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REGIONALNI RAZVOJ I DEMOGRAFSKI TOKOVI ZEMALJA JUGOISTOČNE EVROPE

LIFE EXPECTANCY IN THE REPUBLIC OF MACEDONIA AND THE EU COUNTRIES AND ITS CORRELATIVE DEPENDENCY WITH GDP PER CAPITA (UDC 330.556 (497.7))

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Abstract: Statistical data show that in the Republic of Macedonia life expectancy in 1993 was average 71,8 years, in 2000 - 72,9 years and in 2010 - 74,6 years, while in the EU countries in 1993 it was average 75,4 years, in 2000 - 77,2 years and in 2010 - 79,6 years. Prediction signalizes that in the next period average life expectancy will increase. While processing the data it is stated that the correlation ratio between the average life expectancy and the GDP per capita in the EU countries is quite high - 0,90 which shows strong correlative dependence, while determination ratio is 81% which means that life standard expressed through GDP has 81% influence on the life expectancy of the population and 19% have influence other factors. In the Republic of Macedonia correlative dependence is 0,87 and determination ratio is 75%. Statistical data is processed using table and graphic display.

Key words: life, GDP, data, processing, correlation, determination.

Introduction

Life expectancy in Republic of Macedonia and in the EU countries is continuously increasing. In the last thirty years is noticed increase in average life expectancy in Republic of Macedonia. In the period between 1980 and 2011 life expectancy increases for one year after seven past years and then after five. Average life expectancy in the EU countries between 1980 and 1993 increases for one year after six past years, and from 1993 until 2011

The expectation leads to the fact that in the following period the average life expectancy will increase.

The processed statistical data show that Republic of Macedonia stands behind regarding average life expectancy compared with the EU countries. For example, in Republic of Macedonia in year 2010 it was 75 years while in the EU countries it was 80 years.

In addition to that, Republic of Macedonia is on the last place in comparison with the EU countries measured by GDP per capita. Correlation ratio between the average life expectancy and GDP per capita in Republic of Macedonia is quite high (0,85), and the determination ratio is 75%. Correlation ratio between the average life expectancy and GDP per capita in the EU countries is quite high (0,90) and determination ratio is 81% (which shows high correlative dependence).

Through these ratios is confirmed the opinion that better standard of living provides longer life.

In this work statistical data is processed and shown, quantitative and in table and graphic displays.

Life expectancy of the population in the Republic of Macedonia and the EU countries

Life time of the human, seen from the aspect of the possibility to its influence, depends very much from the quality of living and the health care. That means decreasing mortality from different diseases that can be prevented and proporely treated. In certain aspects of the healthcare, Macedonian citizens are less healthy than the average EU citizens.

Although it is difficult to compare the differences regarding diseases in different countries, the data can be established by comparison of certain diseases.¹

Regarding the total number of years that the average citizen can be expected to live (average life expectancy), this number is for five years lower in Macedonia than the average life expectancy in the EU countries where this number was, 80 while in Macedonia was 75 years.

Likewise in most of the European countries, men in Republic of Macedonia live approximately five years less than the women.

Larger part of the differences in the life expectancy between Republic of Macedonia and the EU countries are explained with the higher supremacy of cardiovascular diseases, partially caused by large tobacco use and from uncontrolled hypertension and hypercholesterolemia.² Another indicator that compares the life span is the "expected healthy life" meaning total number of years that one person can expect to live in good health - without disease or permanent disability.

Distribution of death cases by age³ shows that most cases of death or 43.6 %, appear in age groups of 75 years old people. Death cases in the age group of 65-74 years old people contains 28%, while in the group of 55-64 years old people contains 13.4 %.

Circular diseases are leading reason for death in Republic of Macedonia, containing almost 57% from the number of death cases. Brain stroke is the most significant disease in this group⁴.

Good health and welfare require clean environment in which physical, physiological, social and aesthetic factors have huge importance. Human health depends on availability and quality of food, water, air and home. Although the impact of the physical environment is known for a longer period of time, the topic is still ongoing since new scientific proofs have shown the link between the environment and health. More studies show that risks from the environment contain 25-35 % in the total diseases on a global scale⁵. Health statistics is insufficient with data that would show different lifestyles. In Republic of Macedonia are made a few researches about smoking habits of the population. They have shown a connection between smoking and age, but not a connection with the educational level⁶.

The government in 2006 approved the Strategy for battle against smoking and on 16th September 2006 has ratified the Convention for control of smoking as a member country of WHO. In public and work spaces is already implemented the restriction in smoking.

Despite this strategy, there are also the strategy for battle against alcohol and the strategy for drugs control which defines the objectives and activities for decreasing the demand and availability of drugs in the period 2006-2012, which is accepted by the government in december 2006 and is a current action plan for implementation.

Because of better clarity, the average life expectancy of the population in Republic of Macedonia and in the EU countries will be shown on picture 1.

¹ PhD Nikola Orovchanec< medical doctor, editor associate, Biostatistcs< Skopje 2006, Page 248.

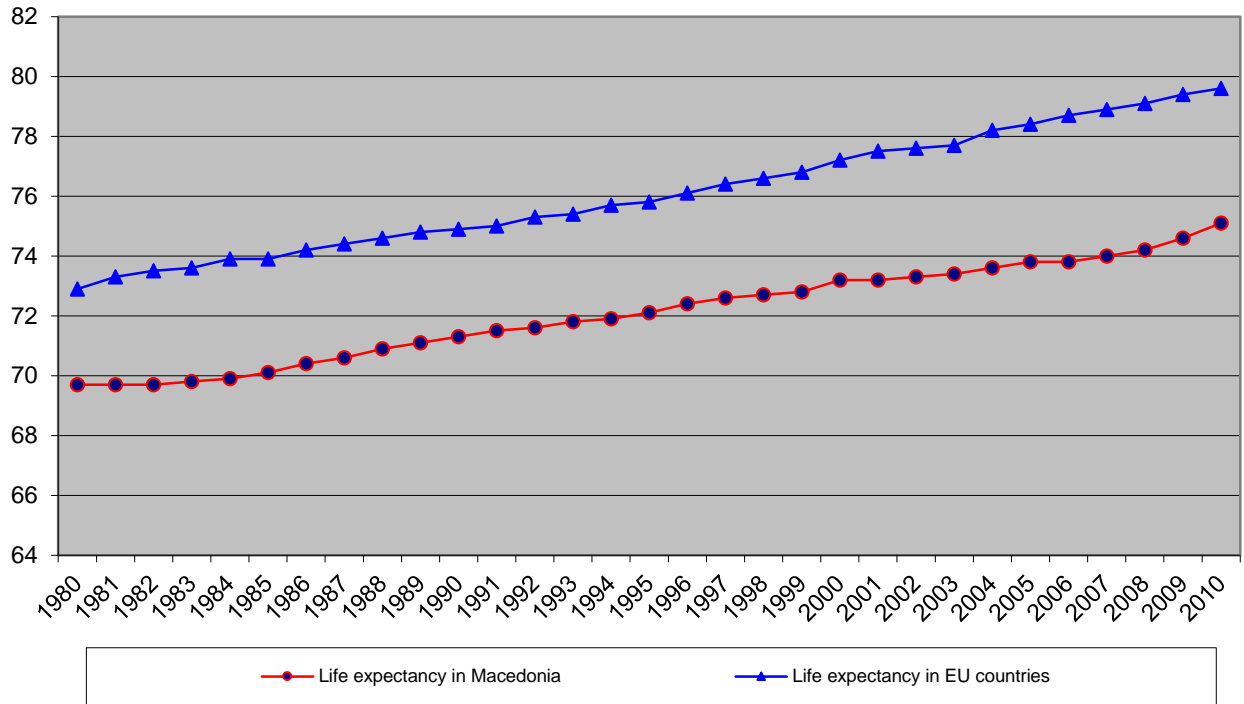
² On line, Ministry of health of Republic of Macedonia, Health statistics in Republic of Macedonia 2020, Safe, efficient and fair health system, Skopje, February 2007.

³ Source: WHU-World health report for year 2003.

⁴Source: WHO HFA-DB, January 2006.

⁵ Source: WHO-Environmental Burden of Diseases Series, 2004.

⁶ "Global Youth Tobacco" ("Тутунот кај младите глобално"), P333, Faculty of Mechanics, year 2004.



Picture 1: Average life expectancy of the population in the Republic of Macedonia and the EU countries

The annual difference between average life expectancy of the population in Republic of Macedonia and the EU countries is 4 to 5 years which is shown in the graphic display.

GDP per capita in the Republic of Macedonia and the EU countries

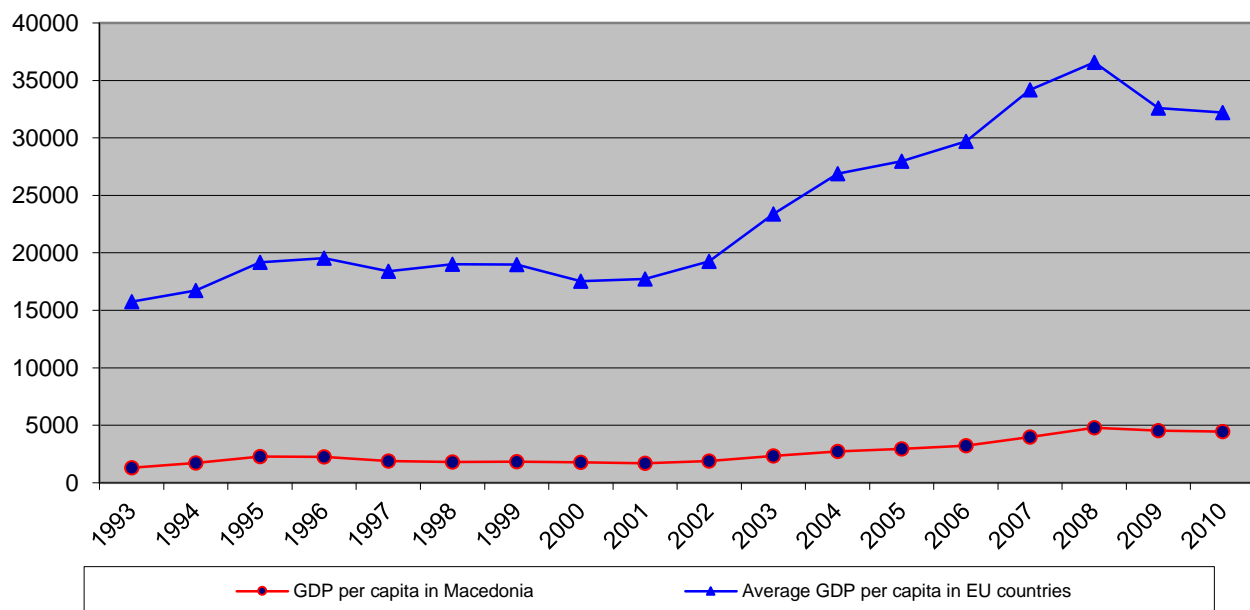
Statistical data show that Republic of Macedonia stands behind in socio-economic development in comparison to the EU countries. GDP per capita in Republic of Macedonia in year 1993 was 1311.60 USD, 1785.33 in 2000 and in 2010 was 4434.48 USD. In the EU countries, GDP per capita in average in year 1993 was 15,748.91 USD, in year 2000- 23,388.77 USD and in 2010 was 32,198.55 USD.

The information about GDP per capita in Republic of Macedonia and EU countries in the period 1993-2010 are shown in Table 1.

Table 1: GDP per capita in Republic of Macedonia and EU countries⁷

Year	GDP per capita in Macedonia	Average GDP per capita in EU countries
1993	1.311,60	15.748,91
1994	1.730,55	16.714,31
1995	2.266,06	19.173,49
1996	2.241,02	19.535,31
1997	1.883,67	18.395,85
1998	1.792,33	19.008,73
1999	1.835,56	18.966,59
2000	1.785,33	17.541,93
2001	1.704,78	17.716,29
2002	1.874,79	19.261,87
2003	2.345,49	23.388,77
2004	2.712,32	26.878,28
2005	2.936,94	27.975,69
2006	3.211,09	29.699,36
2007	3.984,44	34.187,80
2008	4.791,19	36.588,34
2009	4.528,25	32.584,00
2010	4.434,49	32.198,55

This data are also shown in graphic display 2.



Picture 2: GDP per capita in Macedonia and EU countries

⁷ <http://search.worldbank.org/data?qterm=expected%20life&language=EN>

From the table display 1 and graphic display 2, the difference of GDP per capita between Republic of Macedonia and the EU countries is evident. The average GDP in Republic of Macedonia is around 10 times lower than in the EU countries.

Correlation and determination ratio between GDP and life expectancy of population in Republic of Macedonia

The interest of our research was to foresee the correlative dependence between life expectancy and the volume of GDP per capita. The calculation of the correlation ratio is done by using simple correlation:

$$Y_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \varepsilon_i$$

For this calculation was taken GDP per capita as an independent changeable value (x) and life expectancy as dependent changeable value (y) , or with other words its aim was analyzing whether the volume of the GDP per capita influences the life expectancy of the population .

According to the calculations, the correlation ratio between GDP per capita and life expectancy is quite high and is 0.87, which means that there is strong correlative dependence.

Table 2: Calculation of correlation ratio between GDP per capita and life expectancy of the population in Republic of Macedonia

Year	GDP per capita X	Life expectancy Y	Regression line \hat{Y}_i	Residual values ε_i^2
1993	1.311,60	71,8	1.126,87	3.4124,49
1994	1.730,55	71,9	1.296,75	188.181,84
1995	2.266,06	72,1	1.469,09	635.169,03
1996	2.241,02	72,3	1.643,70	356.783,04
1997	1.883,67	72,4	1.820,34	4.011,58
1998	1.792,33	72,6	1.997,28	42.006,07
1999	1.835,56	72,7	2.173,97	114.517,75
2000	1.785,33	72,9	2.352,14	321.282,69
2001	1.704,78	73,1	2.530,43	681.694,93
2002	1.874,79	73,2	2.709,99	695.897,91
2003	2.345,49	73,4	2.888,56	294.930,46
2004	2.712,32	73,6	3.068,02	126.523,13
2005	2.936,94	73,7	3.248,92	97.330,60
2006	3.211,09	73,9	3.432,70	49.111,76
2007	3.984,44	74,1	3.619,12	133.456,69
2008	4.791,19	74,3	3.808,58	965.518,49
2009	4.528,25	74,4	3.998,31	280.844,41
2010	4.434,49	74,6	4.186,12	61.687,92
Total:	47.369,90	1.317,07	47.369,90	5.083.072,80

The determination ratio is almost 0,755 which means that the volume of GDP per capita influences 75% to the life expectancy of the population and 25% have influence other factors. That is a fact because higher life standard provides more comfortable life and improves the life quality of the population (proper health care, regular vacations, consuming healthy food and so on).

Correlation and determination ratio between GDP per capita and life expectancy of population in the EU countries

With the same method is calculated correlative dependence between average life expectancy and average volume of GDP per capita in the EU countries.

The correlations show that correlation ratio between GDP per capita and life expectancy in the EU countries is quite high and is 0,901, which means that there is very correlative dependence.

Table 3: Calculation of correlation ratio between the average GDP per capita and life expectancy of the population in the EU countries

Year	GDP per capita X	Life expectancy Y	Regression line \hat{Y}_i	Residual values ε_i^2
1993	15.748,91	75,4	13.960,10	3.199.860,52
1994	16.714,31	75,7	15.340,71	1.886.797,49
1995	19.173,49	75,8	15.913,09	10.630.167,86
1996	19.535,31	76,1	17.047,63	6.188.534,25
1997	18.395,85	76,4	18.417,52	469,44
1998	19.008,73	76,6	19.281,30	74.292,80
1999	18.966,59	76,8	20.317,38	1.824.636,65
2000	17.541,93	77,2	22.020,30	20.055.811,78
2001	17.716,29	77,5	23.549,89	34.030.881,18
2002	19.261,87	77,6	24.148,67	23.880.856,59
2003	23.388,77	77,7	24.756,98	1.871.997,83
2004	26.878,28	78,2	26.886,36	65,19
2005	27.975,69	78,4	27.610,37	133.457,68
2006	29.699,36	78,7	29.199,93	249.428,99
2007	34.187,80	78,9	30.178,65	16.073.297,83
2008	36.588,34	79,1	31.131,45	29.777.622,05
2009	32.584,00	79,4	32.255,78	107.730,36
2010	32.198,55	79,6	33.547,97	1.820.931,16
Total:	425.564,06	1.395,03	425.564,06	151.806.839,67

The determination ratio is almost 0,81 which means that the volume of the GDP per capita influences 81% of the life expectancy and 19% influence other factors.

Correlation ratio and determination ratio in the EU countries are much higher than the same ratios measured in the Republic of Macedonia.

Conclusion

The researches show that Republic of Macedonia in terms of life expectancy of the population and GDP per capita stand behind in comparison with the EU countries.

Also, the correlation ratio between life expectancy and GDP per capita in the Republic of Macedonia is quite high and amounts 0.87 which shows strong correlative dependence, while the determination ratio is 76%. Same ratios are much higher than the average life expectancy and GDP per capita in the EU countries and also the correlation ratio is 0,90 and determination ratio is almost 81%.

The calculated ratios show that higher GDP per capita in the EU countries determines longer life of their population in comparison to the population of the Republic of Macedonia.

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