

ECONOMIC EVALUATION OF HEALTH CARE UTILIZATION IN THE SLOVAK REPUBLIC

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Abstract: Due to the economic changes and fast progress in health technologies countries face the challenge of rapidly growing health expenditures. Drug policies focus on identification of the most problematic areas for implementation of cost-effective measures. For this purpose, they need to be provided with accurate analyses of health expenditures and drug utilization.

Primary aim of this study was to analyze health expenditures of Slovak Republic in regards to factors, which are considered to have the largest influence on provision of health care. Secondly we focused on providing a brief drug utilization analysis. Our study confirmed that since 2000 Slovakia invests a larger share of GDP in health care, while in 2013 overall health expenditure amounted 5.6 million EUR (7.6% of GDP). Despite recent growth (233.6 % since 2000), Slovakia remains under OECD average in regards to health expenditures per capita (PPP, USD). However, it is on the 2nd place among V4 countries. Patients' share of the overall health expenditures is increasing 12.8 times faster than public reimbursement. Up to 1.5 million EUR was spent on pharmaceuticals in 2013. The most utilized group of drugs in terms of DIDs and sales were cardiovascular drugs.

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Introduction

During the last decades health expenditures have been steadily increasing due to growing life expectancy at birth (based on OECD (2016b), the average increase amounted 4.3% in the OECD countries between 2000 and 2013) and the enormous progress in health technologies and treatment. Health care reforms focus on reducing costs maintaining highest-level quality at the same time. To support the policy makers in carrying out and introducing evidence-based, cost-effective measures in health- and drug policy of each country, well-structured, precise and valid analyses of health expenditures and drug utilization are vital to be conducted on a regular basis.

Key factors influencing health care expenditures

One of the main factors influencing the level of health status of countries is considered to be the gross domestic product (GDP), as the indicator of its general wealth. The Preston curve, first designed by Samuel Preston in 1975, reflects the positive correlation between wealth of a country (represented e.g. by GDP) and the health status of its inhabitants (represented by e.g. mean length of lifespan) with the following result: wealthier countries are more likely to have healthier inhabitants; with a concave relationship (Bloom & Canning, 2007). As Deaton (2003) concludes from the results of his study of Preston curve, the level of health status also depends on the wealth of the country according to the law of diminishing returns. Furthermore, in countries with a higher life standard, the distribution of financial incomes among the population takes on importance.

Filko, Mach, and Zajíček (2012) write that the amount of financial investments in the health care of a particular country contributes greatly to the level of its health status in terms of enabling the implementation of scientific innovations, higher work satisfaction and motivation of health care providers that shall be reflected in higher quality of provided health care.

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A crucial factor to be considered is also the share of private expenditures since this influences rather greatly the compliance with medical therapy, especially of the middle and low-income groups of patients. It is well documented, that higher private health expenditures may cause ceasing the treatment and hence result in even higher expenditures associated with therapy of health care complications resulting from non-treatment of the previous moderate states of diseases.

The proof that cost-related nonadherence to medical treatment is a significant factor contributing to health as well as expenditure losses provide, inter alia, the findings of Kennedy and Morgan (2009) from U.S. and Canada. Recently the results of an extensive European cross-country study carried out by Morrison et al. (2015) even more underline this fact. On the other hand, as Zweifel and Wilard (2000) point out regarding health insurance coverage, too low private expenditures are very likely to potentiate value losses of the provided health care and are likely to cause health hazards that result in direct rapid health-related expenditures increases. Therefore, health-care policies of all countries must precisely comply with and reflect these key factors.

Another factor significantly contributing to overall health expenditures is drug utilization. According to Foltán (2010) approximately 85% of all therapeutic interventions are associated with drugs (pp. 139). Due to the essential role of pharmaceuticals in the health care system and steadily increasing expenditures on them, policy makers of all countries face the challenge to keep the balance between financing innovative, but financially demanding medicines and development of new strategies concerning austerity measures.

Drug utilization research

World Health Organization (2003) defines Drug Utilization Research (DUR) as “the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences” (pp. 8). Truter (2008) and Foltán (2010) state that drug prescription and drug utilization belong to the most important parameters in the evaluation of health care worldwide. Primary goal of DUR is the rationalization of drug consumption; only secondarily it also aims for lowering the amount of public and private expenditures spent on pharmaceuticals.

Essential tool for conducting DUR is the ATC/DDD system developed by the Drug Utilization Research Group to enable comparisons in drug consumption across countries and international methodology development. WHO Collaborating Centre for Drug Statistics Methodology (2014) defines ATC classification as a unitary classification system of drugs based on their anatomical, therapeutic and chemical characteristics and an objective and comparable unit for drug consumption measurement, the Daily Defined Dose (DDD).

Based on cumulative data from OECD (2015), pharmaceuticals comprised around 17% of the overall health care expenditures of OECD countries in 2013. Schumock et al. (2015) describe the situation in the United States in the year 2014 similarly: the overall prescription sales amounted 360.7 milliard USD even with an increase of 12.2% compared to year 2013 (pp. 719). However drug utilization varies widely across OECD countries in terms of numbers as well as expenditures reflecting national prescription patterns of health care specialists and drug consumption habits of patients including their approaches towards drug medication.

Research goals

We have performed a detailed analysis of the health care expenditures in Slovak Republic from 2000-2013. It was focused on examining the three main factors influencing health care spending:

- share of GDP spent on health care provision;
- public and private financing of the health care and their comparison;
- costs of pharmaceuticals.

In relation to the last point, a utilization analysis was conducted to identify the most utilized drug groups in terms of DDDs and sales.

Data and methodology

The analysis of health care expenditures covers a period from 2000 until 2013, which is the latest year from which comparable data from the most OECD countries are available. The data for the analysis were derived from OECD database and recalculated to meet the needs of the performed analyses.

The values of GDP were evaluated from two different perspectives: a) GDP value of current prices expressed in EUR (mil.) for national calculations of health expenditures; b) GDP value of current prices adjusted in accordance with the current Purchasing Power Parity in USD (PPP, USD) to enable the international, per capita comparisons between different countries.

Public health expenditures are considered to be expenditures incurred by all kinds of public funds – in Slovakia this is represented by the public insurance system.

Private or out-of-pocket health expenditures consist of all expenditures that are covered directly by the patients including cost-sharing (meaning the supplement price amount of medicines founded by the Slovak public insurance) and over-the-counter payments. As the data (%) on this indicator are only available from 2005, we have calculated the data for previous years as the difference between overall expenditures and public expenditures. The average deviation between our calculations of private expenditures and the cumulative private expenditures reported by the OECD (2016a) for the following years (2005-2013) was 3.3%.

The cumulative value of the expenditures on pharmaceuticals comprises of the expenditures for the following items: prescription and OTC drugs; and for some OECD countries also of expenditures for some other medical non-durables, such as medical devices (e.g. bandages, incontinence articles etc.). However, this indicator does not include pharmaceuticals dispensed by hospital pharmacies. This indicator represents the final prices (including the margins and VAT).

Data on drug utilization were extracted from the database of State Institute for Drug Control of Slovak Republic. This database consists of data from all drug distributors in Slovak Republic, who are by the law obliged to report on quarterly basis the total numbers of drugs distributed within Slovak Republic and abroad ("Zákon č. 362/2011 Z.z. o liekoch a zdravotníckych pomôckach [Act No. 362/2011 Coll. on drugs and medical devices]," 2011).

Data on drug utilization were analyzed within ATC drug classes in terms of DIDs (DDD/1000 inhabitants) and sales (EUR) using the internationally recognized WHO ATC/DDD methodology (WHO Collaborating Centre for Drug Statistics Methodology, 2014). The values of sales, used for the analyses, refer to the ex-factory prices applicable in the evaluated time period.

Drug utilization was evaluated on yearly basis to match the period from health care expenditures analysis.

In the tables and figures of the analyses the following abbreviations are used:

- GDP = gross domestic product;
- PPP = Purchasing Power Parity;
- HE = health expenditures;
- DDD = defined daily dose;
- DID = DDD per 1000 inhabitants per day.

Results and Discussion: Analysis of health expenditures in Slovak Republic

Slovak Republic spent 7.6% of the overall GDP on health care provision in 2013. The GDP of the Slovak Republic expressed in current prices reached 73.8 milliard EUR in 2013; hence, the expenditures associated with health care amounted 5.6 milliard EUR with an increase of 233.6 % in comparison to the situation in 2000.

Table 1 illustrates the development of the percentage of GDP spent on health care while presenting the precise financial magnitudes of these shares at the same time.

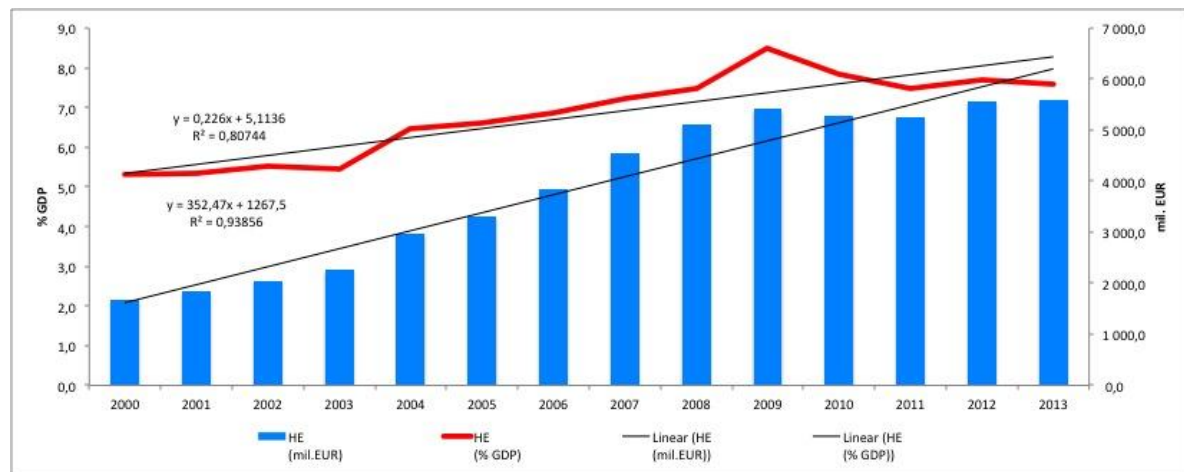
Table 1: Development of the health expenditures in Slovak Republic, 2000-2013

Slovak Republic	HE (% GDP)	GDP (mil. EUR)	HE (mil. EUR)
2000	5.3	31 601.3	1 679.1
2001	5.3	34 310.6	1 832.4
2002	5.5	37 279.8	2 053.1
2003	5.4	41 404.3	2 256.2
2004	6.5	46 101.5	2 982.6
2005	6.6	50 250.6	3 316.6
2006	6.9	56 107.0	3 857.8
2007	7.2	62 884.5	4 535.7
2008	7.5	68 322.5	5 114.6
2009	8.5	63 818.5	5 410.3
2010	7.8	67 387.1	5 286.2
2011	7.5	70 443.5	5 260.6
2012	7.7	72 420.0	5 568.2
2013	7.6	73 835.1	5 601.7
Δ (2000-2013)	42.8%	133.6%	233.6%

Source: Authors on the basis of OECD data (OECD 2016a)

The health expenditures were steadily growing in terms of share from the overall GDP (described by the coefficient of determination of 0.80) but even more in financial values (coefficient of determination of 0.94) due to an increase in the national GDP by 133.6% (Figure 1).

Figure 1: Comparison of health expenditures in terms of EUR and % of GDP in Slovak Republic, 2000-2013

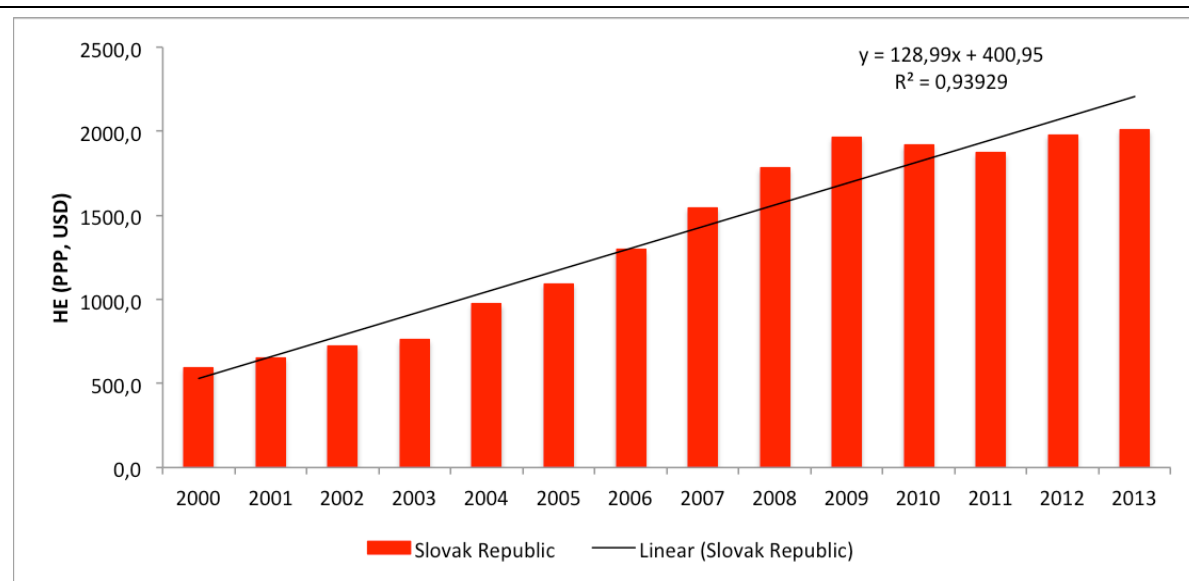


Source: Authors on the basis of OECD data (OECD 2016a)

Since Slovak Republic is a post-communistic country with still developing, relatively weak economy in comparison to other OECD countries, it is reasonable to evaluate the health care expenditures in current prices calculated per capita and adjusted according to PPP following the European Union and OECD (2012) as it is presented in Figure 2.

Although Slovak Republic was on the 28th place of all OECD countries regarding the amount of health related expenditures, it has taken the 2nd place among V4 countries, which have similar socio-economic conditions as well as historical background.

Figure 2: Health expenditures in Slovak Republic, per capita (PPP, USD)



Source: Authors on the basis of OECD data (OECD 2016a)

Public and private health care expenditures

The situation concerning private expenditures-financing health care provision has dramatically changed over the last ten years, as it is shown in Table 2. Even though both, public and private health expenditures (out of the pocket, OOP) have increased, the overall increase was not evenly distributed between both parties. The share of patients' private health expenditures increased by 239.8% in comparison to an increase of 18.8% of the public health expenditures. The differences are even larger in terms of financial values represented by an enormous increase of 693.9% in private health expenditures in comparison to a 177.6 % increase in public health expenditures.

Table 2: Shares of public and private health expenditures. 2000-2013

Slovak Republic	Public HE (%GDP)	Public HE (mil. EUR)	OOP (%GDP)	OOP (mil. EUR)
2000	4.7	1 497.1	0.6	182.0
2001	4.8	1 632.6	0.6	199.8
2002	4.9	1 826.9	0.6	226.2
2003	4.8	1 980.7	0.7	275.5
2004	5.0	2 313.9	1.5	668.7
2005	5.0	2 496.9	1.6	819.7
2006	4.8	2 699.8	2.1	1 158.0
2007	5.0	3 143.2	2.2	1 392.5
2008	5.3	3 604.7	2.2	1 509.9
2009	5.9	3 744.7	2.6	1 665.6
2010	5.6	3 801.2	2.2	1 485.0
2011	5.5	3 881.3	2.0	1 379.3
2012	5.5	4 018.5	2.1	1 549.7
2013	5.6	4 156.8	2.0	1 444.9
Δ (2000-2013)	18.8%	177.6%	239.8%	693.9%

Source: Authors on the basis of OECD data (OECD 2015, OECD 2016a)

Expenditures on pharmaceuticals

The evaluated parameters describing expenditures on pharmaceuticals are presented in Table 4. Expenditures on pharmaceutical have been contributing to overall health expenditures of Slovak

Republic by 26.5% in 2013 with a decrease of 23.5% since 2000 in terms of the expenditures on pharmaceuticals to health expenditures ratio. However, due to the 233.6% increase in the overall health care expenditures, the amounts of per capita annual expenditures spent on pharmaceuticals are steadily growing through the entire assessed period as Table 3, and Figure 3 illustrate.

Table 3: Evaluated parameters describing health expenditures spent on pharmaceuticals, 2000-2013

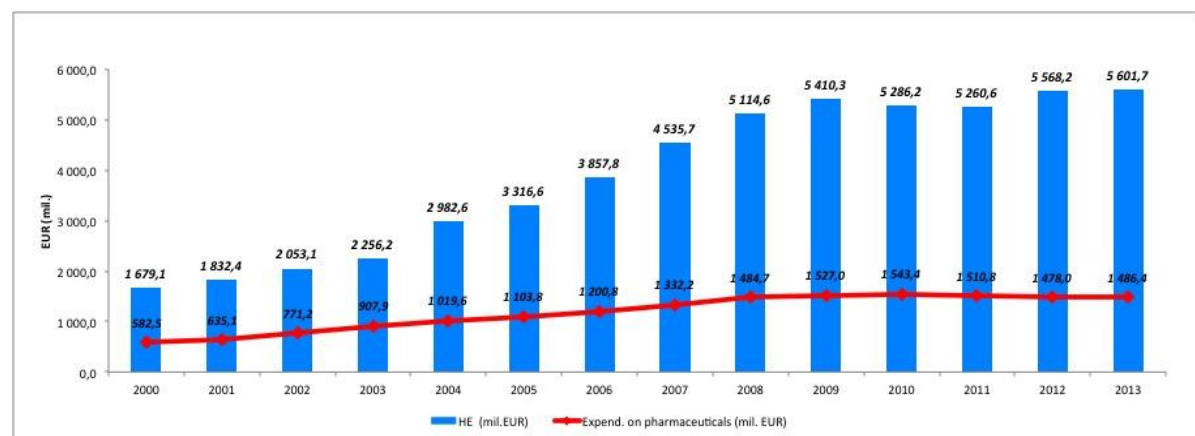
Slovak Republic	HE (mil.EUR)	HE on pharmaceuticals (% HE)	HE on pharmaceuticals (mil. EUR)	Inhab. (mil.)	HE on pharmaceuticals per capita (EUR)
2000	1 679.1	34.7	582.5	5.40	107.82
2001	1 832.4	34.7	635.1	5.38	118.06
2002	2 053.1	37.6	771.2	5.38	143.37
2003	2 256.2	40.2	907.9	5.38	168.75
2004	2 982.6	34.2	1 019.6	5.38	189.35
2005	3 316.6	33.3	1 103.8	5.39	204.83
2006	3 857.8	31.1	1 200.8	5.39	222.64
2007	4 535.7	29.4	1 332.2	5.40	246.66
2008	5 114.6	29.0	1 484.7	5.41	274.33
2009	5 410.3	28.2	1 527.0	5.42	281.48
2010	5 286.2	29.2	1 543.4	5.44	283.97
2011	5 260.6	28.7	1 510.8	5.40	279.56
2012	5 568.2	26.5	1 478.0	5.41	273.15
2013	5 601.7	26.5	1 486.4	5.42	274.45
Δ (2000-2013)	233.6%	-23.5%	155.2%	0.2%	154.6%

Source: Authors on the basis of OECD data (OECD 2015, OECD 2016a)

The overall expenditures on pharmaceuticals and other medical non-durables in Slovak Republic are steadily increasing since the first analyzed year 2000 up to year 2013. This relation is described by a very strong coefficient of determination of 0.89 as it demonstrates Figure 4.

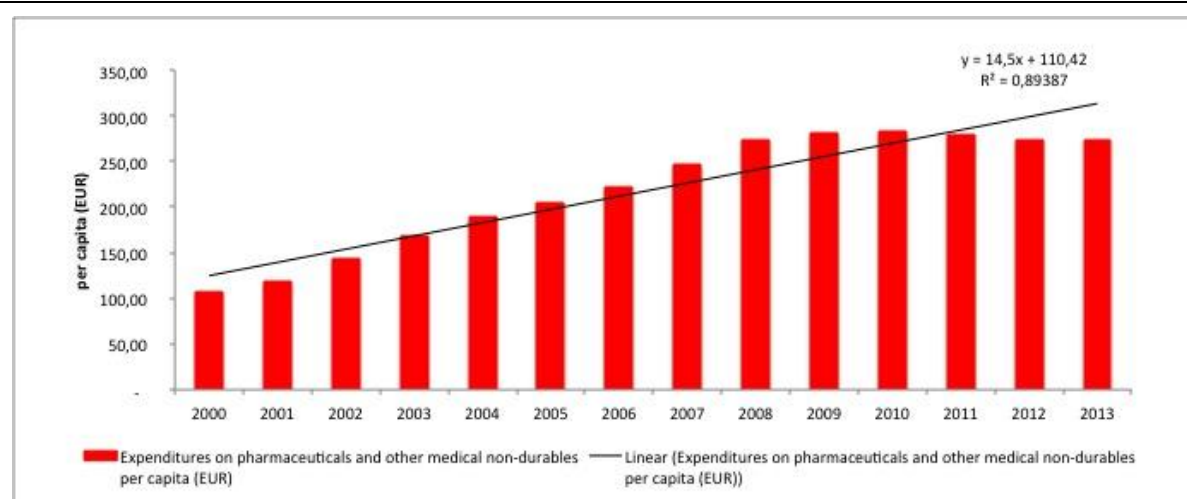
Performing an analysis comparing the expenditures spent on pharmaceuticals and other medical non-durables between Slovakia and the OECD average (Table 4 & Figure 5) confirmed that this indicator still remains an open area for cost-efficient interventions. There has been a decrease of -23.5% in the expenditures spent on pharmaceuticals in the last years, nevertheless this indicator in Slovakia belongs to one of the highest among OECD countries expressed as a percentage of the aggregate health spending. Only three OECD countries had higher costs associated with pharmaceuticals than Slovakia: Mexico (28.0%). Greece (30.5%) and Hungary (30.6%).

Figure 3: Development of the expenditures on pharmaceuticals to health expenditures ratio and the concerning financial amounts in Slovak Republic, 2000-2013



Source: Authors on the basis of OECD data (OECD 2015)

Figure 4: Expenditures on pharmaceuticals, per capita. 2000-2013



Source: Authors on the basis of OECD data (OECD 2015)

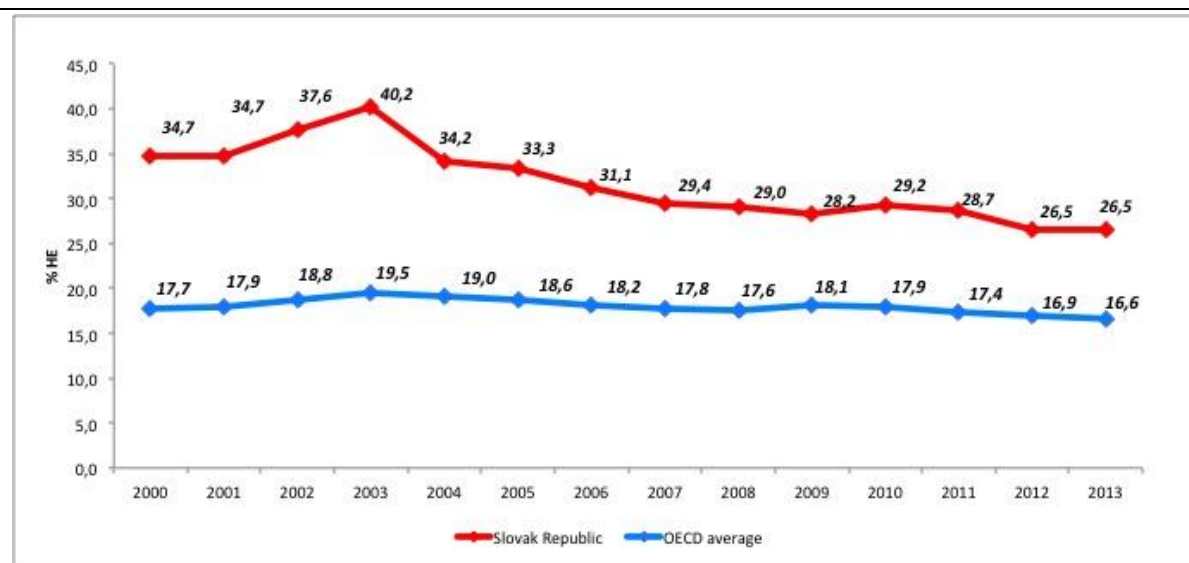
Table 4: Health expenditures on pharmaceuticals: situation in Slovak Republic compared to OECD average

HE on pharmaceuticals (% HE)	Slovak Republic	OECD average
2000	34.7	17.7
2001	34.7	17.9
2002	37.6	18.8
2003	40.2	19.5
2004	34.2	19.0
2005	33.3	18.6
2006	31.1	18.2
2007	29.4	17.8
2008	29.0	17.6
2009	28.2	18.1
2010	29.2	17.9
2011	28.7	17.4
2012	26.5	16.9
2013	26.5	16.6
Δ (2000-2013)	-23.5%	-5.8%

Source: Authors on the basis of OECD data (OECD 2015)

It can be seen from Figure 6 that the expenditures on pharmaceuticals have been rising until they have reached their maximum of 40.2% of all health care expenditures in Slovakia in 2003. From this year onwards the decreasing trend starts, more or less, successfully until 2013. Even though the yearly decrease rate has slowed down over the last period, the decreasing overall trend is statistically significant ($R^2 = 0.76$).

Figure 5: Expenditures on pharmaceuticals – Slovak Republic in comparison to OECD average



Source: Authors on the basis of OECD data (OECD 2015)

Drug utilization analysis

We have conducted drug utilization analysis in terms of DDDs, DIDs and sales for each group of drugs according to ATC classification system covering the period from 2000 until 2013. Our utilization analysis was focused on the evaluation of the overall drug consumption and the expenditures overview at the distribution level. The results are shown in Table 5. During the evaluated 14 years there has been a total of 12.5 milliard EUR spent on pharmaceuticals in Slovak Republic. Slovak patients consumed 1704 DIDs, hence on average 121.7 DIDs yearly. As expected, drugs affecting cardiovascular system were the most utilized group in terms of DIDs (489 DID) followed by drugs acting on alimentary tract and metabolism (268 DIDs) and dermatologicals (165 DIDs). At the same time the most expenditures were spent on cardiovascular drugs: overall 2.3 milliard EUR with and yearly average of 163.07 million EUR. The second most utilized drugs in terms of overall distributor sales were, however, antineoplastic and immunomodulating agents (1.7 milliard EUR) and on the third place were to be found drugs acting on nervous system (1.6 milliard EUR).

Table 5: Drug utilization analysis of ATC drug groups. 2000-2013

Code	Group	DID	DDD	yearly average sales ² [EUR]	overall sales ² [EUR]
C	CARDIOVASCULAR SYSTEM	489	13 481 854 256	163 073 157	2 283 024 194
A	ALIMENTARY TRACT AND METABOLISM	268	7 400 924 925	95 164 293	1 332 300 102
D	DERMATOLOGICALS	165	4 557 565 450	19 713 724	275 992 132
R	RESPIRATORY SYSTEM	157	4 322 420 886	73 045 640	1 022 638 955
N	NERVOUS SYSTEM	142	3 924 255 324	117 033 074	1 638 463 040
M	MUSCULO-SKELETAL SYSTEM	140	3 851 393 241	53 450 438	748 306 134
B	BLOOD AND BLOOD FORMING ORGANS	119	3 289 473 237	73 260 578	1 025 648 094

G	GENITO URINARY SYSTEM AND SEX HORMONES	67	1 853 681 676	38 982 933	545 761 061
V	VARIOUS	52	1 435 287 621	20 528 319	287 396 460
L	ANTINEOPLASTIC AND IMMUNOMODULATING AGENTS	29	803 111 736	124 419 654	1 741 875 160
J	ANTIINFECTIVES FOR SYSTEMIC USE	28	760 265 188	84 107 130	1 177 499 824
H	SYSTEMIC HORMONS ¹	25	684 560 832	15 650 235	219 103 287
S	SENSORY ORGANS	22	611 591 800	12 944 957	181 229 398
P	ANTIPARASITIC PRODUCTS	1	40 716 963	713 992	9 995 882
	Total	1 704	47 017 103 135	892 088 123	12 489 233 723
¹ EXCL. SEX HORMONES AND INSULINS					
² Ex-factory prices					
Source: Authors on the basis of OECD data (OECD 2015)					

Conclusion

Currently, Slovak Republic is in the middle of the transition process of its economy, characterized among others, by a fast year-to-year GDP growth. Over the evaluated 14 years (2000-2013) GDP has grown by 133.6%. At the same time, health expenditures expressed as the percentage of GDP have increased by 42.8%, which indicates that not only Slovakia has a stronger economy, it simultaneously also invests more finances in the health care sector.

In regards to the financing of the health care provision, as our results show both public and private expenditures have increased over the analyzed period, however, not evenly. While the share of patients' private health expenditures of the overall health expenditures increased by 239.8%, the proportion of public health expenditures increased only by 18.8%. These findings indicate that in the year 2013 Slovak patients have carried a burden of health care costs, which was more than two times larger than in 2000.

The lasting area for cost-effective interventions was detected to be the amount of utilized drugs and the associated costs. Despite the decrease of expenditures spent on pharmaceuticals by 23.5% since 2000, Slovak Republic remains enormously above the OECD average. The most utilized drugs in the Slovak Republic over the analyzed time frame have been cardiovascular drugs – both in terms of DID (489) and sales (2.3 milliard EUR) – hence, the intervention of the drug policy of Slovak Republic should focus primarily on this broad group of pharmaceuticals.

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