drinkers of any form of alcohol live longer than those who abstain or drink heavily". "Approximately 20 g a day consumption for women and 30 g consumption a day for men is considered as "safe" or "low risk" for most healthy adults" [35]. Concerning wine consumption, however, it should be stressed on the base of 56 cohorts from several countries representing more than 1 million persons that "moderate wine consumption defined a 1-4 drinks per week was associated with a reduction in risk for cardiovascular disease mortality compared with beer or spirits" [36].

## Conclusions

This study provided the first statically proven observation on the negative correlation between circulatory mortality rates and wine consumption in those countries of Europe where the consumption of red wines dominated. Earlier, similar tendencies concerning morbidities were described already. However, this positive circulatory effect did not appear in a longer life expectancy. High GDP values reduced the mortality rates of both circulatory and cancer diseases and increased life expectancy and wine consumption. Similar data on a smaller number of persons was partly mentioned earlier. Still, these new results stimulate the separated red and white wine – related studies synthesizing wide biochemical, biological, medical and socio-economical approaches. However, these results are valid only for this population (generation) of Europe and this period. Nevertheless, they encourage the finding and discovery of prudent, tolerable

and moderated forms of individual wine consumption when any positive molecular health effects of any type of wine may improve the quality of life but avoid alcoholic abuse and other negative side effects of alcoholic drinks. There are other, similar observations confirming such conclusion related to smaller number of population. The new values of this work are in the documentation and concurrent comparison of internationally available actual mortality data on about 560 millions of European people, coupled to the red and white type related wine consumptions, and the values of GDP and life expectancy. Besides, all the main weaknesses and limitations are critically presented, too. Especially the data on the quantity of additional alcoholic drinks and the intensity of tobacco smoking are failed.

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