



“Voluntary health insurance as a source of funding for the health care system: the world’s experience and Ukraine”

AUTHORS
Fedir Zhuravka  <https://orcid.org/0000-0001-8368-5743>
 <http://www.researcherid.com/rid/P-4821-2014>
Olena Zhuravka  <https://orcid.org/0000-0002-1548-1674>
Eugenia Bondarenko  <https://orcid.org/0000-0003-0525-6948>
 <https://publons.com/researcher/3167105>


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Eugenia Bondarenko, 2020

Fedir Zhuravka, Doctor of Economics,
Professor, Department of International
Economic Relations, Sumy State
University, Ukraine. (Corresponding
author)

Olena Zhuravka, Ph.D. in Economics,
Associate Professor, Department of
Finance, Banking and Insurance, Sumy
State University, Ukraine.

Eugenia Bondarenko, Ph.D. in
Economics, Senior Lecturer,
Department of Finance, Banking and
Insurance, Sumy State University,
Ukraine.



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Fedir Zhuravka (Ukraine), Olena Zhuravka (Ukraine),
Eugenia Bondarenko (Ukraine)

VOLUNTARY HEALTH INSURANCE AS A SOURCE OF FUNDING FOR THE HEALTH CARE SYSTEM: THE WORLD'S EXPERIENCE AND UKRAINE

Abstract

In the conditions of insufficient budgetary financing of the health care system and low quality of medical care in the state medical establishments of Ukraine, the importance of extra-budgetary sources of financing becomes increasingly relevant. One such source is voluntary health insurance. The aim of the paper is to compare the state and structure of medical financing in developed countries and in Ukraine, to study the global experience in the functioning of the voluntary health insurance market, and to calculate the potential capacity of the voluntary health insurance sector in Ukraine. For mathematical calculations, 20 absolute indicators of the state of the voluntary health insurance sector, as well as macroeconomic indicators, were used. The annual values of absolute indicators for the period 2010–2019 were used in forming the array of input data. Based on the experience of foreign countries, the paper substantiates the development of the voluntary health insurance in Ukraine as an extra-budgetary source of health care funding. The capacity of the voluntary health insurance sector was defined by the authors as the maximum possible amount of insurance premiums that insurers can receive in the process of selling voluntary health insurance products. The calculations made it possible to conclude that the voluntary health insurance market in Ukraine has the potential for development, as evidenced by the predominance of the potential capacity of the voluntary health insurance segment over its real indicator.

Keywords insurance market, health insurance, medical insurance, healthcare, medical funding, market capacity

JEL Classification G20, G22

INTRODUCTION

In the conditions of financial, social and political crisis, which are typical for Ukraine, the state cannot ensure the stability of social assistance to its citizens. The most important aspect of social assistance is ensuring the human right to affordable, qualified and high-quality medical care, as provided by the legislation of Ukraine and international standards.

Since its independence, the medical financing by the state has prevailed in Ukraine, but it is not viable. The lack of financial resources imposes significant constraints on the development of medical institutions' infrastructure and the level of health care quality. The deterioration of the financial and economic situation in Ukraine has led to the narrowing of the state's financial capacity to provide the population with quality medical services from budget resources. The existing funding system needs urgent reforming. The world's experience shows that insurance medicine is an effective mechanism for social protection of the population in market conditions, improving the efficiency and quality of the health care system.

Each country's health care system is funded from a variety of sources: budget funding, compulsory health insurance, voluntary health insurance and direct payments of the population. The level of health care expenditures depends on a wide range of demographic, social and economic factors, as well as on the financial and organizational arrangements of the health care system. The issue of finding new sources of medical funding in Ukraine is currently very relevant for several reasons: the medical reform is one of the conditions for Ukraine's European integration; Ukraine is a country with a high percentage of elderly people in the general population structure; Ukraine is a country with a low level of public health. Insurance-based financing of medicine will reduce the burden on the national economy in the social security sector.

It should be noted that the health care reform in Ukraine was launched in 2016, in the context of which mechanisms are actively developed to improve the financing of the health care system, including those based on the introduction of compulsory health insurance. In the context of the reform, the Law of Ukraine "On State Financial Guarantees of Public Health Care" of October 19, 2017, Number 2168-VIII was adopted. It specifies the program of state health care guarantees that determines the list and scope of medical services (including medical devices) and medicines, the full payment of which from the State budget of Ukraine is guaranteed to patients. The amount of funds of the State Budget of Ukraine allocated for the implementation of the program of medical guarantees is annually defined in the Law of Ukraine "On the State Budget of Ukraine" as a share of gross domestic product not less than 5% of gross domestic product of Ukraine. However, in recent years this figure has not exceeded 3.3%.

The definition of state medical care guarantees is only the first step towards full-fledged medical reform in Ukraine. The next step of the reform is the creation of an optimal model of health insurance through a combination of compulsory and voluntary health insurance. However, it can be stated that today there is no comprehensive approach to reforming the mechanism of financing the domestic health care sector on the basis of compulsory health insurance.

The introduction of compulsory health insurance requires the solution of a number of problems at the state level, which depends on the availability of political will, the creation of appropriate financial conditions, the formation and development of public consciousness. The need for compulsory state social health insurance in Ukraine determines the current state and procedure for financing the health care sector, the main drawback of which is the use of the only significant source of funding – budgetary resources. Therefore, the development of voluntary health insurance is an objective need that can improve the level of public health, to ensure the flow of funds into health care. All of the above actualizes the chosen research topic.

The article has the following structure: Section 1 contains a review of the literature, which analyzes the research of domestic and foreign authors on the existing experience in the organization of health care financing in different countries, including through voluntary health insurance. Section 2 provides the information base and research methods. Section 3 is devoted to the comparison of the state and structure of medical financing in the developed countries and in Ukraine; it considers the European experience in the functioning of voluntary health insurance. In addition, it presents the results of the study and their economic interpretation. The last section contains conclusions about the conducted study.

1. LITERATURE REVIEW

In recent decades, the issue of providing the population of different countries and humanity as a

whole with quality and affordable medical services has become very relevant. This is due to the "aging" of the population and declining birth rates in most developed countries, forcing their

governments to increase the retirement age, thus covering the need for young workforce. For older people the need to work is linked to the need to maintain their health for as long as possible, which is only possible through the government's provision of the high quality of life and high quality of health care. High-quality and affordable medicine needs adequate funding, which is why the question of building an effective model for financing medical systems around the world is the subject of research by many scientists.

Yehorycheva et al. (2020) clarified the features of the insurance market's innovation, including medical insurance, by reviewing the literature and analytical data.

Fan and Savedoff (2014) in their study analyzed the cost of medical services in 126 countries, using the data from the period 1995–2009. As a result of the analysis they identified two key trends: on average the cost of per capita health care increases, while the share of the population's own expenditures on medical services decreases. According to the authors, the amount of medical funding depends more on public policy than on the level of state revenues.

Levantesi et al. (2020) investigated the potential of Machine Learning in predicting mortality and consequently improving the longevity risk quantification and management, with practical implication on the pricing of life products with long-term duration and lifelong guaranteed options embedded in pension contracts or health insurance products.

Cherkasova et al. (2020) highlighted the main factors that influence the formation of the Ukrainian insurance companies' investment portfolio and gave recommendation for overcoming a number of related difficulties.

Okhrimenko and Manaienko (2019) substantiated scientific and practical essentials concerning the formation of life insurance companies' reputation in conditions of market competition aggravation and insurance market conjuncture volatility.

Ali and Tausif (2018) profoundly studied the main directions of the Saudi Arabian insurance

market. A special attention was paid to the development of its' medical insurance segment.

Kutzin et al. (2010) in their study focused on the analysis of the experience of medical financing reforms in Central Europe, Eastern Europe, the Caucasus and Central Asia. The criteria for evaluating the reforms were the conceptual requirements first set out in the World Health Organization's 2000 World Health Report (WHO) and subsequently adopted by all member states of the European Region. Based on the analysis, the book's authors developed a number of mandatory provisions that must be taken into account by the government of each country, which seeks to implement the reform of medical funding.

It is interesting to consider China's experience in implementing its medical financing reform, which is studied in detail by Liu and Mills (2002). The funding for public health care reforms in China is characterized by the reduction in state budget support and the introduction of special fees. Prior to the funding reform, the state budget support in 1980 covered all costs of public health facilities, while after the reforms by the mid-1990s the government's contribution to the revenues of medical institutions fell to 30-50%, barely covering the salaries of health workers. Such market-oriented funding reform has improved the performance of public health facilities, but several unintended consequences have become apparent. First, the reduction in the role of government in financing public health services is likely to reduce the overall efficiency of the health sector. Second, charging for health services can reduce the demand for these services and increase the risk of developing a disease. Third, market-oriented reforms of the public health funding should not be considered as a policy option. The Chinese experience suggests that the government should play a very active role in funding public health services to provide decent health care for every member of society.

In addition to analyzing the existing experience of implementing funding systems in different countries around the world, researchers pay considerable attention to the prospects for the development of medical financing, taking

into account the latest trends in technologies. From this position, the work of a group of scientists who are members of the Global Burden of Disease Health Financing Collaborator Network (2018) is important. The researchers conducted a detailed analysis of data related to health care financing from 188 countries in the period from 1995 to 2015, which made it possible to estimate future scenarios of health care costs and combined health care expenditures until 2040.

The Russian scientist Antropov (2019) considered the peculiarities of organization and financing of health care models in European countries and the possibilities of using their experience in the system of organization of health care financing in the Russian Federation. The article examines the current state of two models of health care financing in the EU – budgetary and insurance. Using the examples of individual European countries he assesses the peculiarities of functioning of each model, their advantages and drawbacks.

Domestic scientists also pay considerable attention to the study of experience and opportunities for financing the health care system, as Ukraine has a large number of unresolved issues in this area. Sokyryko et al. (2018) investigated the dynamics of financing the health care system through the expenditure side of the budget and insurance companies. The article describes health care systems according to the types of funding. The experience of Estonia, the Netherlands and the USA on the issues related to the introduction and peculiarities of functioning of health insurance systems has been analyzed. The main changes envisaged by the medical reform in Ukraine and the consequences of a full transition to the health insurance system have been considered.

Also, domestic scientists pay considerable attention to the study of the health insurance market, especially the voluntary one. Sova (2018) identified the main problems of health insurance development in Ukraine. The author studies the availability of health insurance for the population, analyzes the state of reforms in the industry. Measures have been proposed for state authorities and private insurance companies that

will contribute to the expansion of health insurance in Ukraine.

Gataullina (2018) considered the key trends on the market of voluntary health insurance, analyzed its main advantages and drawbacks that affect the development of the market of voluntary health insurance in Ukraine, studied the financial performance of insurance companies in the field of voluntary health insurance.

Despite the large number of studies on this topic, the issue of determining the optimal structure of medical financing in Ukraine remains unresolved, which leads to the growing interest in the analysis of foreign experience. In addition, it is important to find effective extra-budgetary sources of medicine funding in Ukraine, one of which may be the development of voluntary health insurance. Consequently, it is advisable to determine the prospects for the development of the market of voluntary health insurance by assessing its potential capacity.

2. DATA AND METHODS

The World Bank's reporting and analytical data on health care financing in various countries of the world (25 countries, including Ukraine) and the data of the official website Insurance Europe (17 European countries and Ukraine) were used for the analysis. The World Bank's data are presented for the period 2010–2017, as no data is available for later period. The Insurance Europe's statistics are provided for the period 2010–2018, as the report on the EU insurance market for 2018 is the last one presented on the website.

The models used in economic and mathematical analysis were used to calculate the capacity of the voluntary health insurance sector. The calculation was conducted in several stages (Figure 1). For mathematical calculations, 20 absolute indicators of the state of macroeconomic development and the development of the insurance market in Ukraine were used. The methods used in the process of calculating the capacity of voluntary health insurance include: correlation, data normalization (natural normalization, Savage normalization), analytical equalization, Fishburne's formula.

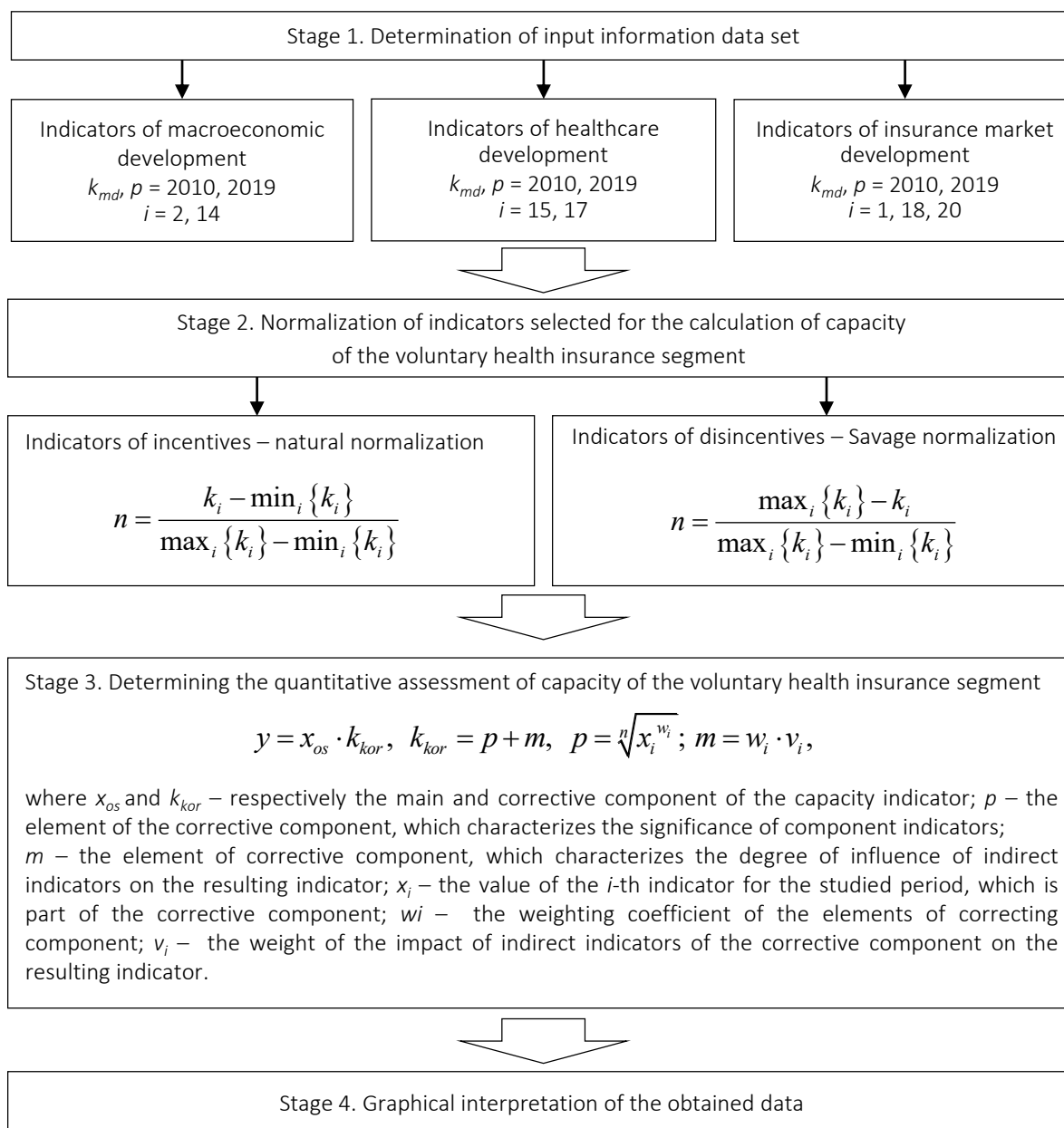


Figure 1. Stages of capacity calculation for the voluntary health insurance sector

3. RESULTS

Under the conditions of insufficient budgetary funding for health care, the importance of extra-budgetary sources of financing is growing. One of these sources is voluntary health insurance. In the context of the research topic it is necessary to consider the sources and the structure of medical funding in foreign countries and in Ukraine.

There are the following macroeconomic indicators of the level of financing of the health care

system: current health expenditure (% of GDP), current health expenditure per capita (USD), domestic general government health expenditure (% of GDP), out-of-pocket expenditure (% of current health expenditure). The main indicator is the current health expenditure (% of GDP). According to Table 1 of Annex A, for most countries in the sample there is a general trend toward an increase of this indicator for the studied period (2010–2017). Exceptions are only countries such as Turkey, Moldova, Georgia, Greece, Italy and Spain. At the same time, the following relationship can be not-

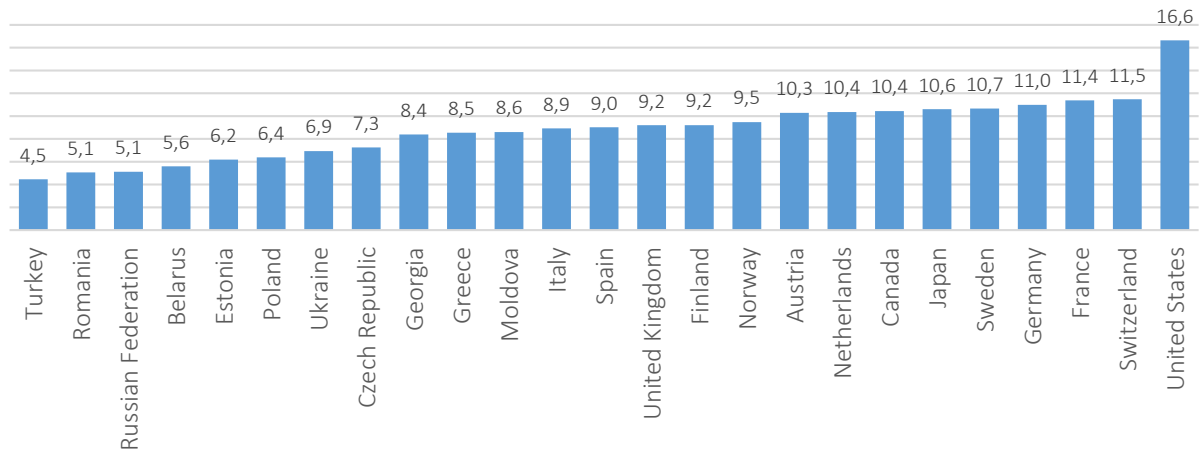


Figure 2. Average current health expenditures (2010–2017), % of GDP

ed: in developed countries the share of total health care expenditures in GDP is on average twice as high as in developing countries.

Based on the data about the average values of current health care expenditures, countries are divided into two groups (Figure 2). In Eastern Europe and in Turkey this indicator ranges from 4 to 9%. In Western Europe, Canada and Japan the figure is in the range of 9-11.5%. The US has the highest level of health care expenditures, which is 16.6% of GDP.

If we consider the experience of Ukraine (Figure 3), the dynamics indicates fluctuations in this indicator, the highest value of which was observed in 2013 (7.4%), the lowest in 2014 (6.6%), in subsequent years the indicator is characterized by an upward trend up to 7% in 2017. The sharp decline in 2014 was caused by many external and internal political and economic factors, but the main ones included: the annexation of Crimea, the beginning of hostilities in Donbass, internal political instability, the devaluation of the national currency by more than two times. In general, compared to the foreign experience, health care financing in

Ukraine is characterized by its low level.

The indicator that reflects the cost of medical care and health care products, the total level of consumption of medical services by the population in the country is the current health expenditure per capita (USD). The dynamics of the average current health care per capita expenditures is presented in Table A2 of Annex A, and the ranking by country in ascending order is presented in Figure 4.

In a number of European countries (Moldova, Greece, Spain, Italy), which were joined by Ukraine, there is a tendency towards the annual reduction of this indicator. In such countries as Austria, Germany, Sweden, Norway, Switzerland, the United States, this indicator grows every year. In addition, it should be noted that even such high-income countries as Germany, France, the United Kingdom, Italy, Canada and Japan spend only about half or less on health care per capita than the United States or Switzerland. Moldova, Ukraine, Georgia and Belarus have the lowest indicator.

The dynamics of per capita health care expenditures in Ukraine for the study period is present-

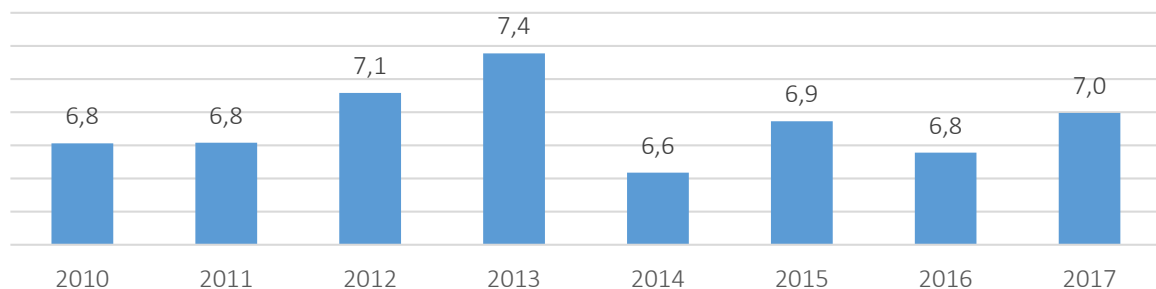


Figure 3. Current health expenditure (% of GDP), Ukraine, 2010–2017

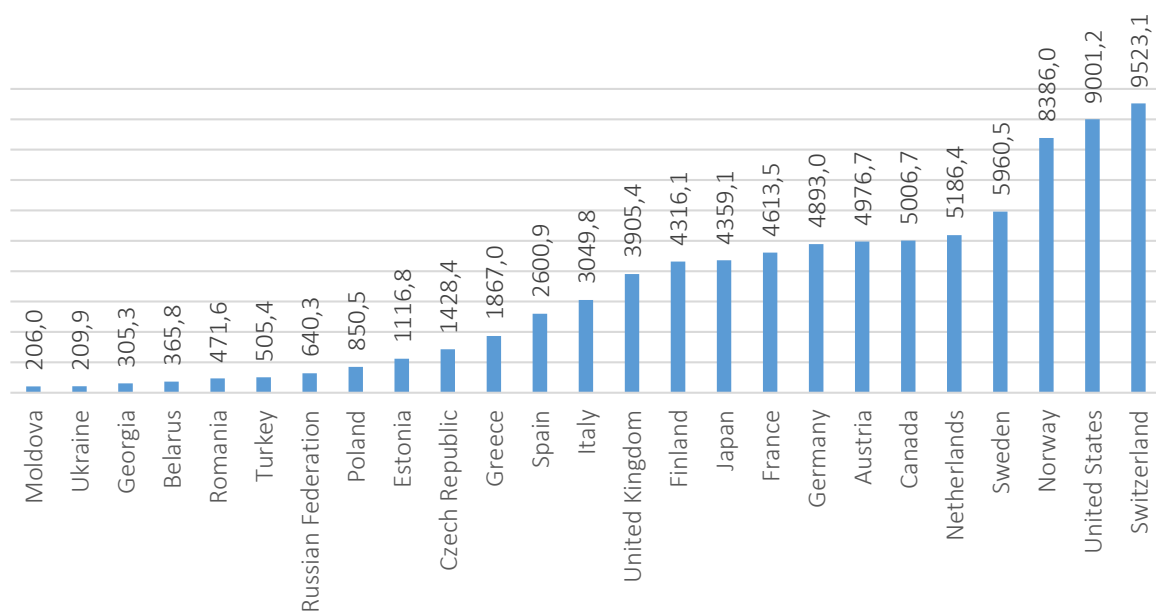


Figure 4. Average current health expenditure per capita (2010–2017), USD

ed in Figure 5. In 2017 the total per capita health care expenditures in Ukraine were 174.4 US dollars, which is almost two times less than in neighboring Belarus, five times less than in Poland and tens of times less than in the leading countries of Western Europe, Canada or the United States. A significant reduction in health care per capita expenditures occurred in 2014 and lasted until 2016, which was caused by the gradual depreciation of the Ukrainian national currency.

The next important indicator that reflects the budgetary funding of the health care system is the domestic general government health expenditure (% of GDP). The dynamics of the indicator for selected countries in 2010–2017 is presented in Table

A3 of Annex A, and the average value of the indicator is presented in Figure 6.

On average, in such developed countries as the United States, Canada and Japan, domestic public health expenditures accounted for 7-9% of GDP. For the group of Eastern and Central European countries this indicator is in the range of 4-6%. Finally, in countries such as Georgia, the Russian Federation, Ukraine, Turkey and Moldova, domestic public health expenditures averaged only 3% of GDP. The dynamics of this indicator in Ukraine for the period 2010–2019 is presented in Figure 7.

The data of Figure 7 indicate a very low (compared to other countries) level of budgetary funding for

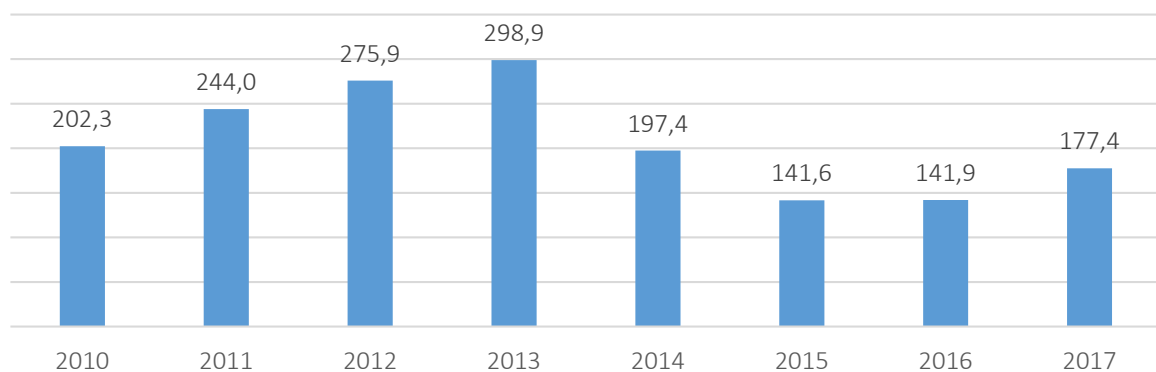


Figure 5. Current health expenditure per capita in USD, Ukraine, 2010–2017

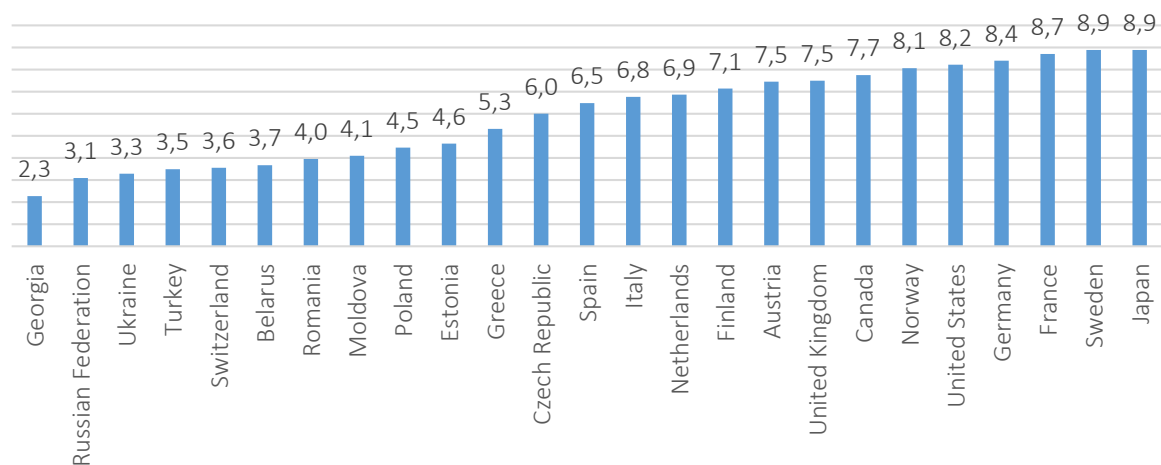


Figure 6. Average domestic general government health expenditure (2010–2017), % of GDP

medicine. Although the Law of Ukraine “On the State Budget” declares the financing of medicine at the level of at least 5% of the country’s GDP, we see that for the entire study period this figure did not exceed 3.8% (in 2013).

The various funding mechanisms in the field of health care are divided according to their mandatory or voluntary nature. The mandatory ones are funding schemes organized at the national or regional level, or for specific groups of the population. An alternative to budgetary funding is a system of compulsory health insurance (through public or private organizations), which covers the bulk of costs of the used medical services. Taken together, state schemes and the compulsory health insurance are the main funding mechanisms in many countries around the world. On average, about 3/4 of all health care costs are covered by these types of mandatory funding schemes. The compulsory social health insurance guaranteed by the state is the dominant source of health care funding in most European countries. However,

there are countries, in which budgetary funding predominates, accounting for about 80% or more of all health care expenditures (Norway, Sweden and the United Kingdom). Voluntary elements of health care financing are domestic private health expenditures (which also include out-of-pocket spending) and external health expenditures. Voluntary health insurance costs are included in private expenditures.

The structure of distribution of the current health care costs by financial resources in different countries is shown in Figure 8.

According to the histogram, in most developed countries of the European Union, as well as in Japan and Turkey, governments seek to maintain the principles of health care based on budgetary funding or compulsory health insurance, and to make health care available to every citizen regardless of his solvency. In these countries, public health expenditures account for more than 70% of total expenditures, in contrast to the United States

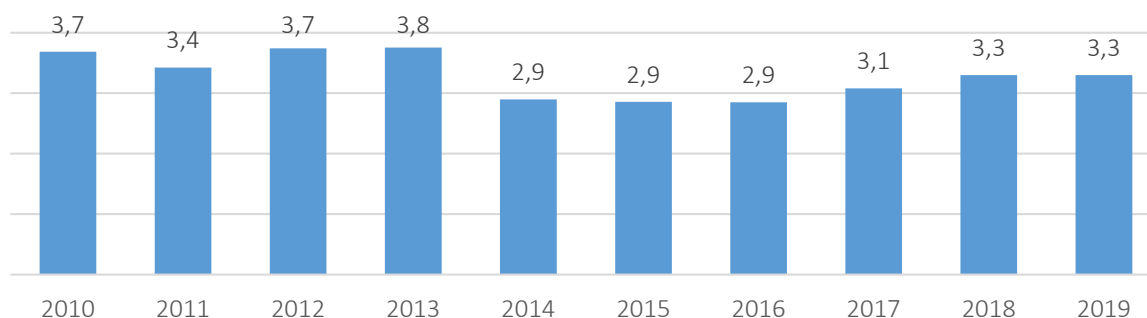


Figure 7. Domestic general government health expenditure (% of GDP), Ukraine, 2010–2019

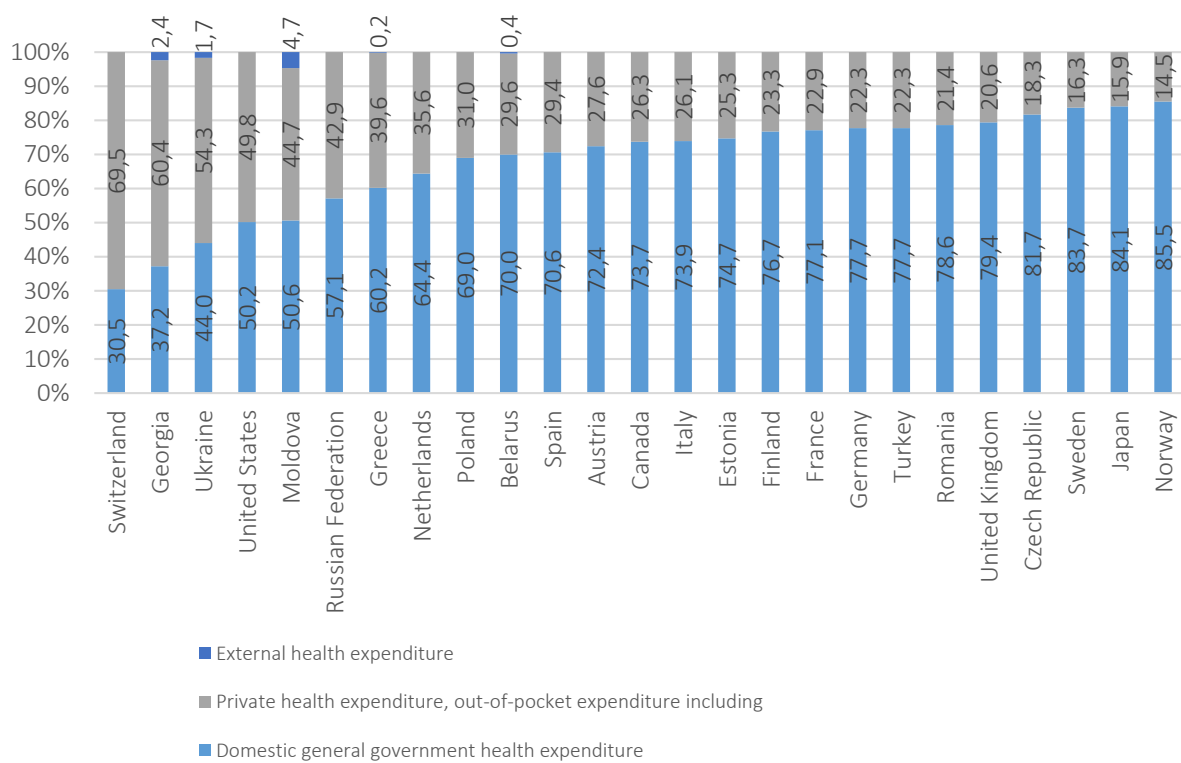


Figure 8. Structure of current health expenditure by financial resources

and Switzerland, where private expenditures play the leading role in health care financing, most of which is formed by an extensive voluntary health insurance market. External health care expenditures are characteristic only for such countries as Ukraine, Moldova, Greece, Belarus, Georgia.

The structure of sources of health care funding in Ukraine is presented in Figure 9.

The data of Figure 9 show that in conditions of insufficient budgetary funding of the health care system, the share of private and external expenditures grows every year. Since 2014, extra-budgetary sources of health care funding exceed 50%. Moreover, if we analyze what share of direct costs of households (out-of-pocket spending) are part of total expenditures, as shown in Figure 10, it appears that for Ukraine they are an important ele-

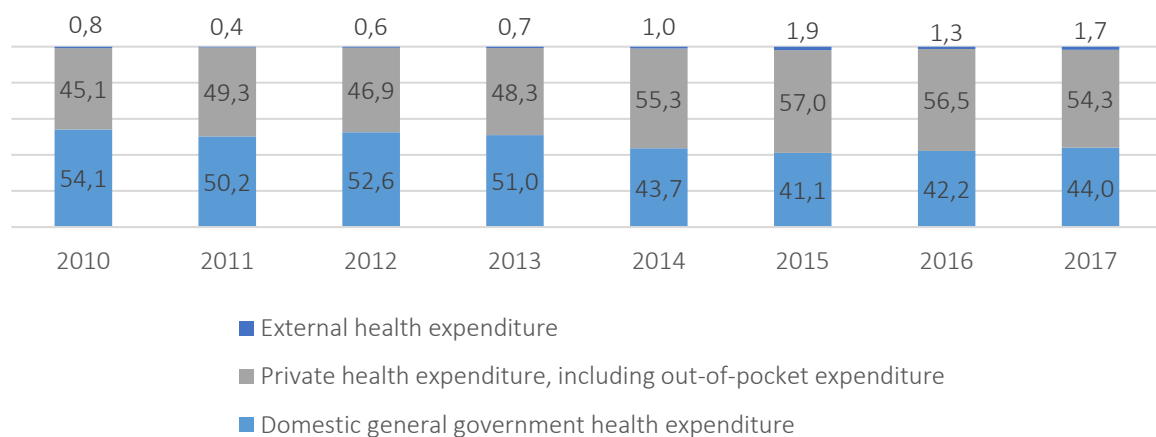


Figure 9. Structure of current health expenditure by financial resources, Ukraine, 2010–2017

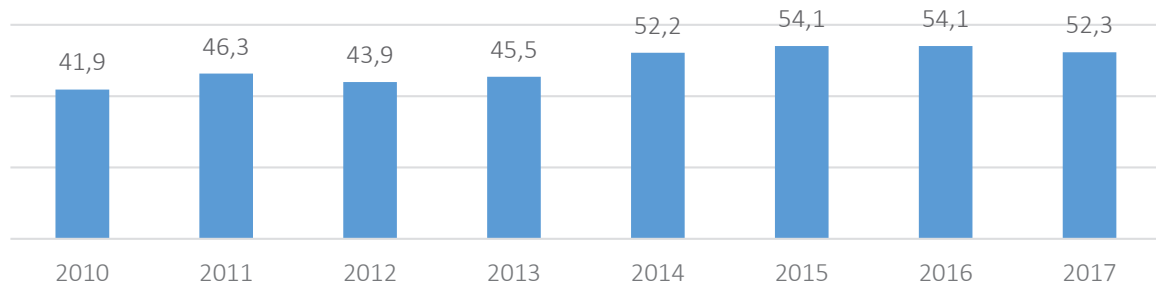


Figure 10. Out-of-pocket expenditure (% of current health expenditure), Ukraine, 2010–2017

ment of health care financing, as their share ranges from 42 to 52%. Therefore, it can be hypothesized that in Ukraine voluntary health insurance in its various forms may play an important role in health care financing, as health insurance payments are direct expenditures of households.

The conducted analysis of the sources of health care funding in 25 countries makes it possible to conclude that there is insufficient funding of health care (according to almost all indicators Ukraine occupies the last position among the selected countries). The current situation requires the search for new sources of funding. The development of voluntary health insurance can be a promising source of additional health care funding. The relevance of the voluntary health insurance for the Ukrainian population is also due to the fact that people already pay for more than half of their needs in medical services out of their pockets. In addition, over the past 30 years the mentality of the average Ukrainian has changed significantly: if previously it was considered that the financing of medicine was purely the responsibility of the state, now the majority of people agrees to take responsibility for organizing the level of medical services they need by paying for the services of private med-

ical institutions or by buying health insurance policies.

Therefore, the goal of further research will be to analyze the experience of European countries in the use of voluntary health insurance as an additional source of funding for the health care system.

In the structure of gross premiums of the European insurance market in 2018 the share of health insurance was 11.41% (Figure 11). Voluntary health insurance is present in all European countries in one way or another. From an economic point of view, voluntary health insurance is a mechanism to compensate citizens for the costs and losses associated with the onset of illness or accident, which are not covered by budgetary funding systems or compulsory health insurance. However, in European countries this segment of the insurance market is represented by different shares, because in different European countries the coexistence of public and private health care systems is carried out in different proportions.

The choice of the form of health insurance in each country depends on the specific economic and cultural-historical conditions, the characteristics of demographic and social indicators, the general level of economic development and other factors that char-

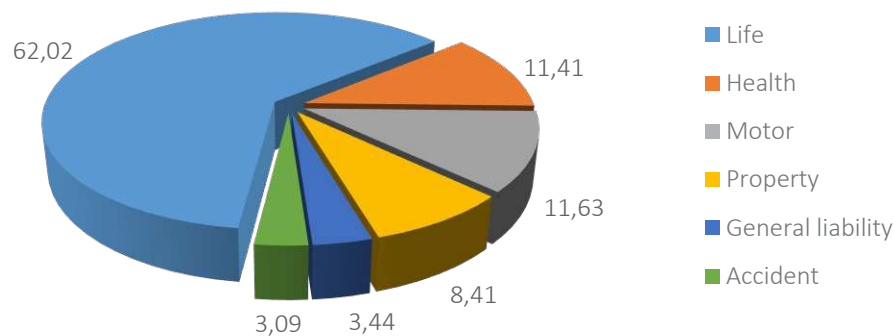


Figure 11. Structure of gross direct health premiums written on domestic market in Europe, %, 2018

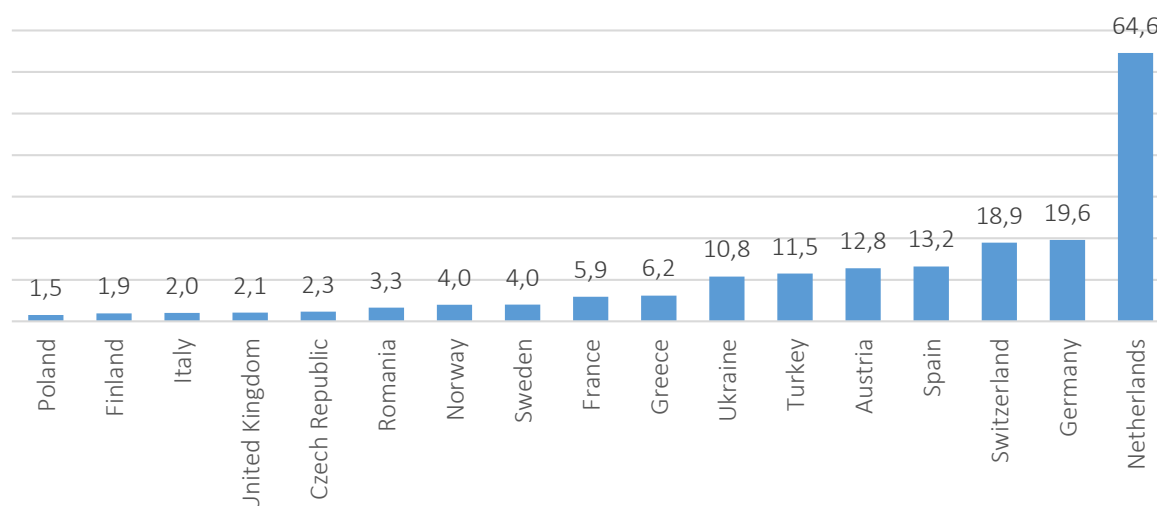


Figure 12. The share of health insurance in gross insurance premiums, %

acterize the level and cost of health care. For example, according to Table A4 of Annex A and Figure 12, there are countries where voluntary health insurance plays an important role, namely the Netherlands (64.6%), Germany (19.6%), Switzerland (18.9%), Spain (13.2%), Austria (12.8%), Turkey (11.5%). In other sampled countries, this figure ranges from 1.5 to 10%.

In Ukraine, the share of voluntary health insurance has doubled from 6.1% in 2010 to 12% in 2019. The data show an increase in demand for voluntary health insurance in Ukraine, which is explained by the fact that state expenditures on health care development are not sufficient to fully finance the health care system of (Figure 12). It should be understood that although this share is higher than in many European countries, the volume of the insurance market is incomparably small compared to European markets. Therefore, the amount of the collected insurance premiums is a small share in the financing of medicine in Ukraine. In addition, the availability of a health

insurance policy in Ukraine is the exception rather than the rule among the population. All this presupposes the presence of significant potential for the development of the health insurance market and the insurance market in general.

Figure 13 shows the dynamics of the share of health insurance in its total volume in 2010–2019.

The data in Figure 13 show instability in the dynamics of the health insurance share. In 2016–2017, there was a significant decline in market share, which was caused by a decrease in the solvency of the population as a result of certain economic and political factors, and especially the devaluation of the Ukrainian national currency. The period of 2018–2019 is characterized by growth dynamics, which is due to a greater decrease in funding for medicine in these years against the background of the military conflict in the East and the allocation of a larger share of budgetary expenditures to finance the military sector.

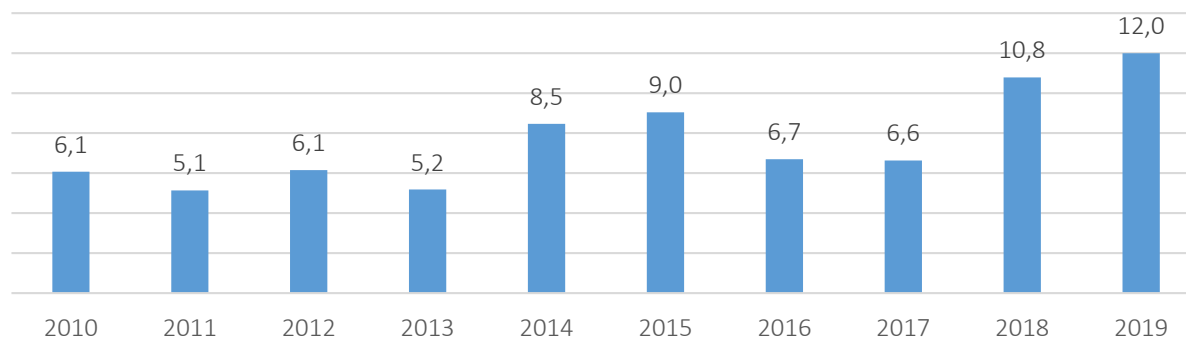


Figure 13. The share of health insurance in gross insurance premiums, Ukraine, %, 2010–2019

All this raises the issue of assessing the potential capacity of the voluntary health insurance sector, which will provide data for assessing the prospects of this source of funding for health care in Ukraine. In addition, the calculation of the segment's capacity will show to insurance companies opportunities to develop health insurance as a promising source of growth in profitability of insurance companies. For the population of Ukraine this will give prospects for improving the quality of medical services and financing of medicine from extra-budgetary sources.

Table B1 of Annex B presents indicators that directly and indirectly characterize the development of voluntary health insurance in Ukraine in 2010–2019.

The study will substantiate the choice of indicators characterizing the segment of voluntary health insurance in Ukraine. Since this segment of the insurance market significantly depends on the country's macroeconomic development and the well-being of its citizens, in addition to standard indicators of the insurance market (in terms of voluntary health insurance), we chose macroeconomic indicators: GDP, per capita GDP, household income, average monthly wages, profitability of enterprises, subsistence level for 1 person and others.

To select the indicators that best describe changes in the resulting indicator, a correlation between $x_2 - x_{20}$ and x_1 was carried out, because x_1 was chosen by as the resulting indicator. The following indicators were selected for the analysis: GDP x_2 (correlation coefficient – 0.982), GDP per capita x_3 (0.981), population x_4 (–0.853), income of the population x_7 (0.987), average monthly nominal salary x_8 (0.988), subsistence level per 1 person x_{14} (0.981), number of hospitals x_{15} (–0.895), expenditures of the state budget of Ukraine on health care x_{17} (0.928), gross insurance premiums x_{18} (0.969), gross insurance payments x_{19} (0.94) and gross insurance payments under voluntary health insurance x_{20} (0.998).

At the second stage of calculations, the selected indicators were normalized in order to bring them into a comparable form. All indicators were divided into two groups: stimulants and disincentives. Stimulants include indicators that lead to an increase in the resulting indicator, which in accordance with the purpose of our study is the amount of insurance premiums for voluntary health insurance. All indi-

cators that we have chosen for the calculations, x_4 and x_5 , are stimulants, as their growth will lead to an increase in the resulting indicator. The normalization of such data is carried out by the method of natural normalization. The normalization of disincentives is carried out according to Savage's formula. The results of normalization of the study's information base are systematized in tabular form (Table B2, Annex B).

At the third stage, the capacity of the voluntary health insurance sector was calculated. Since the capacity of the insurance market's segment is calculated, the capacity is understood as the maximum possible amount of insurance premiums that insurers can receive in the process of selling this insurance product based on the current state of the insurance market, economy and welfare of the population.

To make calculations, it is necessary to determine the function (growth curve), which describes the amount of gross premiums for voluntary health insurance in Ukraine in 2010–2019. To determine the type of growth curve, the method of analytical alignment was used. Analytical alignment of the time series involves the finding of analytical function, $\hat{y} = f(t)$ which characterizes the main trend of changes in the level of the series over time.

To determine the type of growth curve, the brute-force method was chosen, which involves the calculation of values for the coefficient of determination R^2 . The graph of the volume of gross premiums for voluntary health insurance in Ukraine and the calculation of coefficients of determination were carried out by using the MS Excel package. The results of the calculations are presented in Table 1.

Table 1. Interim calculations to determine the type of growth curve for the volume of gross premiums of the voluntary health insurance in Ukraine in 2010–2019

Type of function	The value of determination coefficient R^2
Exponent	0.9624
Linear	0.9039
Logarithmic	0.7169
Polynomial	0.972
Exponential	0.9347

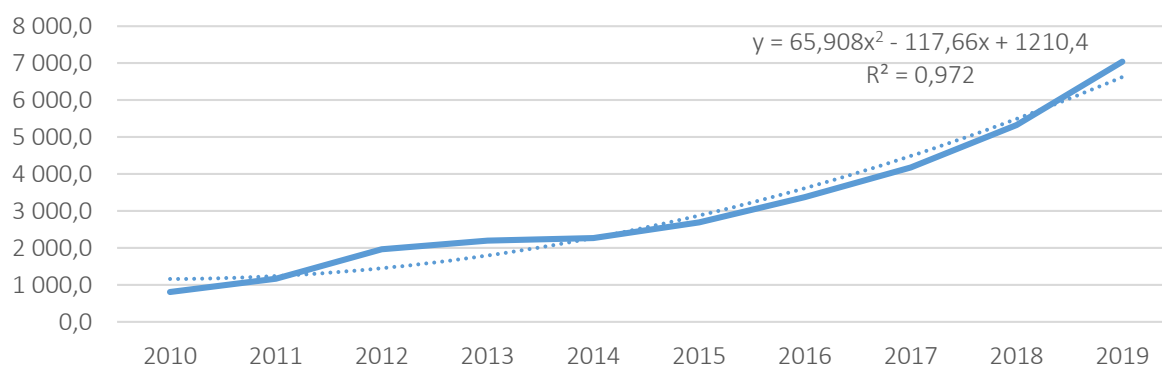


Figure 14. Determination of the type of growth curve for the volume of gross premiums of voluntary health insurance in Ukraine in 2010–2019

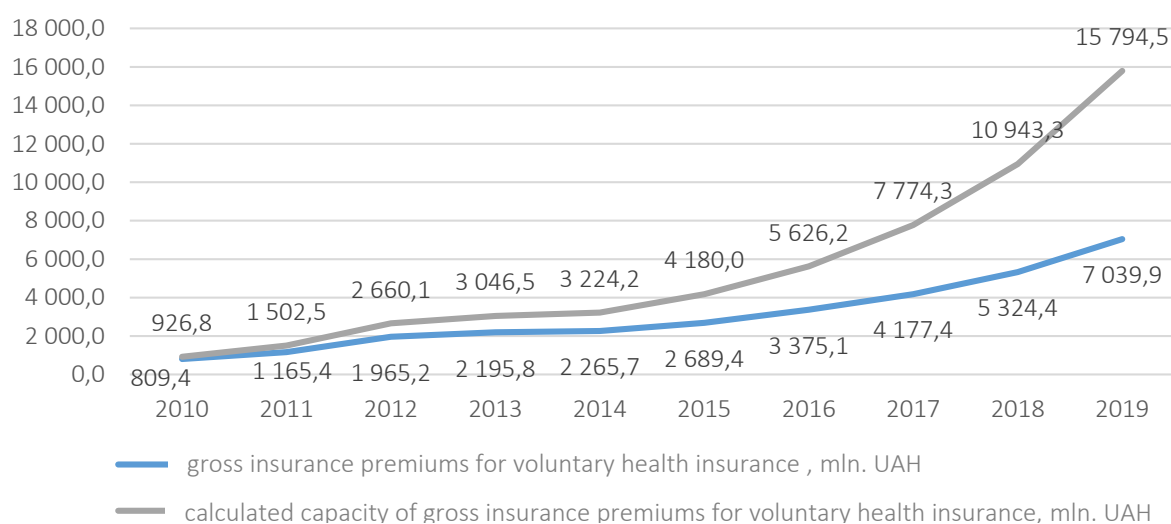


Figure 15. Real values of gross insurance premiums for voluntary health insurance in Ukraine and the values of this segment's capacity in the period 2010–2019

Table 2. Results of calculations of the adjustment factor and capacity of the segment of voluntary health insurance in Ukraine for the period 2010–2019

Year	Adjustment factor	Capacity of the voluntary health insurance segment, million UAH
2010	1.145	926.8
2011	1.289	1502.5
2012	1.354	2660.1
2013	1.387	3046.5
2014	1.423	3224.2
2015	1.554	4180
2016	1.667	5626.2
2017	1.861	7774.3
2018	2.055	10943.3
2019	2.244	15794.5

The coefficient of determination R^2 assumes a value in the range from zero to one $0 \leq R^2 \leq 1$ and reflects what part of the resulting indicator's variance y is explained by the regression equation. The higher the value of R^2 , the better this model agrees with the data of observations.

The results of calculations of the adjustment factor and the resulting indicator (capacity of the segment of voluntary health insurance) are shown in Table 2.

The graph shows the real volume of the received gross insurance premiums on voluntary medical

insurance and the values of this segment's capacity for the period 2010–2019 (Figure 15).

The graph shows that throughout the study period the potential capacity of the voluntary health insurance segment exceeded the real figure, which demonstrates the adequacy of calculations. This conclusion is made based on the fact that market capacity is the maximum possible volume of sales of services on this market, and its real value is adjusted under the influence of economic, political, social and other factors.

CONCLUSION

The analysis of sources for health care funding in 25 countries allows concluding that there is insufficient funding for medicine in Ukraine, as according to almost all indicators this country occupies the last position among the selected countries. In Ukraine, the total health care per capita expenditures amounted to 174.4 US dollars, which is almost two times less than in neighboring Belarus, five times less than in Poland, and ten times less than in the leading countries of Western Europe, Canada or the United States. Since 2014, extra-budgetary sources of health care funding have exceeded 50%, with a significant increase in direct household expenditures (out-of-pocket spending), the share of which ranges from 42 to 52%.

The current situation requires the search for new sources of funding. The development of voluntary health insurance can be a promising source of additional health care funding. The analysis of the market of voluntary health insurance of the European countries and Ukraine leads to the following conclusions:

- for almost a third of the considered 17 European countries health insurance is an important source of medical funding. These countries include the Netherlands (64.6%). Germany (19.6%). Switzerland (18.9%). Spain (13.2 %). Austria (12.8%). Turkey (11.5%);
- in Ukraine, the share of voluntary health insurance among gross insurance premiums is high, but the volume of the insurance market is incomparably small compared to the European markets; therefore, the amount of the collected insurance premiums is a small share in the financing of medicine in Ukraine.

To assess the prospects of voluntary health insurance as a source of health care funding in Ukraine, the calculation of potential capacity of the voluntary health insurance segment was carried out. The calculations made it possible to conclude that the voluntary health insurance sector in Ukraine has the potential for development, as evidenced by the predominance of potential capacity of the voluntary health insurance segment over its real indicator. In addition, this predominance confirms the adequacy of the conducted calculations.

For insurance companies, the obtained data about this segment's potential capacity is the evidence on the possibilities of health insurance development in Ukraine, and for the population and the government – the possibility to increase health care funding from this source. In addition, it should be noted that the capacity of the voluntary health insurance sector is calculated based on the existing conditions.

Therefore, with the change of conditions there will be a corresponding change in market capacity. This statement suggests that under the conditions of economic growth and increasing welfare of the population, there will be an increase in potential capacity, which will be caused by the growth of effective demand from the population.

AUTHOR CONTRIBUTIONS

Conceptualization: Olena Zhuravka, Eugenia Bondarenko.

Data curation: Eugenia Bondarenko.

Formal analysis: Olena Zhuravka.

Investigation: Olena Zhuravka.

Methodology: Eugenia Bondarenko.

Project administration: Fedir Zhuravka.

Resources: Olena Zhuravka.

Software: Eugenia Bondarenko.

Supervision: Fedir Zhuravka.

Validation: Fedir Zhuravka.

Visualization: Eugenia Bondarenko.

Writing – original draft: Olena Zhuravka, Eugenia Bondarenko.

Writing – review & editing: Fedir Zhuravka.

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APPENDIX A

Table A1. Current health expenditure (% of GDP)

Country	2010	2011	2012	2013	2014	2015	2016	2017
Turkey	5.1	4.7	4.5	4.4	4.3	4.1	4.3	4.2
Romania	5.8	4.7	4.7	5.2	5.0	4.9	5.0	5.2
Russian Federation	5.0	4.8	4.9	5.1	5.2	5.3	5.3	5.3
Belarus	5.7	4.9	5.2	5.7	5.4	6.1	5.9	5.9
Estonia	6.3	5.8	5.8	6.0	6.1	6.4	6.5	6.4
Poland	6.4	6.2	6.2	6.4	6.4	6.4	6.5	6.5
Ukraine	6.8	6.8	7.1	7.4	6.6	6.9	6.8	7.0
Moldova	10.1	9.1	9.1	8.7	8.6	8.6	7.5	7.0
Czech Republic	6.9	7.0	7.0	7.8	7.7	7.2	7.1	7.2
Georgia	9.5	8.4	8.4	8.4	8.4	7.9	8.4	7.6
Greece	9.6	9.1	8.9	8.4	7.9	8.1	8.3	8.0
Italy	9.0	8.8	9.0	9.0	9.0	9.0	8.9	8.8
Spain	9.0	9.1	9.1	9.0	9.0	9.1	9.0	8.9
Finland	8.9	9.0	9.3	8.7	9.5	9.7	9.4	9.2
United Kingdom	8.4	8.4	8.3	9.8	9.8	9.7	9.7	9.6
Netherlands	10.2	10.2	10.5	10.6	10.6	10.3	10.3	10.1
Austria	10.2	10.0	10.2	10.3	10.4	10.4	10.4	10.4
Norway	8.9	8.8	8.8	8.9	9.3	10.1	10.5	10.4
Canada	10.7	10.4	10.3	10.2	10.1	10.5	10.7	10.6
Japan	9.2	10.6	10.8	10.8	10.8	10.9	10.8	10.9
Sweden	8.5	10.7	10.9	11.1	11.1	11.0	11.0	11.0
Germany	11.0	10.7	10.8	10.9	11.0	11.1	11.1	11.2
France	11.2	11.2	11.3	11.4	11.6	11.5	11.5	11.3
Switzerland	10.7	10.8	11.1	11.3	11.5	11.9	12.2	12.3
United States	16.4	16.4	16.4	16.3	16.5	16.8	17.2	17.1

Table A2. Current health expenditure per capita (USD)

Country	2010	2011	2012	2013	2014	2015	2016	2017
Ukraine	202.3	244.0	275.9	298.9	197.4	141.6	141.9	177.4
Moldova	198.3	215.0	223.6	231.7	230.8	186.4	171.2	191.2
Georgia	262.5	290.3	323.0	334.9	349.0	280.9	308.5	293.1
Belarus	341.8	318.0	363.8	453.8	447.7	361.0	297.5	342.5
Turkey	539.3	531.7	524.8	552.4	527.2	454.6	468.6	444.7
Romania	472.2	426.6	401.7	495.2	503.3	442.2	476.2	555.1
Russian Federation	567.4	684.8	760.1	811.2	742.3	501.9	469.1	585.9
Poland	809.2	866.1	815.1	878.1	911.3	804.0	813.5	906.8
Estonia	926.5	1,014.6	1,013.4	1,144.3	1,237.3	1,112.5	1,185.3	1,300.5
Czech Republic	1,373.9	1,516.6	1,387.4	1,554.5	1,512.9	1,284.0	1,321.6	1,475.9
Greece	2,573.7	2,354.0	1,968.5	1,834.3	1,724.5	1,464.7	1,499.4	1,516.6
Spain	2,775.1	2,894.8	2,588.7	2,628.9	2,671.3	2,351.5	2,390.6	2,506.5
Italy	3,214.5	3,387.6	3,125.6	3,195.6	3,190.1	2,708.8	2,736.3	2,840.1
United Kingdom	3,309.5	3,501.9	3,492.9	4,207.9	4,601.1	4,326.3	3,945.0	3,858.7
Japan	4,060.2	5,087.1	5,212.1	4,336.1	4,099.5	3,733.7	4,174.9	4,169.0
Finland	4,099.6	4,548.8	4,411.2	4,306.8	4,740.0	4,121.9	4,094.9	4,205.7
France	4,593.4	4,933.4	4,652.3	4,900.4	4,987.9	4,204.1	4,257.0	4,379.7
Canada	5,044.1	5,361.2	5,408.9	5,345.3	5,081.6	4,539.1	4,518.1	4,754.9
Netherlands	5,186.6	5,554.8	5,284.9	5,531.2	5,594.4	4,674.7	4,753.4	4,911.4
Austria	4,796.1	5,161.1	4,966.4	5,233.9	5,386.4	4,611.0	4,718.9	4,939.9
Germany	4,597.2	5,021.6	4,754.7	5,094.4	5,290.7	4,617.5	4,734.2	5,033.5
Sweden	4,437.1	6,386.7	6,273.5	6,723.1	6,628.5	5,623.2	5,707.1	5,904.6
Norway	7,859.5	8,900.4	8,970.1	9,241.3	9,118.3	7,565.5	7,496.8	7,936.4
Switzerland	8,021.8	9,572.2	9,286.5	9,689.7	10,014.7	9,807.8	9,836.0	9,956.3
United States	7,957.3	8,169.9	8,441.0	8,647.6	9,068.0	9,538.1	9,941.3	10,246.1

Table A3. General domestic government health expenditure (% of GDP)

Country	2010	2011	2012	2013	2014	2015	2016	2017
Georgia	2.0	1.5	1.6	2.0	2.3	2.8	3.1	2.8
Russian Federation	3.1	3.0	3.2	3.2	3.2	3.1	3.0	3.1
Ukraine	3.7	3.4	3.7	3.8	2.9	2.9	2.9	3.1
Turkey	3.9	3.7	3.5	3.5	3.4	3.2	3.4	3.3
Moldova	4.6	4.2	4.4	4.1	4.3	3.9	3.7	3.5
Switzerland	3.3	3.4	3.6	3.6	3.5	3.6	3.6	3.8
Romania	4.6	3.5	3.6	4.1	4.0	3.9	3.9	4.1
Belarus	3.8	3.1	3.4	3.6	3.4	3.7	4.2	4.1
Poland	4.6	4.4	4.3	4.5	4.4	4.4	4.5	4.5
Estonia	4.7	4.4	4.4	4.5	4.6	4.8	4.9	4.8
Greece	6.5	5.9	5.8	5.2	4.6	4.6	5.0	4.8
Czech Republic	5.8	5.8	5.9	6.5	6.3	6.0	5.9	5.9
Spain	6.7	6.7	6.5	6.4	6.4	6.5	6.4	6.3
Netherlands	6.8	6.9	7.0	7.1	7.1	6.7	6.7	6.5
Italy	7.0	6.8	6.8	6.8	6.8	6.7	6.6	6.5
Finland	6.9	7.0	7.3	6.8	7.4	7.5	7.2	7.1
Austria	7.4	7.3	7.4	7.4	7.5	7.5	7.5	7.5
United Kingdom	7.1	7.1	7.0	7.8	7.8	7.7	7.8	7.6
Canada	7.9	7.7	7.7	7.6	7.5	7.8	7.9	7.8
United States	8.0	7.9	7.9	8.0	8.3	8.5	8.6	8.6
France	8.6	8.5	8.6	8.7	8.9	8.8	8.8	8.7
Germany	8.3	8.1	8.1	8.3	8.4	8.5	8.6	8.7
Norway	7.5	7.4	7.4	7.6	8.0	8.6	9.0	8.9
Japan	7.5	8.9	9.1	9.1	9.1	9.2	9.1	9.2
Sweden	6.9	9.0	9.1	9.2	9.3	9.2	9.2	9.2

Table A4. The share of health insurance in gross insurance premiums, %

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018
Estonia	2.3	2.7	2.9	3.0	3.0	3.5	2.9	3.1	n / a
Poland	0.6	0.8	0.8	1.0	1.2	1.1	1.1	1.1	1.5
Finland	0.0	0.0	0.0	0.0	0.0	1.5	1.7	1.8	1.9
Italy	1.7	2.0	2.0	1.7	1.4	1.5	1.8	2.0	2.0
United Kingdom	2.3	2.4	2.5	2.7	2.6	2.9	3.0	2.3	2.1
Czech Republic	1.9	2.0	2.0	1.8	1.7	1.8	2.1	2.2	2.3
Romania	0.3	0.4	0.7	0.6	0.5	1.2	1.8	2.2	3.3
Norway	4.3	4.1	4.0	4.3	4.1	4.2	4.2	4.1	4.0
Sweden	2.3	3.7	4.7	4.1	3.7	3.7	4.1	4.1	4.0
France	4.7	5.1	5.6	5.6	5.5	5.4	5.6	5.8	5.9
Greece	0.3	0.4	0.4	0.5	0.7	0.7	4.7	5.6	6.2
Ukraine	6.1	5.1	6.1	5.2	8.5	9.0	6.7	6.6	10.8
Turkey	12.1	11.7	11.3	10.2	11.3	11.1	10.4	10.8	11.5
Austria	10.4	10.6	10.6	10.5	11.0	11.3	12.0	12.4	12.8
Spain	9.7	10.8	11.7	12.3	13.0	13.2	12.2	12.7	13.2
Switzerland	16.1	16.6	16.6	16.4	16.3	16.7	17.7	18.6	18.9
Germany	18.6	19.5	19.6	19.2	18.9	19.0	19.2	19.7	19.6
Netherlands	50.6	51.4	53.1	54.8	56.2	59.4	61.8	62.7	64.6

APPENDIX B

Table B1. Data for the study of capacity of the voluntary health insurance sector

Factor	Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
x_1	Gross insurance premiums of voluntary health insurance, million UAH	809.4	1 165.4	1 965.2	2 195.8	2 265.7	2 689.4	3 375.1	4 177.4	5 324.4	7 039.9
x_2	GDP, billion UAH	1 082.6	1 316.6	1 408.9	1 454.9	1 566.7	1 979.5	2 383.2	2 983.8	3 558.7	3 974.6
x_3	GDP per capita, UAH	23 600.4	28 813.9	30 912.5	31 988.7	35 834	46 210.2	55 853.5	70 224.3	84 192.0	94 589.8
x_4	Population, million people	45.9	45.7	45.6	45.5	45.4	42.9	42.8	42.6	42.4	42.2
x_5	Unemployment rate,%	8.8	8.6	8.1	7.7	9.7	9.5	9.7	9.9	9.1	8.6
x_6	Inflation index	109.1	104.6	99.8	100.5	124.9	143.3	112.4	113.7	109.8	104.1
x_7	Income of the population, billion UAH	1 101.2	1 251.0	1 407.2	1 478.1	1 516.8	1 735.9	2 002.4	2 652.1	3 248.7	3 699.3
x_8	Average monthly nominal salary, UAH	2 250	2 648	3 041	3 282	3 480	4 195	5 183	7 104	8 865	10 497
x_9	Household savings, million UAH	156 358	123 123	147 280	116 266	30 780	31 073	12 951	30 638	31 547	0
x_{10}	Profitability of companies, million UAH	13 906.1	67 797.9	35 067.3	-22 839.7	-590 066.9	-373 516	29 705	168 752.8	288 305.5	523 779
x_{11}	Economically active population aged 15-70 years, thousand people	22 051.6	22 056.9	22 011.5	21 980.6	19 920.9	18 097.9	17 955.1	17 854.4	17 939.5	18 225.3
x_{12}	Employed population aged 15-70 years, thousand people	20 266	20 324.2	20 354.3	20 404.1	18 073.3	16 443.2	16 276.9	16 156.4	16 360.9	16 814.4
x_{13}	Unemployed population aged 15-70 years, thousand UAH	1 785.6	1 732.7	1 657.2	1 576.5	1 847.6	1 654.7	1 678.2	1 698	1 578.6	1 487.7
x_{14}	Subsistence level for 1 person, UAH	875	953	1 095	1 176	1 176	1 330	1 544	1 700	1 853	2 027
x_{15}	Number of hospitals, units	2 763	2 543	2 455	2 278	1 861	1 775	1 743	1 714	1 598	1 292
x_{16}	Number of newly registered sickness cases, thousand	33 080	32 381	31 162	31 024	26 881	26 789	27 361	26 615	н/д	н/д
x_{17}	State budget expenditures on health care, million UAH	8 759	10 223.9	11 358.5	12 879.3	10 580.8	11 450.4	12 456.6	16 729.1	22 617.9	38 561.6
x_{18}	Total gross insurance premiums, million UAH	13 327.7	22 693.5	21 508.2	28 661.8	26 767.3	29 736.0	35 170.3	43 431.8	49 367.5	53 001.2
x_{19}	Gross insurance payments, million UAH	6 104.6	4 864.0	5 151.0	4 651.8	5 065.4	8 100.5	8 839.5	10 536.8	12 863.4	14 338.3
x_{20}	Gross insurance payments under voluntary health insurance, million UAH	632.9	752.4	1 062.2	1 179.4	1 289.1	1 415.1	1 581.8	1 968.1	2 441.7	3 022.0

Table B2. The results of normalization of the study's information base

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gross insurance premiums for voluntary health insurance, mln. UAH	0.00	0.06	0.19	0.22	0.23	0.30	0.41	0.54	0.72	1.00
GDP, billion UAH	0.00	0.08	0.11	0.13	0.17	0.31	0.45	0.66	0.86	1.00
GDP per capita, UAH	0.00	0.07	0.10	0.12	0.17	0.32	0.45	0.66	0.85	1.00
Population, million people	0.00	0.05	0.08	0.11	0.14	0.81	0.84	0.89	0.95	1.00
Income of the population, billion UAH	0.00	0.06	0.12	0.15	0.16	0.24	0.35	0.60	0.83	1.00
Average monthly nominal salary, UAH	0.00	0.05	0.10	0.13	0.15	0.24	0.36	0.59	0.80	1.00
Subsistence level for 1 person, UAH (average value for the year)	0.00	0.07	0.19	0.26	0.26	0.39	0.58	0.72	0.85	1.00
Number of hospitals, units	0.00	0.15	0.21	0.33	0.61	0.67	0.69	0.71	0.79	1.00
State budget expenditures on health care, million UAH	0.00	0.05	0.09	0.14	0.06	0.09	0.12	0.27	0.47	1.00
Total gross insurance premiums, million UAH	0.00	0.24	0.21	0.39	0.34	0.41	0.55	0.76	0.91	1.00
Gross insurance payments, million UAH	0.15	0.02	0.05	0.00	0.04	0.36	0.43	0.61	0.85	1.00
Gross insurance payments for voluntary health insurance, mln. UAH	0.00	0.05	0.18	0.23	0.27	0.33	0.40	0.56	0.76	1.00