

## ORIGINAL ARTICLE

## HEALTH CARE EXPENDITURES OF 179 COUNTRIES WITH DIFFERENT GNI PER CAPITA IN 2018

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### ABSTRACT

**The aim:** To study the difference in health care expenditures in groups of countries with different GNI per capita.

**Materials and methods:** In 4 groups of countries with different GNI per capita were analyzed indicators of Current health expenditure per capita (\$) (CHE), Domestic general government health expenditure per capita, PPP (\$) (GGHE \$) and GGHE%, Domestic private health expenditure per capita, PPP (\$) (PHE) and PHE%, Out-of-pocket expenditure (%) (OOP), Current health expenditure (% of GDP) (CHE% GDP).

**Results:** The group of high-income countries differs by CHE, GGHE \$, GGHE%, PHE \$, PHE%, OOP, CHE% GDP ( $p < 0.001$ ), the group with incomes above the average – by CHE, GGHE \$, PHE \$, PHE%, CHE%GDP ( $p < 0.001$ ). Groups with lower average income and low income do not differ in CHE, GGHE\$, PHE\$, PHE%, OOP ( $p > 0.05$ ). GNI per capita has a positive effect on GDP%GDP, CHE, GGHE, PHE in the high-income group and negatively affects the OOP ( $p < 0.05$ ), GNI per capita has a positive effect on CHE, GGHE in the above-average income group, GNI per capita has a positive effect on CHE, GGHE, GGHE%, PHE and negatively affects OOP ( $p < 0.05$ ) in the income group below average. GNI per capita has a positive effect on the OOP and negatively affects the CHE%GDP ( $p < 0.05$ ) in the low-income group.

**Conclusions:** Each group of countries, depending on per capita income, has its own health care costs.

**KEY WORDS:** Health financing, GNI per capita, Out-of-pocket expenditure, health expenditure

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### INTRODUCTION

Among Sustainable Development Goals (SDGs) by 2030, the UN organization points out the need of ensuring healthy lifestyle and promoting well-being for all humans of any age (goal 3) [1]. The indicators of achieving this goal are increase of life expectancy and reduction of mortality by ensuring equal access to health services within strengthened health care systems [2]. The WHO believes it is necessary to significantly increase funding for health care in order to achieve sustainable global health [3]. This particularly regards the low-income countries and the below-average income ones [4]. In the period from 2014 to 2040, an increase of health care expenditures by 2.62 times from US \$ 9.2 trillion to US \$ 24.2 trillion is expected [5]. The growth rate of health care expenditures depends on the country's income. The highest growth rates of health care expenditures are expected in countries with above-average income (5.3%), and the lowest rates are expected in the group of low-income countries (1.8%) [5]. Growth rates in countries of above-average income are determined by government expenditures [5, 6, 7]. From 2014 to 2040, the share of private health care expenditures in the world is suggested to decrease from 22.8% to 21.4% [5]. Global trends in health care expenditures are characterized by certain peculiarities. Thus, medical coverage depends on the income of the countries; government expenditures are

playing the central role in the structure of the financial resources within health care system; high government expenditures ensure financial protection of population in case of catastrophic treatment costs; out-of-pocket expenditures are reduced; external financing (assistance) is less than 1% of global health expenditures and is significant in low-income countries; the growth rate of health care expenditures depends on the growth rate of gross national product [5, 6, 7, 8, 9, 10, 11, 12, 13].

According to the literature sources, the health care expenditures increase reduces global burden of diseases in the countries [14, 15] and provides for their economic growth [12, 16]. Health care expenditures result in better health servicing, which can strengthen human capital and improve productivity, thereby contributing to economic performance [17]. However, health care expenditures must be economically justified [18]. The actual level of health expenditures in the countries of the Organization for Economic Co-operation and Development (OECD) makes up 5.48% of gross domestic product (GDP). The optimal health care expenditure is 7.55% of GDP [18]. Higher costs are not economically feasible [18]. According to Lancet Commission on Investing in Health, it is predicted that health care expenditure might increase by 1% at the expense of the country's GDP growth or government expenditure growth as a share of the country's GDP [4]. It

**Table I.** Indicators of current health care expenditures in 4 groups of countries with different GNI per capita, 2018

Financial indicators	1 (n = 54)	2 (n = 51)	3 (n = 51)	4 (n = 23)	p
	M 25th – 75th percentile	M 25th – 75th percentile	M 25th – 75th percentile	M 25th – 75th percentile	
CHE% GDP	7,605 <sup>3</sup> (6,331-9,975)	6,061 <sup>3</sup> (5,244-8,224)	4,734 <sup>12</sup> (3,532-6,292)	6,165 (3,973-7,692)	<0.001
CHE\$	2091.5 <sup>234</sup> (1249.3-4912.7)	471.5 <sup>134</sup> (323.0-615.1)	102.7 <sup>12</sup> (71.1-174.5)	40.2 <sup>12</sup> (29.5-53.6)	<0.001
GGHE\$	2216.4 <sup>234</sup> (1432.6-3657.7)	527.6 <sup>134</sup> (345.3-819.9)	109.0 <sup>12</sup> (63.7-213.4)	9.24 <sup>12</sup> (15.7-42.5)	<0.001
GGHE%	71.7 <sup>234</sup> (58.8-78.6)	58.6 <sup>134</sup> (46.4-68.3)	40.3 <sup>124</sup> (28.2-58.5)	23.7 <sup>123</sup> (16.0-30.2)	<0.001
PHE\$	950.9 <sup>234</sup> (657.7-1335.1)	379.0 <sup>134</sup> (243.6-539.6)	113.8 <sup>12</sup> (54.5-203.8)	47.3 <sup>12</sup> (27.8-92.6)	<0.001
PHE%	28.2 <sup>234</sup> (21.4-41.2)	40.2 <sup>1</sup> (29.3-51.0)	50.2 <sup>1</sup> (27.9-59.4)	44.5 <sup>1</sup> (36.3-67.1)	<0.001
OOP	18.4 <sup>234</sup> (12.7-29.5)	32.3 <sup>1</sup> (19.6-42.1)	39.4 <sup>1</sup> (23.3-53.5)	41.6 <sup>1</sup> (28.4-59.5)	<0.001

Source: <https://data.worldbank.org/indicator>

M<sup>n</sup>: M - median of the indicator, <sup>n</sup>- significant differences in groups, p <0.001

is projected that in the period up to 2035, GDP growth in countries may provide an increase of health care expenditures [19, 20]. However, many low- and middle-income countries continue to underinvest in health care [4].

In its 2018 report, Public Health Expenditure: A Closer Look at Global Trends, the WHO recommends examining trends in the specifics of health care financing in countries with different income and expenditure levels [7].

## THE AIM

The aim of the study was to examine the differences in health care expenditures in groups of countries with different GNI per capita and the impact of GNI per capita on financial indicators in these groups of countries.

## MATERIALS AND METHODS

The article presents an analysis of indicators of health care expenditures in 4 groups of countries with different GNI per capita. The health expenditure indicators were obtained from The World Bank Data (<https://data.worldbank.org/indicator>) for 2018. This database contains financial indicators for 264 countries. In 2018, full set of information on financial indicators was available for 179 countries, which were divided into 4 groups by GNI per capita, Atlas method (current US \$) (<https://www.vsemirnyjbank.org/ru/news/press-release/2013/07/02/new-country-classification>).

According to the World Bank classification, group 1 includes 54 high-income countries (GNI per capita US \$ 12616 and >), group 2 includes 51 above-average income countries (GNI per capita US \$ 4086 – 12615), group 3 includes 51 countries with below-average income (GNI per capita 1036 – 4085 US \$), and group 4 of 23 low-income countries (1035 US \$ and <). For the purpose of analysis,

we selected 7 indicators of health care expenditures: Current health expenditure per capita (current US \$) (SHE), Domestic general government health expenditure per capita, PPP (current international \$) (GGHE \$), Domestic general government health expenditure (% of current health expenditure) (GGHE%), Domestic private health expenditure per capita, PPP (current international \$) (PHE \$), Domestic private health expenditure (% of current health expenditure) (PHE%), Out-of-pocket expenditure (% of current health expenditure) (OOP), Current health expenditure (% of GDP) (CHE% GDP).

Medians and quartiles (QI – QIII) were calculated to compare financial indicators in 4 groups. Median operation and interquartile range of 25th – 75th percentile were used for better comparison of each country. Financial parameters were expressed in US currency. A nonparametric Kruskal-Wallis test was used to determine the differences in financial indicators in the groups. Pearson's correlation coefficient was used to determine the relationship between each group of indicators of interest. Statistically significant results were associated with a 'p value' of <0.05. The data analysis was performed using the license analysis package MedCalc v.19.4.1 (MedCalc Software Inc, Broekstraat, Belgium, 1993–2020).

## RESULTS

The medians of 7 financial indicators SHE, GGHE \$, GGHE%, PHE \$, PHE%, OOP, CHE% GDP and the differences of these indicators in groups of countries with different GNI per capita are presented in Table I.

Four groups of countries with different incomes differ significantly only in the median GGHE% (p <0.001). In the group of high-income countries, the median GGHE% is 71.7%, in the group of countries with above-average

**Table 2..** Pearson correlation coefficients between GNI per capita and financial indicators in groups of countries with different incomes, 2018

Financial indicators	GNI per capita									
	179 countries		1 gr, n = 54		2 gr, n = 51		3 gr, n = 51		4 gr, n = 23	
	r	p	r	p	r	p	r	p	r	p
CHE% GDP	0.35	<0.05	0.39	<0.05	-0.15	> 0.05	0.09	> 0.05	-0.49	< 0.05
CHE\$	0.94	<0.05	0.89	<0.05	0.63	<0.05	0.68	<0.05	0.22	> 0.05
GGHE\$	0.93	<0.05	0.81	<0.05	0.55	<0.05	0.64	<0.05	0.55	<0.05
GGHE%	0.50	<0.05	0.15	> 0.05	0.23	> 0.05	0.49	<0.05	0.29	> 0.05
PHE\$	0.74	<0.05	0.55	<0.05	0.19	> 0.05	0.38	<0.05	0.33	> 0.05
PHE%	-0.29	<0.05	-0.14	> 0.05	-0.12	> 0.05	-0.28	> 0.05	0.25	> 0.05
OOP	-0.39	<0.05	-0.41	<0.05	-0.05	> 0.05	-0.283	<0.05	0.31	> 0.05

income – 58.6%, in the group of countries with below-average – 40.3% and in the group of low-income countries – 23.7%. In the structure of health care expenditures in groups of high-income and above-average incomes, government expenditures predominate. In the structures of health care expenditures in the group of countries with below-average income and in the group of low-income countries, private expenditures predominate (50.5 and 44.5%, respectively). However, only the group of high-income countries differs significantly from other countries in the median PHE% ( $p < 0.001$ ). In this group, the median PHE% is 28.2%. The median share of health expenditures from gross domestic product (GDP) differs significantly only in the group of countries with below-average income from all groups ( $p < 0.001$ ). In this group, the median CHE% GDP is the lowest (4.734%, (3,532-6,292)). In other groups, this figure is higher (7.605%, 6.061% and 6.165% respectively). The group of high-income countries significantly differs in 7 financial indicators (CHE, GGHE \$, GGHE%, PHE \$, PHE%, OOP, CHE% GDP) from other groups of countries ( $p < 0.001$ ). This group of countries has the largest medians on 5 financial indicators (CHE, GGHE \$, GGHE%, PHE \$, CHE% GDP) and the smallest medians on 2 financial indicators (PHE%, OOP) ( $p < 0.001$ ).

The group of countries with above-average income differs from other groups of countries in the medians of 5 financial indicators (CHE, GGHE \$, PHE \$, PHE%, CHE% GDP) ( $p < 0.001$ ). The medians (CHE, GGHE \$, PHE \$, PHE%) in the above-average income group are lower than in the high-income group and higher than in the below-average income group and in the low-income group ( $p < 0.001$ ). The groups of countries with below average income and low income do not significantly differ in the medians of 5 financial indicators CHE, GGHE \$, PHE \$, PHE%, OOP ( $p > 0.05$ ). However, these groups of countries differ significantly in GNI per capita. In the income group below the average, the GNI per capita is \$ 2370, in the low-income group – \$ 720. However, the 5 financial indicators in these countries do not differ significantly, except for the share of government spending on health (GGHE%) and the share of GDP on health (CHE% GDP). In the group of countries with income below the

average median GGHE% (40.3%) is significantly higher than in the group with low income (23.7%) ( $p < 0.001$ ). Groups of countries with below-average income and a group of countries with low income significantly differ in medians CHE, GGHE \$, GGHE%, PHE \$ from the group of high income and above average ( $p < 0.001$ ). There were no differences in the median PHE% and OOP ( $p > 0.05$ ) in the groups with above-average income, below-average income and low income. The median PHE% (28.2%) and the median OOP (18.4%) are the lowest in the group of high-income countries compared to other groups of countries ( $p < 0.001$ ).

Table II presents separately the Pearson correlation coefficients ( $r$ ) between GNI per capita and financial indicators in four groups of countries with different incomes. In each group, some differences were found between GNI per capita and financial indicators. In the group of high-income countries, a positive correlation was found between GNI per capita and 4 financial indicators (CHE% GDP (0.38), CHE (0.89), GGHE (0.81), PHE (0.55)) and negative correlation with OOP (-0.41) ( $p < 0.05$ ). In this group there is no correlation between GNI per capita and GGHE% (0.15), PHE% (-0.14) ( $p > 0.05$ ). In the group of countries with above-average income, a correlation was found between GNI per capita and only 2 financial indicators (CHE (0.63), GGHE (0.55)) ( $p < 0.05$ ). Other financial indicators are not correlating with GNI per capita ( $p > 0.05$ ). In the group of countries with below-average income, a positive correlation was found between GNI per capita and 4 financial indicators (CHE (0.68), GGHE (0.64), GGHE% (0.49), PHE (0.39)) and a negative correlation with OOP (-0.283) ( $p < 0.05$ ). In this group, there is no correlation between GNI per capita and CHE% GDP (0.09) and PHE% (-0.281) ( $p > 0.05$ ). In the group of low-income countries, a positive correlation was found only between GNI per capita and GGHE (0.55) and a negative correlation with CHE% GDP (-0.49) ( $p < 0.05$ ). In this group there is no correlation between GNI per capita and other financial indicators. OOP has a negative correlation with GNI per capita in the group of high-income countries and in the group of countries with below-average income ( $p < 0.05$ ). In other groups of the countries correlation was absent ( $p > 0.05$ ).

## DISCUSSION

Our study found some differences in health care expenditures in high-income, above-average, below-average, and low-income country groups. Each group is characterized by correlation of GNI per capita and financial indicators of health care expenditures.

The four groups of countries with different incomes differ significantly only in the share of government expenditures in the structure of health care expenditures in the country. Government expenditures play the central role in health care expenditures [7, 10]. In our study, it was found that the structure of health care expenditures in high-income and above-average countries is dominated by government expenditures (71.7% and 58.6%), and in groups of countries with below-average and low-income incomes private expenses predominate (50.5% and 44.5%). According to the literature sources, in low-income countries, private expenditures predominate as well in the structure of health care expenditures [11]. In the group of low-income countries, external funding in the structure of health care expenditures is about 30%. low-income countries spend little on health care, waiting for the arrival of foreign aid [5].

According to Jakovljevic M. et al, in order to achieve index 80 of effective coverage of health services, the combined cost of health care (public, private costs and external assistance) must be at least 1398 dollars per capita. [21] According to our data, such expenditures are observed only in the high-income group and in the above-average income group. To estimate the cost of health care in the country, the share of expenditures in the country's GDP is important. According to the literature, the optimal share of health care expenditures in GDP is 7.55% [19]. In our study, it was found that only in the group of high-income countries, this indicator has a median of 7.605% (6.331-9.975). The lowest median CHE% GDP is in the group of countries with below average income (4.734% (3,532-6,292)). It should be noted that the groups with high income, below average and low income on this indicator do not differ significantly (7.605%, 6.061%, 6.165%) ( $p > 0.05$ ).

In our study, we found that the group of high-income countries differs significantly from other groups in all financial indicators. In this group, the largest GNI per capita (12616 and > US \$) and the highest median current health expenditure per capita (US \$ 2091.5 (1249.3-4012.7), the median government expenditure per capita) (US \$ 2216.4 (1432.5-3657.7), median share of public spending on health care (71.7% (58.8-78.6), median of private spending per capita) (\$ 950.9 (657,7-1335,1)). At the same time, this group is characterized by the lowest median share of private expenditures (28.2% (21.4-41.2) and the median share of expenditures from patients' pockets (18.4%) (12,7-29,5). That means that a high level of GNI per capita provides high government expenditures on health care, low shares of private spending in the cost structure, and low shares of direct spending out of patients' pockets. The obtained results are confirmed by the literature [22, 23].

It is known that the data on the population private expenditures on high quality medical services are a key

indicator of financial protection against the catastrophic consequences of treatment and an indicator of achieving the goals of SDGs [1]. As for literature sources in the European Union, the domestic private expenditures on health care make up about 25% of total expenditures [6]. Almost all countries of the European Union belong to the group of high-income countries. In our study, only in the group of high-income countries, this indicator is 28.2%. Groups of countries with above average income (4086 – 12615 US \$), with income below average (1036 – 4085 US \$) and low income (1035 US \$ and <) do not differ significantly in the share of private health care expenditures (40,2%, 50.2%, 44.5% respectively) ( $p > 0.05$ ). In addition, these groups of countries do not differ in the share of patient direct out-of-pocket expenditures (32.3%, 39.4%, 41.6%) ( $p > 0.05$ ). That means that in these groups the shares of private health care expenditures and the shares of direct expenditures from patients' pockets are almost the same. However, private health care expenditures in dollars per capita in the above-average group (\$ 379.0) differ significantly from those in the below-average income (\$ 113.8) and low-income groups (\$ 47.3) ( $p < 0.05$ ). Private health care expenditures in dollars per capita in groups with below-average and low-income incomes do not differ ( $p > 0.05$ ).

Our research results indicate that in the group of 179 countries GNI per capita significantly affects all financial indicators of health care expenditures in the country ( $p < 0.05$ ). GNI per capita has a positive effect on the share of health care expenditures in GDP, on current health care expenditures, on government expenditures and private expenditures, and also has a negative impact on the share of private expenditures in the structure of health care expenditures health and direct out-of-pocket expenditures ( $p < 0.05$ ).

However, in each group of countries with different GNI per capita, there is a certain difference in financial indicators, as well as a difference in the impact of GNI per capita on health care expenditures. We found a significant impact of GNI per capita on 5 out of the 7 financial indicators in the groups of high-income and below-average income countries. That means that the growth of GNI per capita in these groups of countries will affect almost all financial indicators. The increase in GNI per capita in these groups leads to an increase in current health care expenditures, government expenditures in dollars and the share of government expenditures, private expenditures in dollars, as well as a decrease in the share of direct out-of-pocket patient expenditures. In these groups, GNI per capita does not affect the share of government expenditures and the share of private expenditures on health care. That means that health care expenditures are most dependent on GNI per capita in groups of high-income and below-average income countries.

In other groups, the increase in GNI per capita has a positive effect only on 2 financial indicators (current and government expenditures in dollars) in the above-average income group and on 2 indicators (government

expenditures in dollars and the share of expenditures in GDP) in the low-income group. The increase in GNI per capita does not affect other financial indicators in these groups of countries. That means that in these groups, only government expenditures depend on GNI per capita, while private expenditures and direct out-of-pocket expenditures do not depend on changes in GNI per capita. In addition, in the group of low-income countries, it was found that with an increase in GNI per capita there is a decrease in the share of health care expenditures in the country's GDP.

## CONCLUSIONS

The study identified the impact of GNI per capita on health care expenditures in groups of high-income, above-average, below-average and low-income countries. GNI per capita has a significant impact on most financial indicators (5 out of 7) in the high-income and below-average income groups. GNI per capita has a significant impact on only 2 financial indicators, including government expenditures in dollars per capita, in the above-average and low-income groups. The central core of health care expenditures in high-income and above-average countries is government health care expenditures, while in below-average income and low-income groups, private expenditures predominate. The obtained results can be used in strategic planning of health care expenditures in countries with different GNI per capita.

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**Conflict of interest:**

*The Authors declare no conflict of interest.*

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**A** – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis,

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