

## ORIGINAL RESEARCH

### **Pharmaceutical expenditure changes in Serbia and Greece during the global economic recession**

**Mihajlo B. Jakovljevic<sup>1</sup>, Kyriakos Souliotis<sup>2,3</sup>**

<sup>1</sup> Health Economics and Pharmacoeconomics, Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia;

<sup>2</sup> University of Peloponnese, Corinth, Greece;

<sup>3</sup> The Centre for Health Services Research, Medical School, University of Athens, Greece.

**Corresponding author:** Mihajlo (Michael) Jakovljevic, MD, PhD, Head of Graduate Health Economics & Pharmacoeconomics Curricula, Faculty of Medical Sciences, University of Kragujevac;

Address: Svetozara Markovica 69, 34000 Kragujevac, Serbia;

Telephone: +38134306800 (ext. 223); Email: sidartagothama@gmail.com

## **Abstract**

**Aim:** Clarity on health expenditures is essential for the timely identification of risks that jeopardize the democratic provision of health services and the credibility of health insurance systems. Furthermore, observing health outcomes with geographical scope is essential for making multilateral associations. This study aimed at conveying information on the variability of important economic parameters of the health sector of Serbia and Greece from 2007 to 2012, when the most serious financial crisis in the post-war economic history hit the global economy.

**Methods:** Exchange rates, purchase-power-parities (PPP) and price indices were used for the bilateral review of health and pharmaceutical expenditure dynamics during 2007-2012. Prescription and dispensing changes were also studied taking into account the anatomical therapeutic chemical (ATC) structure of drugs consumed.

**Results:** Greece was forced to cut down its total health care and pharmaceutical expenditure and mainly its out-of-pocket payments were more seriously affected by the recession. Surprisingly, emerging market of Serbia, although severely damaged by global recession, succeeded to maintain 19% growth of its per capita health expenditure and even 25% increase of its per capita spending on pharmaceuticals. Innovative pharmaceuticals showed an upward trend in both countries.

**Conclusions:** These two countries might serve as an example of two distinct pathways of mature and emerging health care markets during financial constraints caused by global recession. Our findings show that producing disease-based feedback, in the long run, may empower the assessment of the return on investment on medical technology and healthcare systems' cost-effectiveness.

**Keywords:** economic crisis, expenditure, Greece, pharmaceutical global recession, Serbia.

**Conflict of interest:** None.

**Source of funding:** The Ministry of Education, Science and Technological Development of the Republic of Serbia has funded this study through Grant: OI 175014. In any case, publication of results of this study was not contingent on Ministry's censorship or approval.

## **Introduction**

Studying the cost of services in healthcare over multiple periods is a challenging task taking into account the coalescence of explicit and implicit parameters of change in the service products provided; namely, the changes in the commodities' price and quality (1). Pharmaceutical care is, *'par excellence'*, a dynamic part of health sector. Firstly, pharmaceutical products are dominated by continual change due to the unstoppable technological improvement; secondly, the public sector has a role of payer and hence the power to regulate market prices. Financial fluctuations can thus act as tidal waves affecting providers, users and, ultimately, the population's health. The following paragraphs attempt to delineate key changes in the Serbian and Greek healthcare sector covering the period from 2007 onwards, when the global economy was hit by the most serious financial crisis in the post-war economic history (2).

Serbia, the largest market of the Western Balkans region, has experienced bold growth of domestic public and private health care sector. Its total health expenditure grew from 7.7% of GDP in 2000 to 10.5% in 2009, well above the EU average. Its total public health expenditure increased enormously (from €1,175 million in 2004 to €1,847 million in 2012). At the same time, public spending on pharmaceuticals doubled, reaching a level of €742 million (3). Unfortunately, like all the surrounding Balkan and Eastern European transitional post-socialist markets, the Serbian health system suffered heavily from several consecutive waves of global recession. After sustaining these impacts and introducing severe cost-cutting policies (some of which introduced only recently in 2014), the national market of Serbia began its slow recovery.

The Greek health sector experienced a period of significant growth during the first decade of the millennium, with a total health expenditure rising from 8.7% of GDP in 2003 to 10% in 2009, which was above the EU average (4). This growth was very pronounced particularly in the pharmaceutical sector where total expenditure more than doubled during the same period (from €3.2 billion in 2003 to €6.6 in 2009), rising from 1.9% to 2.8% of the GDP, with more than 78% being public expenditure (5). Specifically, public pharmaceutical expenditure increased by €0.5 billion per year between 2004 and 2009, reaching €5.2 billion in 2009 (4). Yet, following the signing of the Memorandum of Understanding (MoU) (6) in 2010, a series of extraordinary cost-containment measures and structural reforms were imposed on the Greek health sector, and on the pharmaceutical sector in particular, a sector regarded as a major contributor to both the deficit and the public debt due to the excessive public spending resulting from lack of control over both volume and cost of prescribing. Thus, since May 2010, the pharmaceutical sector has been placed at the centre of fiscal consolidation, becoming one of the key areas of intervention in order to reduce public pharmaceutical expenditure to 1% of GDP, thereby approaching the European average (7). As a result, public pharmaceutical expenditure has dropped by 44% between 2009 and 2012, reaching €2.8 billion and corresponding to 1.5% of the GDP in 2012 (IOBE, 2014).

## **Methods**

### ***Setting***

Serbian and Greek national pharmaceutical sectors assessments grounded in official data released by the respective national medicines' agencies and national health insurance funds.

Study design consisted of a retrospective database analysis conducted from the First Party Payer's perspective with a six-year long time horizon.

Health outcomes regarding values, prices and the quality of the services provided were observed for Serbia and Greece. The time domain of the analysis covers the time interval 2007-2012. Any information fissures caused by lack of data in health accounts are glossed over by more recent data.

Differences in price levels between the two countries are measured with the official exchange rates into US dollars. The purchasing power parity (PPP) was additionally used as a real expenditure change survey tool (8). The presented PPPs are in 2011 US dollars (9). The price index of the comparative price level (CPL) was also computed according to the algebraic expression shown below (10):

$$CPL = \frac{PPP}{Exchange\ Rate}$$

The relevant outcomes are presented in Table 1. Other measures of bilateral comparability are also included in Table 1, such as the GDP and the GDP per capita which are based on PPPs in US dollars. Population magnitudes as the size of the population, the percentage of people aged 65 and over, and the crude birth and death rates per 1000 people are also appended.

**Table 1. Basic macroeconomic and demographic magnitudes in Serbia and Greece in 2012/2013**

<b>ECONOMY</b>	<b>SERBIA</b>	<b>GREECE</b>
Gross national income (PPP billions US\$, 2012)	82.6	290.3
Gross national income per capita (PPP US\$, 2012)	11 430	26 170
<b>Indices</b>		
PPP* (1 US\$=1.000)	37.29	0.69
Exchange rate (1 US\$=1.000)	73.34	0.72
CPL price index (US prices=100)	16.22	37.00
<b>Demographics</b>		
Resident population (millions, 2013)	7.3	11.3
Population ≥65 years (% , 2013)	14	20
Crude death rate per 1000 people (2012)	14	11
Crude birth rate per 1000 people (2012)	9	9
Unemployment % of total labour force (2008-2012)	24	24

\* Sources: 2014 World Development Indicators. 2014 International Bank for Reconstruction and Development, The World Bank Purchasing Power Parities and the Real Size of World Economies. A Comprehensive Report of the 2011 International Comparison Program. 2015 International Bank for Reconstruction and Development, The World Bank.

Table 2 includes health expenditure values and changes based on PPPs. Annual percentage changes depicted in the last column of the table are yielded according to the harmonic mean of annual changes within the period 2007-2012.

National total and pharmaceutical health expenditure per capita trends in Serbia and Greece during 2007-2012 are analytically presented (in PPP\$ values) in Figure 1.

National health expenditures as percentage of GDP in Serbia and Greece during the period 2007-2012 are also depicted in Figure 2.

**Table 2. Health expenditure values and their increase: Serbia and Greece, 2007-2012**

HEALTHCARE OUTCOME	2007	2012	Change (%)	Annual change (%)
Health expenditure per capita, PPP\$ - Serbia	1 047	1 250	19.39	3.44
Health expenditure per capita, PPP\$ - Greece	2 727	2 346	-13.95	-3.28
Health expenditure, private (% of GDP) - Serbia	4	4	1.62	0.28
Health expenditure, private (% of GDP) - Greece	4	3	-16.39	-3.88
Health expenditure, private (% of total health expenditure -THE) - Serbia	39	39	0.55	0.10
Health expenditure, private (% of total health expenditure-THE) - Greece	37	32	-11.53	-2.84
Health expenditure, public (% of GDP) - Serbia	6	6	0.72	0.12
Health expenditure, public (% of GDP) - Greece	6	6	7.09	1.06
Health expenditure, public (% of government expenditure) - Serbia	14	13	-3.37	-0.72
Health expenditure, public (% of government expenditure) - Greece	12	11	-7.10	-1.56
Health expenditure, public (% of total health expenditure) - Serbia	61	61	-0.34	-0.07
Health expenditure, public (% of total health expenditure) - Greece	60	68	13.32	2.42
Health expenditure, total (% of GDP) - Serbia	10	10	1.07	0.19
Health expenditure, total (% of GDP) - Greece	10	9	-5.50	-1.20
Health expenditure, total (current US\$, millions) - Serbia	4 035	4 030	-0.13	-1.00
Health expenditure, total (current US\$) - Greece	29 964	23 080	-22.97	-5.58
Pharmaceutical expenditure per capita, PPP\$ - Serbia	305	382*	25.25	0.64
Pharmaceutical expenditure per capita, PPP\$ - Greece	676	673*	-0.44	-1.16

\* Sources: Data from database: Health Nutrition and Population Statistics. The World Bank. 2011. WHO Global Health Expenditure Database 2007–2012 and European Health for All Database (HFA-DB) 2007–2012.

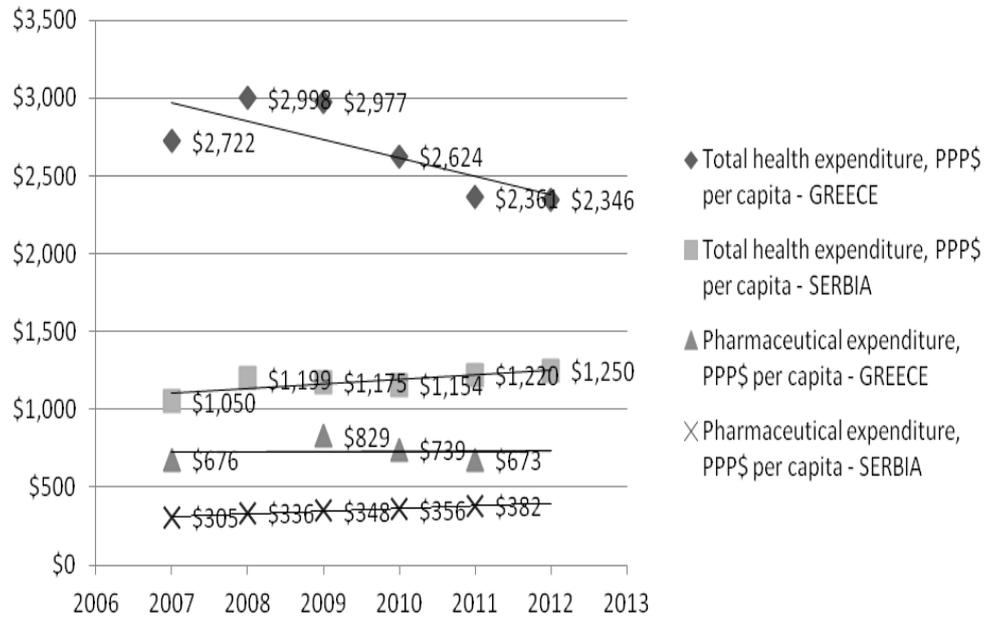
Tables 3 and 4 illustrate respectively the maximum and minimum absolute changes in the available outcomes of the two countries' pharmaceutical sector, classified according to the ATC4 level of the anatomical therapeutic chemical classification system of drugs (11).

Direct bilateral PPP comparisons were conducted for the GDP per capita and the pharmaceutical expenditure per capita, simplifying the Paasche price index. In the algebraic expression (2), Serbia is the base country and the  $P_{GS}$  expresses Greece's "p" values (i.e., the p.c. GDP or the p.c. pharmaceutical expenditure) in Serbian terms. "S" and "G" initials denote "Serbia" and "Greece", respectively, and "q" is the general population of Greece.

$$P_{GS} = \frac{\sum p_G q_G}{\sum p_S q_G} \quad (2)$$

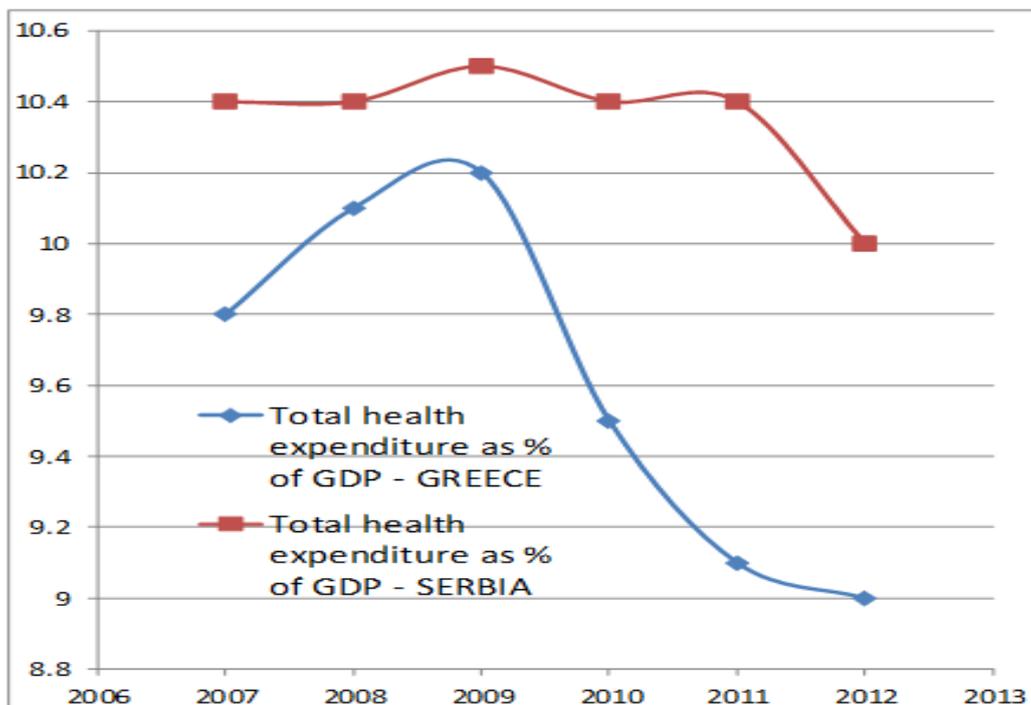
*Jakovljevic MB, Souliotis K. Pharmaceutical expenditure changes in Serbia and Greece during the global economic recession (Original research). SEEJPH 2016, posted: 06 April 2016. DOI 10.4119/UNIBI/SEEJPH-2016-101*

**Figure 1. National total and pharmaceutical health expenditure trends in Serbia and Greece during the period 2007-2012 (expressed in current PPP \$ per capita)**



\* Source: WHO Global Health Expenditure Database 2007-2012 and European Health for All Database (HFA-DB) 2007-2012.

**Figure 2. National health expenditure trends in Serbia and Greece during the period 2007-2012 (expressed as a percentage of disposable Gross Domestic Product, GDP)**



\* Source: WHO Global Health Expenditure Database 2007-2012 and European Health for All Database (HFA-DB) 2007-2012.

**Table 3. Top 20 ATC drug classes based on turnover growth, 2007-2012**

ATC classes	Serbia*	ATC classes	Greece†
C09BA ACE inhibitors and diuretics	€ 2 246 511	L01XC Monoclonal antibodies	€ 11 287 179
L01XC Monoclonal antibodies	€ 1 890 961	L01XE Protein kinase inhibitors	€ 9 001 287
B01AC Platelet aggregation inhibitors excluding heparin	€ 1 662 525	L04AB Tumor necrosis factor alpha (TNF- $\alpha$ ) inhibitors	€ 8 711 090
C10AA HMG CoA reductase inhibitors	€ 1 560 979	L04AA Selective immunosuppressants	€ 4 954 700
R03AK Adrenergics in combination with corticosteroids or other drugs, excl. Anticholinergics	€ 1 430 330	L02BX Other hormone antagonists and related agents	€ 4 405 048
C09CA Angiotensin II antagonists, plain	€ 1 180 464	L04AX Other immunosuppressants	€ 4 155 810
L01XE Protein kinase inhibitors	€ 1 000 095	S01LA Antineovascularisation agents	€ 3 530 581
A10AD Insulins and analogues for injection, intermediate- or long-acting combined with fast-acting	€ 863 908	L04AC Interleukin inhibitors	€ 2 756 671
C07AB Beta blocking agents, selective	€ 789 919	A16AB Enzymes	€ 2 440 854
V08AB Water-soluble, nephrotropic, low osmolar X-ray contrast media	€ 635 129	J05AB Nucleosides and nucleotides excluding reverse transcriptase inhibitors	€ 2 396 560
N04BC Dopamine agonists	€ 600 260	B03XA Other antianemic preparations	€ 2 354 249
G04CA Alpha-adrenoreceptor antagonists	€ 589 965	C01EB Other cardiac preparations	€ 2 238 049
J05AR Antivirals for treatment of HIV infections, combinations	€ 581 846	C09DX Angiotensin II antagonists, other combinations	€ 2 001 835
N02BE Anilides	€ 562 326	A10BD Combinations of oral blood glucose lowering drugs	€ 1 902 922
C05BA Heparins or heparinoids for topical use	€ 541 038	R03DX Other systemic drugs for obstructive airway diseases	€ 1 760 418
L01CD Taxanes	€ 493 830	L01XX Other antineoplastic agents	€ 1 758 626
N06DA Anticholinesterases	€ 438 968	B01AE Direct thrombin inhibitors	€ 1 606 684
G04BE Drugs used in erectile dysfunction	€ 432 442	L01BA Folic acid analogues	€ 1 597 243
R01AA Sympathomimetics, plain	€ 418 995	L03AA Colony stimulating factors	€ 1 411 531
A10BA Biguanides	€ 415 132	L01BC Pyrimidine analogues	€ 1 368 591

\* Sources: medicines and Medicinal Device Agency of Serbia annual reports on turnover and consumption of pharmaceuticals; National Health Insurance Fund of Serbia.

*Jakovljevic MB, Souliotis K. Pharmaceutical expenditure changes in Serbia and Greece during the global economic recession (Original research). SEEJPH 2016, posted: 06 April 2016. DOI 10.4119/UNIBI/SEEJPH-2016-101*

†Greek National Organisation for Health Care Services Provision-EOPYY.

**Table 4. Bottom 20 ATC drug classes based on turnover growth 2007-2012**

ATC classes	Serbia*	ATC classes	Greece†
C09AA ACE inhibitors, plain	-€ 1 643 854	C10AA HMG CoA reductase inhibitors	-€ 31 679 014
G03GA Gonadotropins	-€ 1 330 919	C09DA Angiotensin II antagonists and diuretics	-€ 13 420 269
J01FA Macrolides	-€ 1 197 082	B01AC Platelet aggregation inhibitors excluding heparin	-€ 8 526 396
J01DD Third-generation cephalosporins	-€ 1 059 188	C09CA Angiotensin II antagonists, plain	-€ 7 929 987
M01AB Acetic acid derivatives and related substances	-€ 1 040 177	N03AX Other antiepileptics	-€ 7 071 604
C01DA Organic nitrates	-€ 935 780	A02BC Proton pump inhibitors	-€ 6 745 836
A02BA H2-receptor antagonists	-€ 896 631	N06AB Selective serotonin reuptake inhibitors	-€ 6 399 987
M01AE Propionic acid derivatives	-€ 846 670	N06DA Anticholinesterases	-€ 5 199 056
J01DB First-generation cephalosporins	-€ 691 096	N05AX Other antipsychotics	-€ 5 119 251
L01CB Podophyllotoxin derivatives	-€ 577 411	M05BA Bisphosphonates	-€ 4 794 650
B03XA Other antianemic preparations	-€ 566 477	C08CA Dihydropyridine derivatives	-€ 4 165 272
C04AD Purine derivatives	-€ 563 692	N06AX Other antidepressants	-€ 3 810 668
L04AA Selective immunosuppressants	-€ 438 147	C09AA ACE inhibitors, plain	-€ 3 275 530
J01CA Penicillins with extended spectrum	-€ 433 257	R03DC Leukotriene receptor antagonists	-€ 3 182 560
J01DC Second-generation cephalosporins	-€ 417 805	N05AH Diazepines, oxazepines, thiazepines and oxepines	-€ 2 894 838
B05BA Solutions for parenteral nutrition	-€ 390 852	A10BG Thiazolidinediones	-€ 2 860 150
R03AC Selective beta-2-adrenoreceptor agonists	-€ 376 303	R03BA Glucocorticoids	-€ 2 455 708
J01CR Combinations of penicillins, including beta-lactamase inhibitors	-€ 374 335	C09BA ACE inhibitors and diuretics	-€ 2 195 843
R03DA Xanthines	-€ 340 329	A10BB Sulfonamides, urea derivatives	-€ 2 137 085
B05AA Blood substitutes and plasma protein fractions	-€ 328 794	L02BG Aromatase inhibitors	-€ 2 007 464

\* Sources: medicines and Medicinal Device Agency of Serbia annual reports on turnover and consumption of pharmaceuticals; National Health Insurance Fund of Serbia.

<sup>†</sup>Greek National Organisation for Health Care Services Provision-EOPYY (estimations based on 2010-2012 data).

## Results

Aside from minor differences in their aging populations, Serbia and Greece were spending similar amounts on health as percentage of the GDP, in the beginning of the recession. The recession, however, resulted in decreases in the amounts allocated for health in both countries, with Greece reducing mainly its private expenditure on health (from 37% to 32% of THE). In per capita terms, pharmaceutical expenditure recorded bold 25% growth in Serbia, whereas marginal decreases (0.4%) were jotted down for Greece, during the recession.

Greece's more intense recession effects on the pharmaceutical sector were also reflected on the values of the  $P_{GS}$  price index. Greece's p.c. GDP in PPP\$ was 2.29 times the p.c. GDP of Serbia in 2012 ( $P_{GS} = 26,170/11,430$ ). Similarly, the pharmaceutical expenditure per capita of Greece was 2.22 times the pharmaceutical expenditure per capita of Serbia in 2007 ( $P_{GS} = 676/305$ ), whereas in 2012 it reduced to 1.76 ( $P_{GS} = 673/382$ ).

The pharmaceutical market internal structure of prescription and sales has in some cases moved in the same direction in the two countries. Specifically, within some therapeutic categories, pharmaceutical expenditure continued to grow despite the depression. These categories included the L01XC monoclonal antibodies, the L01XE protein-kinase inhibitors, the A10B blood glucose lowering drugs, excluding insulins and the J05A direct acting antiviral drugs. Continuing rise of share of innovative biological medicines is evident despite the financial constraints.

Few important differences in adaptive responses to the economic crisis induced weaknesses were noticed between emerging and mature health market. While health expenditure per capita (PPP\$) in Serbia still succeeded to grow for 19.4%, the Greek one felt almost 14% during these six years. The total health expenditure (THE) in Serbia decreased marginally by 0.13%, whereas during the same time, the Greek THE fell abruptly by even 23%. Health expenditure percentage of GDP in Serbia grew 1% while Greek one decreased almost 5.5%. A similar pattern was noticed with private health care expenditure expressed either as percentage of THE or GDP: the Greek one decreased by 16.4% and 12% respectively, while Serbian private health expenditure recorded minor growth in crisis' years. Governmental share of health expenditure has fallen dramatically in both countries although more prominently in Greece. Opposed to all the aforementioned recessionary changes, public health expenditure was rising much faster in Greece compared to Serbia both on grounds of GDP proportion and THE proportion which reached 13.3% increase. At the same time, in Serbia, these values were slightly up and down, but only marginally (see Table 2).

## Discussion

To date, all countries of the broader South Eastern Europe have found themselves in different stages of profound demographic transition outsourcing from increased longevity and falling fertility rates (12). Greece's population is ageing faster considering its lower crude death rates and its higher proportion of old ages in the general population. Population aging in Serbia has deep historical roots and is likely to pose severe challenge on the national health system financing in the upcoming decades (13). This inevitable demographic change will be shaping growing needs for pharmaceuticals and the landscape of their consumption in both countries in the long run.

Observing much shorter time horizon of six recent years of global economic recession, emerging Serbian pharmaceutical market has undergone complex changes in terms of value-based medicines prescription and dispensing. Regardless of significant difficulties and slower growth, national public expenditure on pharmaceuticals has doubled since 2004. Innovative cardiovascular, anti-diabetic agents, combined adrenergic and corticosteroid preparations and targeted immunotherapies dominated the landscape. Economic crisis induced package of policy measures provided temporary relief for the ongoing financial difficulties.

Nevertheless, shortages of pharmaceuticals continued to occur more frequently compared to the period before 2008. These shortages occasionally refer even to the essential medicines and are primarily caused by the substantial public debt toward major multinational pharma companies supplying the Eastern European markets. Contemporary market access and reimbursement policies by regional authorities in most of Balkans peninsula limit patient access to the expensive innovative medicines to narrowly defined diagnoses related groups (14). It is essential to be aware of the boomerang effect created by these restrictive policies. Individuals, who are denied primary care preventive or screening services, ultimately end up in late severe stages of illness requiring expensive and complex inpatient treatment. A higher presence of clinically evolved conditions in transitional Eastern European countries has already been proven in the case of COPD (15), alcohol abuse (16) and cancer (17). These health system inefficiencies inherited from the socialist era create significant costs to the system, as well as worse health outcomes. High consumption of medicines indicated to treat some of key “prosperity” diseases such as diabetes (18), COPD, risky pregnancies (19,20), addiction disorders, hepatitis (21) and cancer (22) serves as the evidence of such vulnerabilities within the system (20). These major illnesses should also present core targets for more responsible, evidence-based national resource allocation strategies (23).

In Greece, the pharmaceutical industry has traditionally represented an important sector of the economy and has been a major employer in the production, research and development, as well as distribution wholesale and retail. However, the Greek pharmaceutical market has been long characterized by significant overspending (24), with public pharmaceutical expenditure reaching unprecedented levels in 2009 and thus being blamed as one of the main contributors of public deficit and debt.

Between 1990 and 2010, the applied pharmaceutical policy has focused mostly on price regulations in order to control expenditure, while no real effort was made to contain the volume of prescribed medicines, determined by the prescribing habits of physicians and by patients’ demand (25,26). As a result, public pharmaceutical expenditure continued to rise during this period, while the introduction of measures such as pharmaceutical pricing according to the lowest ex-factory European price and the positive list, had only a temporary effect on reducing expenditure, ultimately leading to the replacement of old products with new, more expensive ones and to the switching to more expensive medicines of the same therapeutic category (27,28).

In light of the above and in the context of fiscal consolidation, a comprehensive health care reform was implemented after the signing of the MoU in 2010 and is still on-going, aiming, among other things, to reduce waste, control expenditure and increase the accountability and efficiency of the Greek pharmaceutical sector. The MoU defined a number of cost-containment measures that had to be implemented within very tight timelines, targeting the reduction of both cost and volume of prescribed medicines. These measures included interim flat decreases of pharmaceutical prices, a new pharmaceutical pricing system according to

which prices are determined based on the average of the three lowest prices in the EU-27, introduction of positive, negative and over-the-counter (OTC) medication lists, reduction in the profit margins of pharmacists and wholesalers, collection of rebate and claw-back from pharmaceutical companies, changes in the distribution of high-cost medicines, increase in the use of generics in the national health system, introduction of electronic prescriptions for medicines, publication of clinical guidelines and prescribing protocols, as well as monitoring of physicians' prescribing habits (29).

Following the implementation of the MoU, the Greek government has primarily focused on applying cost-containment measures such as flat decreases of pharmaceutical prices and the collection of the rebates from pharmaceutical companies in order to achieve a fast reduction of pharmaceutical expenditure, while the measures and structural reforms aiming at the rationalization of the prescribing behaviour of physicians, such as e-prescribing and monitoring of physicians' behaviour progressed at a slower pace. By 2012, public pharmaceutical expenditure shrunk by 44% since 2009, reaching 1.5% of GDP, while in 2013 it was reduced to €2.4 billion (53% decrease).

The recent changes in pharmaceutical policy which have been implemented in Greece in the context of its economic adjustment program have created turmoil in the pharmaceutical sector challenging its growth prospects and its long-term sustainability, thus resulting in instability in the market. This led to temporary drug shortages, hampering access to timely and effective therapy for the patients (30). At the same time, the policy of continuous reductions in pharmaceutical expenditure after a certain level and the substantial downsizing of the market, led to significant losses in public income resulting from the layoffs in the pharmaceutical sector and the subsequent loss of tax revenues and social contributions from pharmaceutical companies and pharmacies. The above demonstrate that even though in 2010 there was a real, urgent need for rationalization of the Greek pharmaceutical market and for the implementation of a number of structural reforms, currently, several years after the eruption of the fiscal crisis and while the health care reform is still on-going, there is a need to adopt a more multi-factorial approach in policy-making, i.e., an approach which will account for the potential impact of applied policies on: i) patient access; ii) insurance contributions, employment and GDP, as well as; iii) the benefits brought by the strengthening of scientific research and development, when estimating the net financial result of these policies.

### **Conclusions**

These two countries might serve as an example of two distinct pathways of mature and emerging health care markets during financial constraints caused by global recession. Apart from the ostensible differences in their composition of health and pharmaceutical expenditure, Serbia and Greece both cut down on their pharmaceutical expenditure during the financial crisis, even though Greece was more seriously affected by the recession. Surprisingly, the emerging market of Serbia, although severely damaged by the global recession, succeeded to maintain 19% growth of its per capita health expenditure and even 25% increase of its per capita spending on pharmaceuticals.

The recession left unaffected certain pharmaceutical expenditure trends in both countries dictating inelastic areas in the curve of pharmaceutical needs. Specifically, an increasing expenditure was documented for the L01XC monoclonal antibodies, the L01XE protein-kinase inhibitors, the A10B Blood glucose lowering drugs, excluding insulins and the J05A direct acting antiviral drugs.

The current results show that studies in the direction of producing disease-based feedback could empower the assessment of return on investment on medical technology, enhance the process of pharmaceutical expenditure estimations, predictions and projections and, in the long run, increase health outcomes' predictability and the European healthcare systems' cost-effectiveness.

## References

1. OECD/Eurostat. Main pricing methods for Service Producer Price Indices, in Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition, OECD Publishing; 2014. <http://www.oecd-ilibrary.org/docserver/download/3014061e.pdf?expires=1425723757&id=id&accname=guest&checksum=4F961BCD18ABFCDB937D44B46B3DD708> (accessed: February 15, 2015).
2. European Commission. European Economy - 7/2009. Economic Crisis in Europe: Causes, Consequences and Responses. Luxembourg: Office for Official Publications of the European Communities; 2009. [http://ec.europa.eu/economy\\_finance/publications/publication15887\\_en.pdf](http://ec.europa.eu/economy_finance/publications/publication15887_en.pdf) (accessed: February 15, 2015).
3. Jakovljevic MB, Djordjevic N, Jurisevic M, Jankovic S. Evolution of the Serbian pharmaceutical market alongside socioeconomic transition. *Expert Rev Pharmacoecon Outcomes Res* 2015; posted January 16. DOI:10.1586/14737167.2015.1003044.
4. Hellenic Statistical Authority (EL.STAT.). System of Health Accounts, Greece. 2014. <http://www.statistics.gr/portal/page/portal/ESYE/> (accessed: February 15, 2015).
5. Foundation for Economic and Industrial Research (IOBE). The Pharmaceutical Market in Greece. Facts and Figures; 2013. [http://www.iobe.gr/docs/research/en/RES\\_05\\_A\\_03122014\\_REP\\_ENG.pdf](http://www.iobe.gr/docs/research/en/RES_05_A_03122014_REP_ENG.pdf) (accessed: February 15, 2015).
6. Greece: Memorandum of Understanding on specific economic policy conditionality; 2010. <http://peter.fleissner.org/Transform/MoU.pdf> (accessed: February 15, 2015).
7. European Commission. The Economic Adjustment Programme for Greece. Brussels, May 2010. [http://ec.europa.eu/economy\\_finance/publications/occasional\\_paper/2010/pdf/ocp61\\_en.pdf](http://ec.europa.eu/economy_finance/publications/occasional_paper/2010/pdf/ocp61_en.pdf) (accessed: February 15, 2015).
8. The World Bank/International Bank for Reconstruction and Development. 2014 World Development Indicators; 2014. <http://data.worldbank.org/sites/default/files/wdi-2014-book.pdf> (accessed: February 15, 2015).
9. The World Bank/International Bank for Reconstruction and Development. Purchasing Power Parities and the Real Size of World Economies. A Comprehensive Report of the 2011 International Comparison Program; 2014. <http://siteresources.worldbank.org/ICPINT/Resources/270056-1183395201801/Summary-of-Results-and-Findings-of-the-2011-International-Comparison-Program.pdf> (accessed: February 15, 2015).
10. Eurostat [tec00120] - Comparative price levels - Comparative price levels of final consumption by private households including indirect taxes (EU28 = 100). <http://ec.europa.eu/eurostat/tgm/web/table/description.jsp> (accessed: February 15, 2015).
11. European Commission. DG Health & Consumers, Public health, Reference documents, Register, Full Human ATC list. 2014. <http://ec.europa.eu/health/documents/community-register/html/atc.htm> (accessed: February 15, 2015).
12. Jakovljevic M, Laaser U. Long term population aging 1950-2010 in seventeen transition countries in the wider region of South East Europe. *SEEJPH* 2015; posted February 21. DOI: 10.12908/SEEJPH-2014-42.

13. Ogura S, Jakovljevic M. 2014. Health Financing Constrained by Population Aging- An Opportunity to Learn from Japanese Experience. *SJECR* 2015;15: 175-81.
14. Jakovljevic MB, Nakazono S, Ogura S. Contemporary generic market in Japan—key conditions to successful evolution. *Expert Rev Pharmacoecono Outcomes Res* 2014;14:181-94.
15. Lasic Z, Gajovic O, Tanaskovic I, Milovanovic D, Atanasijevic D, Jakovljevic MB. GOLD stage impact on COPD direct medical costs in elderly. *J Health Behav Public Health* 2012;2:1-7.
16. Jovanovic M, Jakovljevic M. Inpatient detoxification procedure and facilities: financing considerations from an Eastern European perspective. *Alcohol Alcohol* 2011;46: 364-5.
17. Radovanović A, Dagović A, Jakovljević M. Economics of cancer related medical care: worldwide estimates and available domestic evidence. *Arch Oncol* 2011;19:59-63.
18. Biorac N, Jakovljević MB, Stefanović D, Perović S, Janković S. Assessment of diabetes mellitus type 2 treatment costs in the Republic of Serbia. *Vojnosanit Pregl* 2009;66:271-6.
19. Jakovljevic M, Varjadic M, Jankovic SM. Cost-Effectiveness of Ritodrine and Fenoterol for Treatment of Preterm Labor in a Low–Middle-Income Country: A Case Study. *Value Health* 2008;11:149-53.
20. Vuković M, Gvozdenović BS, Gajić T, Stamatović Gajić B, Jakovljević M, McCormick BP. Validation of a patient satisfaction questionnaire in primary health care. *Public Health* 2012;126:710-18.
21. Jakovljevic M, Mijailovic Z, Jovicic BP, Canovic P, Gajovic O, Jovanovic M, et al. Assessment of Viral Genotype Impact to the Cost-Effectiveness and Overall Costs of Care for Peg-Interferon-2 $\alpha$ + Ribavirine Treated Chronic Hepatitis C Patients. *Hepat Mon* 2013;13: e6750.
22. Jakovljevic M, Zugic A, Rankovic A, Dagovic A. Radiation therapy remains the key cost driver of oncology inpatient treatment. *J Med Econ* 2014;18:29-36.
23. Jakovljevic M, Lazarevic M, Milovanovic O, Kanjevac T. The New and Old Europe: East-West Split in Pharmaceutical Spending. *Front Pharmacol* 2016;7:18. DOI: 10.3389/fphar.2016.00018.
24. Souliotis K, Papageorgiou M, Politi A, Ioakeimidis D, Sidiropoulos P. Barriers to accessing biologic treatment for rheumatoid arthritis in Greece: the unseen impact of the fiscal crisis - the Health Outcomes Patient Environment (HOPE) study. *Rheumatol Int* 2014;34:25-33.
25. Economou C. Greece: Health system review. *Health Systems in Transition* 2010;12:1-180. [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0004/130729/e94660.pdf](http://www.euro.who.int/__data/assets/pdf_file/0004/130729/e94660.pdf) (accessed: February 15, 2015).
26. Economou C, Giorno C. Improving the performance of the public health care system in Greece. OECD Economic Department Working Paper, No. 722, OECD Publishing, Paris; 2009. [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=eco/wkp\(2009\)63](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=eco/wkp(2009)63) (accessed: February 15, 2015).

27. Contiades X, Golna C, Souliotis K. Pharmaceutical regulation in Greece at the crossroad of change: Economic, political and constitutional considerations for a new regulatory paradigm. *Health Policy* 2007;82:116-29.
28. Yfantopoulos J. Pharmaceutical pricing and reimbursement reforms in Greece. *Eur J Health Econ* 2008;9:87-97.
29. Watson R. Greek drug price cuts will have knock on effects across Europe, industry warns. *BMJ* 2010;340:c3043. DOI: <http://dx.doi.org/10.1136/bmj.c3043>.
30. Souliotis K. Quality in healthcare and the contribution of patient and public involvement: talking the talk and walking the walk? *Health Expect* 2015;18:1-2.

---

© 2016 Jakovljevic et al; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.