THE COST OF PERSONAL HEALTH CARE IN SERBIA ACCORDING TO THE INTERNATIONAL CLASSIFICATION OF DISEASE

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ABSTRACT

Introduction: There is a growing interest in the world for the diseases' treatment costs estimation. This value represents a pressure that a particular disease or group of diseases puts on each society in terms of the global crisis burden. **The aim** of this study was to determine the costs of personal health care in the Republic of Serbia according to the major International Classification of Diseases (ICD-10) and to provide a comparative cost analysis for the treatment of diseases in the period from 2005 to 2015.

Material and Methods A retrospective and comparative analysis of health statistics from the database of the Institute of Public Health of Serbia (IPHS) and financial information provided by the National Health Insurance Fund (NHIF), Republican Statistical Office (RSO), and National Bank of Serbia (NBS) in the period 2005–2015 was performed.

Results showed that during the observation period, the maximum cost of personal health care in Serbia by main classification of ICD-10 was achieved in 2015 and it was RSD 194.128.864.011 (€1.580.853.941; $ 1.764.807.854) and the minimal cost was achieved in 2005 – the amount being RSD 81,222,190,336 RSD (€ 949,967,138; $ 1,124,666,678).

Conclusion Comparative analysis of the cost of treatment showed that the costs of the personal health care in the Republic of Serbia in the period 2005-2015 increased by almost three times and that the largest amount in Serbia singled to treat people with diseases of the circulatory system.

Keywords: cost of the disease; health spending; health accounts; cardiovascular diseases.

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INTRODUCTION

Health care is one of the most important human activities and one of the most dynamic in terms of growth of costs for its assurance. There are more and more achievements in medicine, pharmaceuticals, medical technologies, which affect the improvement of the health status of people in most countries, but the increase in costs, while caring for the establishment of justice, efficiency and effectiveness of health care is increasingly the focus of health policy makers.

Health care costs are a burden that a particular disease or group of diseases burden on the community (Segel 2006).

The need for realistic presentation of financial data in health care, in particular those relating to monitoring costs for the treatment of patients with certain diseases are emerging as a necessity. In line with that in recent years a growing interest for calculating the costs of of treatment of patients (Rice 2000; Kirschstein 2000; Bloom at al. 2001), and studies around the world that deal with particular diseases (Goetzel at al. 2004; Honeycutt at al. 2004; CDC 2004; Taylor and Sloan 2000; Begley at al. 2000; Begley at al. 2001; Javitz at al.2004; Lazar 2005; Lowell and Shulman 2005; Hogan at al. 2004; Szucs at al. 2001; Liu at al. 2002.) and injuries (Currie at al. 2000), disorders (Swensen at al. 2004) and the some health state (Yelin at al. 2002; Yelin at al. 2001; Roux and Donaldson 2004; Corso at al. 2004; Flegal at al. 2005; Finkelstein at al. 2004).

2000. The Organization for Economic Development countries (Organisation for Economic Co-operation and Development - OECD) has established a system of health accounts (SHA), who formulated the methodological instructions framework for calculating the price of treating patients through Table 6.

Until the appearance of the new Methodological guidelines SHA 2011, used the table No. 6 in SHA (OECD 2000) as part of the National health accounts (NHA). The above-mentioned table shows the current costs of health care by main groups of diseases of the International Classification of Diseases (ICD).

In the System of Health Accounts PERSONAL health care costs are defines as all those costs in the health system that does not include the Collective health care protection, consisting of public health services, collective prevention, health insurance, health administration and costs for performing functions in connection with healthcare.

THE AIM of this study was to determine the costs of personal health care in the Republic of Serbia according to the major International Classification of Diseases (ICD-10) and to provide a comparative cost analysis for the treatment of diseases in the period from 2005 to 2015.

MATERIAL AND METHODS

A retrospective and comparative analysis of health statistics from the database of the Institute of Public Health of Serbia (IPHS) and financial information provided by the National Health Insurance Fund (NHIF), Republican Statistical Office (RSO), and National Bank of Serbia (NBS) in the period 2005–2015 was performed.

IPHS data on health services performed within different health providers such as hospitals, outpatients clinics, ambulatory health care, ancillary centres and residential providers, as well as use of drugs and therapeutical appliances, were analyzed and crossed with the financial data of the NHIF, according to SHA (version 11) methodology.

Personal health care costs of the Serbian population according to main ICD-10 categories were made according to the following scheme and SHA 11 methodology :

• H.C.1. – Hospital inpatient curative care services are financially presented with the number of hospital days by groups of diseases according ICD-10 (Source: IPHS)
multiplied by the cost of a hospital day according to the NHIF Price List of health services valid for calculated year (OECD 2000).

• H.C.1.2. – Day curative care services data are multiplied by the price according to the NHIF Price list of health services valid for calculated year;

• H.C.1.3. – The cost for the outpatient curative care were obtained by the number of outpatient treatment services, multiplied by the price according to the NHIF Price list of health services valid for the calculated year;

• H.C.1.4. – Home based care is financially expressed by the data on home treatment services (data source: IPHS) multiplied by the price according to the NHIF Price list of health services valid for calculated year;

H.C.4. – Ancillary health care services (laboratory analysis, diagnostics and medical transportation) are financially expressed by the empirically estimated total number of these services multiplied by the appropriate prices according to the NHIF Price list of health services valid for calculated year;

H.C.5.1. – Consumption of drugs, other consumed pharmaceutical goods, therapeutic appliances and their financial data are obtained from the Agency for Drugs and Medical Devices of Serbia.

The sum of following items:

HC1 - Hospital inpatient curative care,

HC1.2 - Day curative care,

HC1.3 - Outpatient curative care,

HC1.4 - Home based care,

HC4 - Ancillary services and

HC5.1 - Medical goods

by groups of diseases ICD-10, gives the estimated financial value of the total cost of personal health care for population of the Republic of Serbia.

In the analysis were applied retrospectively and comparative research methods. The analysis used the data of the Fund for Statistics (RZS) and National Bank of Serbia (NBS).

Table 1. ICD main groups of diseases

Infectious and parasitic	*A A00-B99*
Neoplasms	*C C00-D48*
Disease of the blood	*D D50-D89*
Endocrine and metabolic	*E E00-E90*
Mental disorder	*F F00-F99*
Disease of the nervous system	*G G00-G99*
Disease of the circulatory system	*I I00-I99*
Disease of the respiratory system	*J J00-J99*
Disease of the digestive system	*K K00-K93*
Disease of the skin	*L L00-L99*
Disease of the musculosceletal system	*M M00-M99*
Disease of the genitourinary system	*N N00-N99*
Complications in pregnancy	*O O00-O99*
Perinatal conditions	*P P00-P96*
Congenital anomalies	*Q Q00-Q99*
Pathological conditions	*R R00-R99*
Injuries, poisoning	*S S00-T98*
All others categories	*U U01-Z99*

Table 2. Table 6 used for calculation

Personal healthcare	**HC.1-HC.3**				**HC.4**	**HC.5**	**HC.5.1**	**HC.5.2**	**HC.1-HC.5**
Table no.6	*Hospital inpatient curative care*	*Day curative care*	*Ambulatory outpatient curative care*	*Home-based curative care*	*Ancillary services*	*Medical goods*	*Pharmaceuticals*	*Therapeutic appliances*	*Total personal costs*
Infectious and parasitic diseases									
Neoplasms									
Diseases of the blood									
Endocrine and metabolic diseases									
Mental disorder									
Diseases of the nervous system									
Diseases of the circulatory system									
Diseases of the respiratory system									
Diseases of the digestive system									
Diseases of the skin and subcutaneous tissue									
Disease of the musculoskeletal system									
Diseases of the genitourinary system									
Complications in pregnancy									
Perinatal conditions									
Congenital anomalies									
Pathological conditions									
Injuries, poisoning									
All other categories									

RESULTS

The results have determined the costs for personal health care by main ICD-10 groups (Table 3).

The total funds (in dinars, euros and US dollars), which were spent on the health care of the population of Serbia during the observed eleven years, according to ICD main groups of diseases, are shown in table 3.

Table 3. Cost of illness in the period from 2005. to 2015.

Year	*Total costs (dinars (RSD))*	*Total costs (euro (€))*	*Total costs (dolars ($))*
2005	81,222,190,366	949,967,138	1,124,666,678
2006	96,16,554,246	1,217,247,522	1,603,358,597
2007	120,987,502,236	1,526,922,066	2,251,868,727
2008	142,398,620,728	1,607,189,769	2,263,889,041
2009	144,150,456,906	1,503,321,134	2,160,253,219
2010	151,333,139,835	1,434,464,541	1,908,843,843
2011	151,614,999,374	1,488,057,711	2,076,022,877
2012	166,972,893,694	1,477,505,475	1,898,282,102
2013	176,734,078,012	1,563,050,128	2,081,183,208
2014	183,189,009,509	1,547,596,600	1,875,591,374
2015	194,128,864,011	1,580,853,941	1,764,807,854

Source: National Health Insurance Fund (NHIF), National Bank of Serbia (NBS) and Institute of Public Health of Serbia (IPHS)

The results showed that the health care cost by main ICD-10 categories in **2005** amounted 81,222,190,336 RSD (€ 949,967,138; $ 1,124,666,678). As observed by groups of diseases, the highest costs were allocated to circulatory diseases (17.26%), infectious and parasitic diseases (10.46%), neoplasm (9.49%) and urogenital system diseases (9.33%), while the lowest allocated funds were for symptoms and pathological conditions (0.92%), congenital anomalies (0.61%) and prenatal conditions (0.45%) Total cost for health care by main ICD-10 categories per capita amounted to € 126.70 in 2005, while the percentage of total expenditures relative to GDP for the same year was 4.81%.

Total expenditure on health care by main ICD-10 categories in **2006** amounted 96,162,554,246 RSD (€1,217,247,522; $ 1,603,358,597). Observed by groups of diseases the highest amount of funds were allocated to circulatory diseases (20.14%), infectious and parasitic diseases (11.64%), digestive system diseases (9.87%) and neoplasm (8.48%), with the lowest funds allocated for symptoms and pathological conditions (0.95%), congenital anomalies (0.59%) and perinatal conditions (0.59%) The analysis showed that cost of health care by main ICD-10 categories in 2006 per capita amounted to € 176.00, while the percentage of total expenses in relation to GDP for 2006 amounts to 4.86%.

Total expenditure on health care by main ICD-10 categories in **2007** amounted 120,987,502,236 RSD (€ 1,526,922,066; $ 2,251,868,727). Observed by groups of diseases the highest costs were allocated to circulatory diseases (19.42%), infectious and parasitic diseases (11.67%), digestive system diseases (9.53%) and neoplasm (8.33%), with the lowest allocation of funds to symptoms and pathological conditions (0.79%), congenital anomalies (0.49%) and perinatal conditions (0.37%). In 2007 the costs for health care by main ICD-10 categories per capita amounted to € 201.00, while the percentage of total expenses in relation to GDP for the same year was 5.12%.

The results showed that the total costs for health care by main ICD-10 categories in **2008** amounted 142,398,620,728 RSD (€ 1,607,189,769; $ 2,263,889,041). Observed by groups of diseases the highest costs related to circulatory diseases (21.64%), nervous system diseases (8.73%), infectious and parasitic diseases (10.53%), diseases of digestive system (10.40%) and neoplasm (8.24%), while the lowest costs related to symptoms and pathological conditions (0.70%) and congenital anomalies (0.30%) The analysis showed that cost of health

care by main ICD-10 categories in 2008 per capita amounted to € 232.00, while the percentage of total expenses in relation to GDP for the same year amounted to 5.04%.

Total expenditure on health care by main ICD-10 categories in **2009** year amounted 144,150,456,906 RSD (€ 1,633,396,861; $ 2,160,253,219). Observed by groups of diseases the highest costs were for circulatory diseases 18.87%, followed by infectious and parasitic diseases 11.20%, diseases of digestive system of 9.26% and 8.88% for neoplasm and the lowest were for isolated congenital anomalies of 0.33% The analysis showed that costs of health care by main ICD-10 categories in 2009 per capita amounted € 200.00, while the percentage of total expenditures relative to GDP for 2009 amounted to 5.10%. The results showed that the greatest costs per groups of diseases in the period 2005–2009 were for circulatory diseases, and the lowest for congenital anomalies and perinatal conditions.

Total personal costs for health care by major ICD category in **2010** were 151,331,867,999 dinars. By groups of diseases are the biggest personal expenses separate for diseases of the circulatory system (19,58%), neoplasms (10.0%), digestive system diseases (9.75%), nervous system diseases (8.33%), infectious and parasitic diseases (8,99%), while the least for congenital anomalies (0.27%). In 2010, total personal expenditures on health care by main categories of ICD-10 per capita stood at € 195.00, while the percentage of total personal expenses in relation to GDP in 2010 stood at 5.20%.

151,614,999,373 dinars in **2011** were total personal expenditures on health care by major ICD categories. By groups of diseases are the biggest personal expenses separate for diseases of the circulatory system (19,14%), digestive system diseases (9.71%), infectious and parasitic diseases (8.88%) and neoplasms (8.90%), while at least for congenital anomalies (0.30%). Personal expenses for health care by main categories of ICD-10 in 2011 per capita stood at € 205.00, while the percentage of total personal expenses in relation to GDP for the year 2011 amounted to 4.77%.

Total personal costs for health care by major ICD category in **2012** were 166,575,285,407 dinars. The largest personal expenses, grouped diseases were singled out for diseases of the circulatory system (20,69%), diseases of the digestive system (10.38%), neoplasms (10.07%), nervous system diseases (9.00%), infectious and parasitic diseases (8.69%), and at least for congenital anomalies (0.23%). Personal expenses for health care by main categories of ICD-

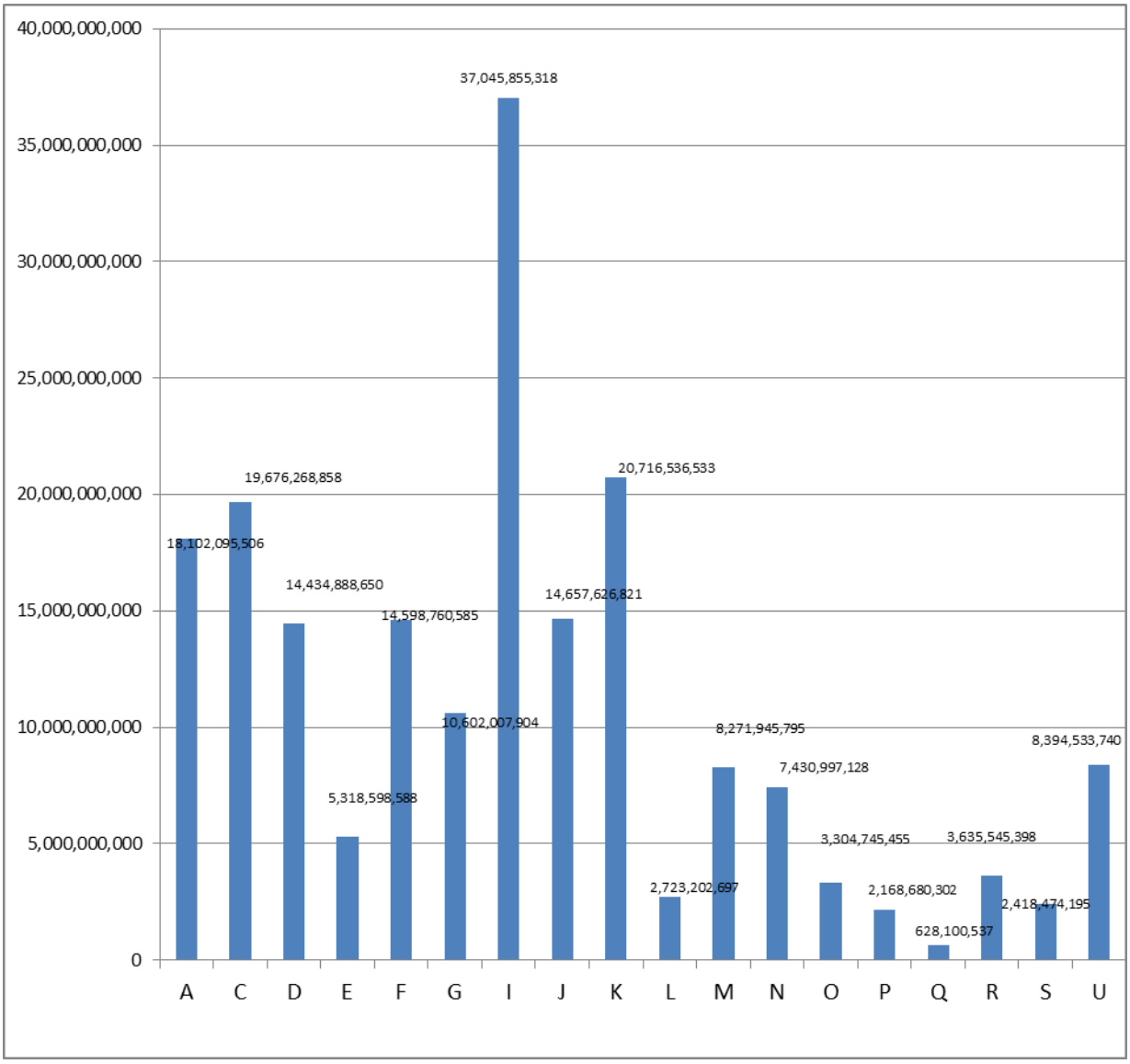
10 in 2012 per capita stood at € 205.00, while the percentage of total personal expenses in relation to GDP for the year 2012 amounted to 4.97%.

In **2013**, total personal expenditures on health care by major ICD categories were 176,734,078,012 dinars. By groups of diseases the greatest personal expenses are allocated to circulatory system diseases (20.44%), neoplasms (10.84%), diseases of the digestive system (10.62%), nervous system diseases (8.74%), infectious and parasitic diseases (8.51%), and at least for congenital anomalies (0.21%). Personal expenses for health care by main categories of ICD-10 in 2013 per capita stood at € 219.00, while the percentage of total personal expenses in relation to GDP in 2013 stood at 4.88%.

Total personal costs for health care by major ICD category in **2014** were 183,189,009,508 dinars. The largest personal expenses, grouped diseases were singled out for diseases of the circulatory system (18,62%), diseases of the nervous system (11,79), diseases of the digestive system (10.74%), neoplasms (10.62%), infectious and parasitic diseases (8,79%), for a minimum of congenital anomalies (0.34%) and perinatal conditions (1.15%).In 2014, total personal expenditures on health care by main categories of ICD-10 per capita stood at € 217.00, while the percentage of total personal expenses in relation to GDP for 2014 stood at 4.72%.

The maximum cost of personal health care in Serbia by main classification of ICD-10 was achieved in **2015** and it was RSD 194,128,864,011 (€1,580,853,941; $ 1,764,807,854). In 2015, the highest costs were allocated to circulatory diseases (19.08%), diseases of digestive system (10,67%), neoplasm (10.13%) and lowest for congenital anomalies (0,32%).
Results are expressed in dinars in the following Graph number 11.

Graph 11. Cost of personal health care in Serbia by main classification of ICD-10 in 2015



Source: National Health Insurance Fund (NHIF), National Bank of Serbia (NBS) and Institute of Public Health of Serbia (IPHS)

In 2015, total personal expenditures on health care by main categories of ICD-10 per capita stood at € 223.00, while the percentage of total personal expenses in relation to GDP for 2015 stood at 4.89%.

Health care expenditures by main ICD-10 categories per capita in dinars have a constant upward trend from 2005. to 2015 year.

Following Table 4. show expences per capita in dinars, euros and dolars from 2005 to 2015. year.

Table 4. Health care expenditures per capita from 2005 to 2015

	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*
Expences per capita in dinars	10,833	12,825	16,136	18,992	19,225	20,178	20,887	23,251	24,669	25,686	27,360
Expenses per capita in euros	127	176	201	232	200	195	205	205	219	217	223
Expenses per capita in dolars	150	213	300	302	288	259	286	264	291	263	249

Source: National Health Insurance Fund (NHIF), National Bank of Serbia (NBS) and Institute of Public Health of Serbia (IPHS)

The percentage share of total costs for health care by main ICD-10 categories in GDP in the period 2005–2010 had continuous growth from 4.81% to 5.20% whereas in year 2011 slight decline was recorded, with constant fluctuation from 2012 to 2015. year (Table 5.).

Table 5. Percentage of costs for health care in GDP from 2005 to 2015

Year	*GDP at current prices (in million RSD)*	*Share of assets in GDP*
2005	1,709,083.0	4.81
2006	1,991,076.5	4.86
2007	2,276,744.9	5.12
2008	2,665,045.2	5.04
2009	2,835,229.4	5.10
2010	2,999,632.9	5.20
2011	3,268,315.6	4.72
2012	3,460,113.4	4.97
2013	3,715,738.8	4.88
2014	3,749,898.8	4.72
2015	3,842,439.3	4.89

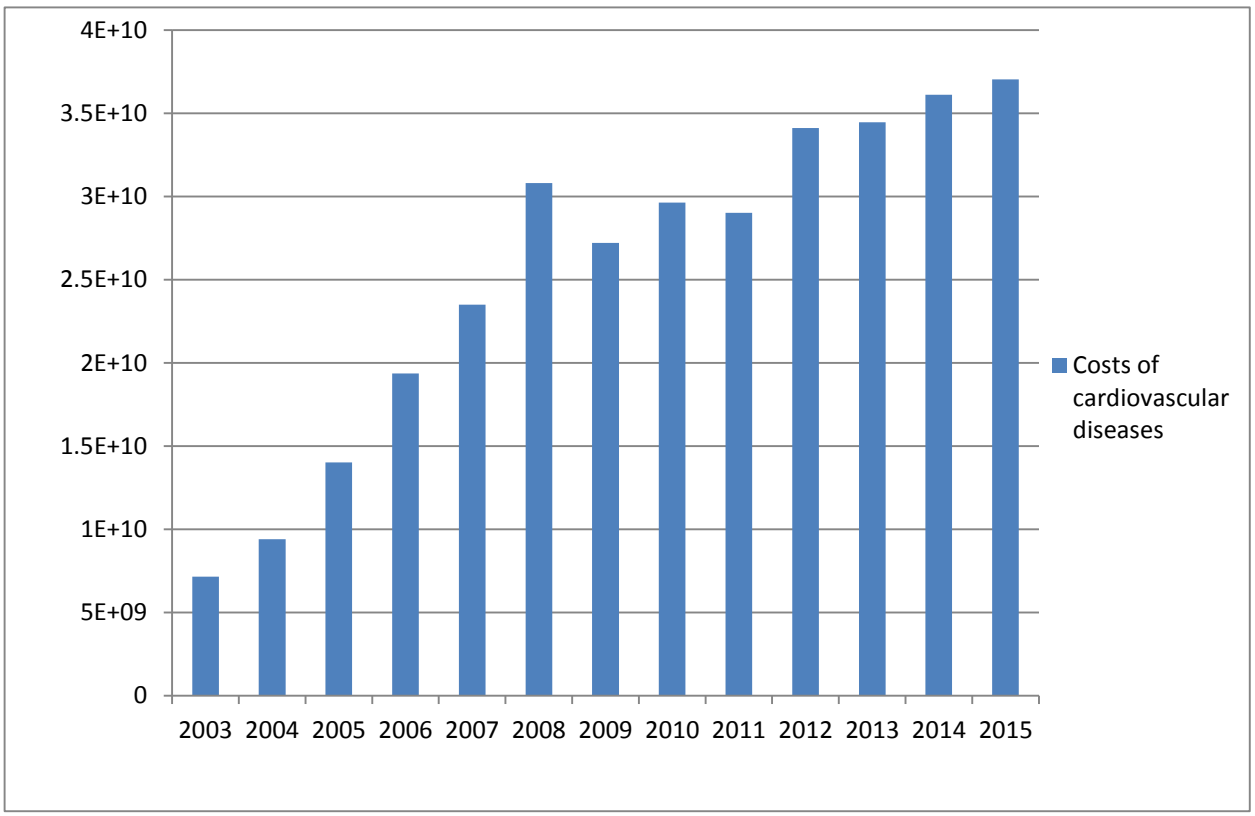
Source: Republican Statistical Office (RSO), National Bank of Serbia (NBS) and Institute of Public Health of Serbia (IPHS)

Observing the costs of illness, the highest health care costs from 2005. to 2015. period in Serbia have been identified for the treatment of people with cardiovascular disease (CVD) (Table 6. and Graph 2.).

Table 6. Costs of cardiovascular diseases from 2005. to 2015.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Costs of cardiovascular diseases	7,158,427,158	9,404,713,299	14,019,809,883	19,371,570,398	23,494,825,963	30,810,315,975	27,204,241,342	29,628,005,602	29,024,716,033	34,114,573,606	34,459,846,677

Graph 2. Costs of cardiovascular diseases in the period from 2005. to 2015. year.



Source: National Health Insurance Fund (NHIF) and Institute of Public Health of Serbia (IPHS)

During the reporting eleven years period CVD costs have been increased three times.

This compared with an increase of funds for other groups of diseases, represents a medium growth.

DISCUSSION

A review of articles dealing with estimating cost of illness (Rice 2000; Kirschstein 2000; Bloom at al. 2001), have shown that studies usually covered some particular disease (Goetzel at al. 2004; Honeycutt at al. 2004; CDC 2004; Taylor and Sloan 2000; Begley at al. 2000; Begley at al. 2001; Javitz at al.2004; Lazar 2005; Lowell and Shulman 2005; Hogan at al. 2004; Szucs at al. 2001; Liu at al. 2002.), injuries (Currie at al. 2000), disorders (Swensen at al. 2004) some health state or conditions (Yelin at al. 2002; Yelin at al. 2001; Roux and Donaldson 2004; Corso at al. 2004; Flegal at al. 2005; Finkelstein at al. 2004). Costs for health care by main groups of diseases are shown only in table 6 of SHA (OECD 2000). Many users of NHA tables have considered that Table 6, entitled "Health care costs according to the main groups of the International

Classification of Diseases" (ICD-10 categories) was the most important and useful to decision makers. Although there is still no internationally accepted strict methodological instructions for making table 6 (except for the framework used in this study), international comparisons based on Table 6, although still very rare, started to appear per se (Heijink and Renaud 2009). International comparability is the main advantage of Table 6, while the main disadvantage is that the cost estimates in different countries vary in coverage and methodology of assessment, so the estimates are based on a set of assumptions and/or very small samples.

Total expenditures on health care in Serbia by main international classifications of disease in the period from 2005 to 2015 grew from 81,222,190,336 RSD in 2005 to 194,128,864,011 RSD in year 2015. Costs per capita expressed in Euros in the period from 2005 to 2015 grew from 127 Euros per person in year 2005 to 232 Euros in 2008. In 2009, the costs were reduced to 200 Euros per person, which is explained by low value of Dinar to Euro in 2009. Costs grew over observed period and reach again 232 Euros in 2015. Expenditure per capita expressed in dollars in the observed period recorded the same trend growth.

Observed by groups of diseases the highest expenses in Serbia during period from 2005 to 2015 were for circulatory diseases (increased three times), and as compared to the increase in funding for other groups of diseases, showed the average growth. When these costs were compared with findings from Australia, Canada, France, Germany and Netherlands (Heijink and Renaud 2009) it was observed that in these countries circulatory diseases were credited

for major expenses as well, probably as a consequence of modern life style. Unlike our country, where infectious and parasitic diseases proved the second highest consumption of financial funds in the begining of the observed period, followed by diseases of digestive system, nervous system diseases and neoplasm, in the above countries nervous system diseases proved to be the second largest consumer of financial resources, followed by diseases of digestive system, musculoskeletal system and neoplasm. At the end of observed period after cardiovascular diseases (19.08%), second highest consumption of financial funds, belong to diseases of digestive system (10.67%), followed by neoplasm (10.13%) .

Cardiovascular disease (CVD) represents a major economic burden on health care systems in Serbia in terms of direct (eg, hospitalizations, rehabilitation services, physician visits, drugs) and indirect costs associated with mortality and morbidity (eg, losses of productivity due to premature mortality and short- or long-term disability).

When the results of CVD costs are compared with a review of studies and their findings from Australia, Canada and selected European countries, it is evident that in these countries the situation tends to be very similar in terms of healthcare expenditures. A review of studies published in Australia, shows that cardio-vascular disease has the highest level of healthcare expenditure of any disease group in Australia, ranking it ahead of oral health, mental disorders and musculoskeletal conditions.

According to an Australian study, CVD expenditure has remained relatively stable at around 12 % of all health-care expenditure for the period from 2000 to 2009, while costs for CVD in Serbia have been on a constant rise over the observed period and riched 19% of all health-care expenditure in 2015.

Observed by years, the total cost of health care by main ICD-10 categories showed the tendency of growth and was increased almost threefold. This fact speaks in favour of growing cost in the Republic of Serbia for the treatment of diseases over the years, and an insuficient investments in prevention, public health services, capital investments as well as other functions related to health care.

The percentage in share of costs for health care by main ICD-10 categories in GDP in the period 2005–2015 increased from 4.81 % to 4.89 % in 2015.

There are no data available for other countries and other years, thus they are not comparable.

CONCLUSION

A comparative analysis of the cost of treatment showed that the costs of personal health care in the Republic of Serbia during the period from 2005 to 2015 increased three times, and that the largest amount in Serbia was spent to treat people with diseases of the cardiovascular system.

RECOMMENDATION

As the cost of Cardiovascular Diseases is likely to continue to grow due to increased stress, bad habits, increased obesity rates and our aging society, it is important to work on CVD prevention and promotion and to conduct a new comprehesive study to gain a detailed understanding of the cost of CVD and its current main drivers in order to reduce the constantly increased costs.

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