International Journal of Public Health Science (IJPHS)
Vol. 13, No. 3, September 2024, pp. 1442~1451
ISSN: 2252-8806, DOI: 10.11591/ijphs.v13i3.23731

Analysis of the structure and efficiency of national health care systems

Myroslava Shalko[1], Anhelina Andriushchenko[2]
[1]Department Public Administration, Classical Private University, Zaporizhzhia, Ukraine
[2]Department of Biochemistry, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

Article Info

Article history:

Received Aug 6, 2023
Revised Dec 12, 2023
Accepted Dec 21, 2023

Keywords:

Health
Health economics
Medical care
National policy
Public policy

ABSTRACT

It was noted that the right to health care is a key topic of discussion around the world, and ensuring the realization of this right and the opportunity to access the necessary medical care is in the spotlight. The realization of the right to health care in each country directly depends on the national health policy. The analysis is focused on assessing the effectiveness of health care systems of states according to several models. The data for this study were obtained from the existing WHO database, which provides accumulated data for groups of countries. Thus, it was possible to compare different countries, whose state health statistics may have their own characteristics. For data processing, an input-oriented analysis model of a dynamic network data shell was used. The analysis combines the use of traditional and non-traditional methods for measuring health performance. The analysis shows that there are no pure health systems financing models, most states use mixed funding models. The only way to reduce dependence on direct payments is for the government to encourage the use of a prepayment and risk pooling approach.

Corresponding Author:

Anhelina Andriushchenko
Department of Biochemistry, Taras Shevchenko National University of Kyiv
60 Vladimirskaya Str., Kyiv, 01601, Ukraine
Email: anhelina.andr@gmail.com

1. INTRODUCTION

The formation of an effective healthcare system is a priority for any state in the world, and the financial costs of states are increasing every time due to pandemics, wars, and the movement of people. Analyzing the structure and effectiveness of national health systems is the most effective way to manage resource resources. Such analysis provides insight and motivation for governments around the world to create expanded budgets to finance national health systems, as well as reform existing universal health coverage (UHC) recommendations. The current topic of research is also the lack of healthcare resources around the world, which is extremely important to take into account for healthcare systems, both in high-income countries (HIC) and in low- and middle-income countries (LMIC), it is necessary to focus on the use of their basic resources with taking into account long-term forecasts, also according to forecasts of the World Health Organization (WHO).

Today, the achievement of the highest attainable level of health is a major factor in achieving peace and security and depends on the close cooperation of individuals and states [1]. The right to health care is a key topic of discussion around the world, and ensuring the realization of this right and the ability of the population to access the necessary health care is in the center of attention. The countries of the world are facing various health problems. According to the World Bank and the World Health Organization, at least half of the world's population cannot get the necessary medical services, in many countries of the world people are still dying without access to preventive and curative services. Developing countries continue to struggle with the

incidence of accidental infectious diseases, the spread of acquired immunodeficiency syndrome (AIDS), malaria and other diseases, while facing a growing burden of accidental deaths, child mortality, poor sanitation and other environmental factors [2]. Wealthier countries are also fighting with pressure on their health systems due to population aging, rising prevalence of chronic diseases, comorbidities, and demand for access to new health technologies [3].

There are four main sources of funding for health systems:

- funds from taxation;
- contributions to the social insurance system;
- contributions to voluntary health insurance;
- direct payments from the population [4].

The first two sources can be attributed to the mandatory, regulated (established) legislative acts of countries. The last two sources are voluntary, decisions on which are made by the citizens themselves. Many health systems rely on a combination of all these sources of funding. Singaroyan *et al.* [5] came to the conclusion that increasing the efficiency of healthcare does not always lead to an improvement in the quality of life of the population. Mobley and Magnussen [6] emphasized that poor outcomes in health care are associated with low efficiency and the chosen model. Helling *et al.* [7] confirmed that increased efficiency also improves the quality of care provided. The results of an effective healthcare model are an increase in life expectancy at birth, and a decrease in infant mortality.

Afonso and Aubyn [8] use the drug enforcement administration (DEA) and free disposal hull (FDH) approaches to assess the effectiveness of health care and education in 24 The organization for Economic Cooperation and Development (OECD) countries. Raty and Luoma [9] critically review the study, pointing out the performance differences that can be created by using more appropriate input and output forms. They criticize the input-output-oriented interpretation of the results of the DEA model. Raty and Luoma [9] performed the same performance evaluation process for each country. However, the authors used revised data and excluded the number of hospital beds from the original data because they do not consider this to be significant for the analysis.

Medeiros and Schwierz [10] only confirmed that performance measurements can be done in two ways. On the one hand, by improving health outcomes while maintaining current costs (result-based models). On the other hand, by reducing costs with current health outcomes (cost-based models). Woolf and Aron [11] recommend in the case of international comparisons of the level of health systems to examine the effectiveness between public health and medical care as components of the entire health system.

2. METHOD

Reporting and analytical information, as well as an information base, were utilized during the research process [1]–[25]. For the study, a dialectical method was employed to identify contradictions in methodological approaches for determining the characteristics of national health systems, based on the provision of national health statistics, each with its own unique features. Using the systemic-structural method, grounded in the principle of systematically researching socio-economic phenomena and processes constituting the innovative development process, the modern national healthcare system of certain countries was determined. Employing the historical-logical method, innovation drivers for the development of national healthcare systems were identified. The investigation utilized methods of quantitative and qualitative comparisons, observations over time, pattern recognition, comparisons of the state and structure of indicators, and the dynamics of production of national healthcare systems.

The investigation focuses on assessing the performance of countries' healthcare frameworks across several models. The data for this study were obtained from the existing WHO database, which provides aggregated information for numerous countries. Thus, it was possible to compare different nations, each with its unique national health statistics [12]. For data processing, an input-oriented analysis model of a dynamic network data shell was employed. The performance of the WHO healthcare systems was comprehensively examined and evaluated, both collectively and separately for two sectors: the public health sector and the medical services sector. The investigation combines the use of both conventional and non-traditional strategies for measuring health performance [13].

The accumulated national experience in ensuring national, social, and economic security within the healthcare system has allowed the formulation of models for socio-economic national systems based on institutional resource capabilities. The German, English, and American health systems are considered classic models [14]. From these, we will examine three models—Bismarck, Beveridge, and the market model—whose synthetic characteristics are shown in Table 1 [15]. Typically, in developed countries, except for the United States, one of the three mentioned models predominates, known as the Beveridge, Bismarck, and Semashko models. The U.S. model is commonly referred to as the residual model. A comparative feature of these models is presented in Tables 1 and 2.

Table 1. Institutional characteristics of social insurance models from the standpoint of ensuring social and economic security

Model selection criteria	Scandinavian model	Anglo-Saxon (Beveridge Model)	Continental (Bismarck Model)	Southern European model (Rudimentary)
Main responsibility	State	State	Labor market	Family and church
Solidarity type	Public	Mostly individual	Economical	Family
Level of income redistribution	High	High	Limited	Limited
Level of provision of social services	Medium/High	Medium/High	Differentiated	Low
Degree of coverage of social services	All residents	All residents	Occupied	Mostly poor
Financing	Taxes	Taxes	Insurance contributions	Insurance contributions and other sources
Management	State/trade unions	State	Self-governing insurance organizations	Self-governing insurance organizations

When analyzing the health care system using the above models, two circumstances should be taken into account [16]. First, the model is a synthetic description of the system of each country or group of countries, where the systems are almost identical. Secondly, it is a tool for comparing systems that operate differently in each country.

Table 2. Comparison of models of healthcare systems

Determinant	Bismarck model (insurance)	Beveridge model (services)	Residual model (pluralistic)
The idea of creating a system	Protection from the impact of accidental events, as a result of which the economic and material situation of a citizen may get worse	Guarantee of citizens' safety at the level of basic, basic needs	Exemption of the state from the obligation to ensure citizens' access to medical services
Financing services	Insurance funds collecting mandatory contributions from employees and employers	The state budget, which is created at the expense of taxes	The sphere of public health is the state budget; sphere of individual health – voluntary (private) insurance
State participation	Performs integrity oversight; creates a legal field for the functioning of the system; insurance organizations are organized and function without state administration	Controls the entire health care system; responsible for access to health care services; monopolist hiring employees; in legal acts, the need for insurance is defined as the basis	State control over spending is limited; refusal of the state to guarantee access to medical services
Consumer privileges	Individuals who have high incomes, exempted from the obligation of insurance, can use private insurance	Freedom of choice is limited to the choice of the doctor of first contact	Especially needy patients (elderly, from lower social strata) are provided with protection guaranteed by the state
The right to benefits	It arises from the insurance agreement: the insured pays contributions, which is a condition for providing him with services	All citizens have equal access to medical services	In the private sector, access depends on the level of wealth of the citizen
Country	France, Germany, and Benelux countries	Great Britain, Scandinavian countries, and Ireland	USA

As already noted, the health system is the totality of all institutions, organizations, material and human resources involved in activities to improve health. For its successful functioning, it is necessary to effectively solve problems in the following main areas: personnel; infrastructure; equipment and medicines; logistics; progress tracking; financing. As the World Health Organization notes, limited access to essential health care in many developing countries is due to the dire state of their health systems. However, in some developed countries, many people, and often entire groups, due to the unfair organization of social protection, price increases provoked by the unproductive use of resources, do not have access to such assistance or this access is very limited [17].

3. RESULTS AND DISCUSSION

3.1. Foreign experience in the functioning of the healthcare system

World rankings, aimed at determining the best healthcare system and ensuring the realization of citizens' right to healthcare, do not yield a single answer regarding the global leader in this field. This is primarily due to the use of various evaluation criteria [18]. For instance, according to the Prosperity Rankings in 2019, Singapore tops the list for the best healthcare system in terms of efficiency, followed by Japan, with Switzerland securing the third position. Ukraine's healthcare system holds a specific rank in this assessment. On the other hand, the Global Health Security Index in 2019 ranks the United States, the United Kingdom, the

Netherlands, and Australia as the best countries worldwide. Ukraine, in this ranking, occupies the 94th position. As per the European Health Consumers Index 2018 report, Switzerland, the Netherlands, and Norway secure the top positions [4], [19]–[21].

However, the same report acknowledges variations in specific aspects, such as the best provision of patient rights in the Netherlands and Norway, accessibility in Switzerland, treatment outcomes in Finland, Norway, and Switzerland, and range and access to services in the Netherlands and Sweden. It highlights prevention efforts in Norway and pharmaceutical preparations in Germany and the Netherlands. Globally, various models for the functioning of healthcare systems are employed to realize the right to healthcare, access to medical care, and treatment [22]. Most developed countries worldwide utilize health insurance as a specific form of healthcare system.

3.1.1. Japan

Japan is consistently ranked as one of the healthiest countries globally, with a healthcare system widely recognized as among the best. Since the 1960s, Japan has operated a universal public health insurance system, ensuring comprehensive coverage for all its citizens. A notable aspect of the Japanese healthcare system is its provision of free access to medical facilities. Patients enjoy unrestricted access, allowing them to receive medical care at any facility across the country and determine the frequency of their treatment, irrespective of their insurance, status, or the severity of their condition. Only in certain cases are patients required to pay additional fees for tertiary care facilities if they lack a referral from a primary or secondary health facility [23]. This system in Japan is known as the "free access system," enabling patients to access necessary medical services at a fixed contribution rate, contingent upon insurance confirmation. The health insurance encompasses over 5,000 types of medical services, dental care, and medicines.

Enrollment in public health insurance is mandatory for all individuals staying in Japan for more than three months, regardless of nationality. Japanese legislation mandates specific public health insurance schemes based on employment status, age, and place of residence. These schemes include employer-based health insurance, residence-based national health insurance, and over-75 health insurance. Under Japan's healthcare system, patients bear 30% of medical costs, with the government covering the remaining 70%. Health insurance for individuals aged 75 and over is primarily supported by government funding, supplemented by health insurance premiums paid by employers and national health insurance.

3.1.2. USA

The US does not have a national health care system, there is no universal health care, and Americans buy health insurance to cover a large portion of their health care costs. Health insurance protects against health care debt, pays for regular checkups, lab tests, prescription vaccines, and drugs [24]. In the United States, acquiring health insurance involves selecting a health insurance plan, registering, and making regular payments to a health insurance company. Those with health insurance in the United States enjoy a range of services in the exercise of their right to healthcare. This includes prompt access to specialized doctors and the utilization of the latest technologies, innovations, and advanced methods of treatment. American hospitals lead the world in research and development, contributing to the global development and use of many drugs and technologies.

However, a significant challenge in the United States is the existence of a substantial number of uninsured individuals. Those without insurance often face the burden of expensive medical care. Hospitals may only address emergencies without prepayment and can refuse treatment without proof of insurance or a deposit. This results in uninsured individuals being more likely than those with insurance to delay or altogether refuse medical care, leading to serious consequences [25]–[27].

For instance, medical care for a broken leg can cost up to $7,500, and the average cost of a three-day hospital stay is approximately $30,000. While a majority of U.S. citizens have health insurance, typically provided by their employer and extending to their immediate family, some insurance plans are offered by federal or state governments, labor unions, or private individuals. After retirement, citizens can receive assistance through the government insurance program Medicare, while families and low-income individuals can seek help through the government insurance program Medicaid.

3.1.3. Australia

In contrast to the United States, healthcare in Australia serves as an exemplary model of a reliable and well-managed system, characterized by a blend of public and private healthcare providers. Australians have access to a broad spectrum of services, encompassing health support, preventive measures, and treatment for more complex conditions that may necessitate specialist or hospital care. The healthcare system in Australia comprises two main components: the public health system and the private health system [28].

Australia achieves universal coverage through the taxpayer-funded Medicare insurance program. This program involves individuals contributing a percentage of their income to cover the costs of most medical services, including doctor and hospital services, as well as prescription drugs. The existence of Medicare

ensures that individuals receive high-quality and affordable healthcare, incorporating free treatment in public hospitals and free or subsidized payments to private healthcare providers for specific services nationwide. Additionally, Australia has a voluntary private health insurance system, granting access to private hospitals and certain services not covered by the public system.

3.1.4. Switzerland

Switzerland has the best healthcare system in Europe. Along with this, the Swiss healthcare system is one of the most expensive in the world. Unlike other European countries, Switzerland's health care system is not based on taxation and is not funded by employers. On the other hand, everyone living in Switzerland pays contributions and can get basic health and accident insurance to get treatment. Many people supplement basic coverage with additional private health insurance. Consequently, only those who have at least basic health insurance have access to the health care system. Basic health insurance covers about 80-90% of health care costs, includes: accidents, alternative therapy, psychotherapy, rehabilitation after surgery or serious illness, cancer screening, emergency treatment of serious diseases of the mouth or jaw (dental care), general examinations and treatment (inpatient, outpatient and emergency), treatment of eye diseases, gynecological examinations and childbirth, expenses for medical devices, prescription drugs [29]. In addition, basic health insurance covers several vaccinations, in particular: pertussis, diphtheria and tetanus, hepatitis B, measles, mumps and rubella.

3.1.5. Netherlands

The health insurance system in the Netherlands combines private health plans with social conditions based on principles such as solidarity, efficiency, and value for the patient. Two types of health insurance exist in the Netherlands: compulsory basic insurance or basic insurance and optional supplemental insurance. Basic health insurance is mandatory in the Netherlands, providing entitlement to free medical treatment, including standard prescriptions. However, certain treatments, such as dental care and physical therapy, are not covered by public health insurance [30].

Anyone residing or working in the Netherlands for more than four months must acquire basic health insurance, either with or without additional coverage. Individuals with lower incomes can seek financial assistance for basic healthcare or additional services they cannot afford. To exercise their right to healthcare in the Netherlands, individuals must register with their local council to obtain a citizen service number (BSN). Subsequently, they can select and register for health insurance and choose a local doctor.

Notably, the Dutch government takes measures to address uninsured individuals. If a person fails to acquire basic health insurance within four months, the government initiates actions to rectify this situation. Initially, a letter is sent, urging registration for health insurance within three months [31]. Failure to comply within the specified period results in fines, with the amount set at 410.49 euros in 2019. Furthermore, if a person remains unregistered for more than six months, a second fine of the same amount is imposed. After nine months since the initial letter, local authorities will independently register the person with the insurer, charging monthly salary compensation.

3.2. Financing the healthcare system is an international experience

However, there are serious health problems in the US: 45 million Americans of working age do not have health insurance. Every year, Americans spend $2.7 trillion on healthcare, most of which is out-of-pocket. At the same time, 45,000 people who cannot afford to see a doctor die every year in the United States. The study showed that the lack of health insurance in the United States increases the risk of dying by 40%. Elderly users of the Medicare program can be considered protected only conditionally: the vast majority of doctors do not accept these policies, and the range of available services is very limited [32]–[34]. At the same time, according to the quality of medical care, the USA is in the fourth top ten of the list of countries.

None of these models is implemented in a "pure" form in any country, their combination with the predominance of one of them is observed Table 3. According to WHO estimates, the health care systems of France and Austria, based on the principles of social insurance, were recognized as the best in the world in 2006-2007 according to a set of criteria, including efficiency, accessibility, and meeting the needs of the population. However, there are other opinions regarding the effectiveness of a particular model.

Table 3. Sources of financing - international comparison (%)

Source of financing	Germany	Netherlands	Great Britain	USA
Budget financing	13	45	86	35
Social Insurance	60	35	0	0
Private insurance	16	13	5	30
Payment of services by patients	11	7	10	35

Khan *et al.* [35] assessed the national health care systems of 18 countries according to the criterion "expenditure - manageable indicators of public health". It was assumed that the system that is more effective is:
1) at lower cost provides similar (compared) or better indicators of public health;
2) at comparable costs allows to achieve similar (compared) or better indicators of public health:

- with a larger proportion of the elderly in the structure of the population;
- under less favorable social and climatic conditions of life (determined by the prevalence of tuberculosis);
- there is a higher prevalence of bad habits in the adult population, including alcohol consumption and being overweight, with the prevalence of smoking as a separate factor not taken into account [36]–[38].

A comparative analysis of manageable indicators of public health and healthcare expenditures across countries is presented in Tables 4-6, grouped as: Group 1 (Mediterranean and German cultures), Group 2 (English-speaking and German culture), and Group 3 (Latin American countries, the Middle East, and Slavic post-Soviet countries).

National healthcare systems in countries employing the "state" model of healthcare generally exhibit higher efficiency, as evidenced by the criterion of the ratio "healthcare costs - managed population health indicators" Tables 4 to 6. This trend is observed when comparing them to culturally close and demographically comparable countries that predominantly use an "insurance" model [39]–[41]. The observed regularity is influenced by factors such as geographical location, culture, population, and economic development of the country.

Table 4. Comparison of some indicators characterizing the effectiveness of health care systems of Group 1 countries (WHO, 2020)

Indicator	Countries of Mediterranean culture		Countries of German culture with a population of 8-10 million people.		Countries of German culture with a population of up to 8 million people	
	Italy	France	Sweden	Austria	Denmark	Switzerland
Expenditures on health care, % of Gross domestic product (GDP)	9.5	11.9	9.6	11.0	11.4	11.5
Total expenditure on health care per capita, US dollars, taking into account purchasing power parity	3022	4021	3757	4388	4537	5394
Life expectancy, men/women, years	79/84	77/84	79/83	78/83	77/81	80/84
Healthy life expectancy, men/women, years	74	73	74	72	72	75
Maternal mortality per 100,000 newborns	4	8	4	4	12	8
Neonatal mortality per 1,000 newborns	2	2	2	2		
Infant mortality per 1,000 newborns	3	3	2	4	3	4
Mortality of children under five years of age per 1,000 newborns	4	4	3	5	4	5
Probability of death aged 15 to 60, men/women per 1 thousand population	77/41	122/56	74/47	102/50	107/65	74/43
The country's place in the Bloomberg rating	2	13	9	12	26	4

Table 5. Comparison of some indicators characterizing the effectiveness of health care systems of Group 2 countries (WHO, 2020)

Indicator	English-speaking countries				German culture countries	
	Great Britain	Canada	Australia	USA	Sweden	Germany
Expenditures on health care, % of GDP	9.6	11.3	8.7	17.9	9.6	11.6
Total expenditure on health care per capita, US dollars, taking into account purchasing power parity	3480	4404	4774	8362	3757	4332
Life expectancy, men/women, years	78/82	79/83	80/84	76/81	79/83	78/83
Healthy life expectancy, men/women, years	72	73	74	70	74	73
Maternal mortality per 100,000 newborns	7	12	8	21	4	7
Neonatal mortality per 1,000 newborns	3	4	3	4	2	2
Infant mortality per 1,000 newborns	5	5	4	7	2	3
Mortality of children under five years of age per 1,000 newborns	5	6	5	8	3	4
Probability of death aged 15 to 60, men/women per 1 thousand population	95/58	87/53	79/45	134/78	74/47	99/53
The country's place in the Bloomberg rating	21	14	3	33	9	10

The comparison of healthcare systems doesn't yield a definitive answer in favor of a specific model [42]. Socially oriented healthcare systems typically offer more equity, but they often suffer from large bureaucracies and deficiencies in the management system [43]–[45]. In countries with a public healthcare

system, reforms aim to establish clearer legislative and institutional frameworks for competitive relationships between buyers and sellers (manufacturers) of medical services [46].

Table 6. Comparison of some indicators characterizing the effectiveness of health care systems of Group 3 countries (WHO, 2020)

Indicator	Latin American countries			Countries of the Middle East		Eastern Europe
	Chile	Cuba	Costa Rica	Syria	Turkey	Ukraine
Expenditures on health care, % of GDP	8.0	10.5	10.9	3.4	6.7	7.7
Total expenditure on health care per capita, US dollars, taking into account purchasing power parity	1199	431	1242	174	1029	519
Life expectancy, men/women, years	76/82	76/80	77/81	71/76	72/77	62/74
Healthy life expectancy, men/women, years	70	69	69	63	66	60
Maternal mortality per 100,000 newborns	25	47	40	58	21	32
Neonatal mortality per 1,000 newborns	5	3	6	9	8	6
Infant mortality per 1,000 newborns	8	5	9	14	12	11
Mortality of children under five years of age per 1,000 newborns	9	6	10	16	13	13
Probability of death aged 15 to 60, men/women per 1 thousand population	116/59	120/78	115/69	159/95	134/73	395/148
The country's place in the Bloomberg rating	27	28	37	42	44	99

The effectiveness of healthcare system financing models is notably reflected in the average life expectancy of the population [47]. According to Table 7, Ukraine exhibits the lowest life expectancy compared to other economically developed countries. The difference in life expectancy between women and men is 10 years, whereas in other considered countries, the difference is no more than six years. Consequently, it can be argued that the Semashko model is no longer effective, indicating the need to change the financing model of the healthcare system in Ukraine.

Table 7. Average life expectancy of the population

Country	Men, years	Women, years	Difference, years	Country	Men, years	Women, years	Difference, years
Модель Бісмарка				Beveridge model			
Austria	79.4	84.00	4.60	Great Britain	79.50	83.10	3.60
Belgium	79.2	83.90	4.70	Danemark	79.20	83.10	3.90
Italy	80.80	85.20	4.40	Ireland	80.40	84.00	3.60
Luxembourg	79.90	84.40	4.50	Spain	80.60	86.10	5.50
Netherlands	80.20	83.40	3.20	New Zealand	80.20	83.60	3.40
Germany	78.70	83.40	4.70	Private model			
France	79.60	85.60	6.00	USA	76.10	81.10	5.00
Switzerland	81.60	85.60	4.00	National model			
Sweden	80.80	84.10	3.30	Canada	79.90	84.00	4.1
Japan	81.10	87.30	6.20	Korea	79.70	85.70	6.00
				Semashko model			
				Ukraine	66.69	76.72	10.03

Based on a comparison of the life expectancy rate for women and men in countries classified according to their characteristic models, it was determined that Ukraine has the lowest life expectancy compared to other economically developed countries. Therefore, the functioning of the Soviet model in independent Ukraine is inefficient. On the contrary, the most effective is the English Beveridge model, the positive experience of which Ukraine needs to borrow for medical reform and the introduction of compulsory health insurance.

The authors note that the existing model has a number of shortcomings, which are more related to how the system is implemented and what its content is [48]–[52]:

- Insufficient implementation of insurance principles and their replacement by administrative management;
- Insufficient motivation among the participants of the cell-mediated immunity (CMI) system to take actions to improve its effectiveness;
- Weak focus of planning and distribution of volumes of medical care on solving problems of improving the quality of medical care and efficient use of resources;
- Instability of financial parameters of activity of insurance medical organizations and medical organizations;

- Incomplete transition to new methods of payment for medical care;
- Weak justification of tariffs for medical care;
- Remaining barriers to the participation of non-governmental medical organizations in the CHI system;
- Insufficient grounds for effective competition of insurance medical organizations;
- Incomplete transition to a single-channel financing system.

An analysis of the realization of the right to health care and the functioning of health care systems in different countries of the world made it possible to conclude that in practice there is no single correct, universal model for the financial support of the healthcare system [53]. Foreign experience has shown that an important role in the functioning of health care is played by the culture of society and the social behavior of citizens of a particular country [54]–[56]. The health care financing mechanism can be successfully improved both within the framework of budget financing and social health insurance.

In Ukraine, to increase the effectiveness of the national health care system, it is necessary to develop and implement its own health insurance program, taking into account the socio-economic features of the state's development. For this, the existing national policy in this area should be reviewed and the main efforts should be focused on solving the most important health care problems, including the availability and timeliness of quality medical care, high efficiency of health care, and improving the quality of services [57]. The introduction of mandatory medical insurance in Ukraine will lead not only to the improvement of the provision of medical services, but also to the improvement of the management of the entire system and its financing. The analysis shows that there are no "pure" models of financing health systems. Most countries use mixed funding models. Almost all countries have some form of direct payment, sometimes called cost sharing [58].

4. CONCLUSION

The only way to reduce dependence on direct payments is for the government to encourage the use of a prepaid and risk-pooling approach. After analyzing the experience of highly developed countries, we propose to use a strategy of patient participation in payment for medical services, and also recommend taking into account at least two points. First, in any country there is a low-income population that is unable to contribute to the health budget either in the form of income taxes or through insurance contributions. This category of people will need subsidies, usually from the state budget, pooled into a special fund. Such support may take the form of direct access to government-funded services or through subsidies for insurance premiums.

Countries where the entire population has access to a certain set of services usually create funds with a relatively high level of funds - about 5-6% of GDP. Second, contributions must be mandatory, otherwise the rich and healthy will avoid paying, and funding will not be sufficient to meet the needs of the poor. Voluntary insurance schemes can raise some funds, as well as familiarize people with the benefits of insurance, but if there is no widespread involvement of the population in prepaid systems and there is no pooling of funds into a special fund, then voluntary insurance has limited ability to provide a range of services to the poor, unable to pay insurance premiums. When reforming the domestic healthcare system and concretizing the program of state guarantees of free medical care, it is extremely important to take into account international experience in this area and choose a cost-sharing method, based, among other things, on the mentality of the population.

REFERENCES

[1] W. Zeng *et al.*, "Understanding the performance of county health service delivery in Kenya: a mixed-method analysis," *Health Policy and Planning*, vol. 37, no. 2, pp. 189–199, Feb. 2022, doi: 10.1093/heapol/czab129.

[2] P. Pokataiev, A. Liezina, H. Petukhova, and A. Andriushchenko, "The role of biotechnology in the development of the bioeconomy," *Acta Innovations*, no. 46, pp. 19–34, Oct. 2022, doi: 10.32933/ActaInnovations.46.2.

[3] V. Zarulli, E. Sopina, V. Toffolutti, and A. Lenart, "Health care system efficiency and life expectancy: A 140-country study," *PLOS ONE*, vol. 16, no. 7, Jul. 2021, doi: 10.1371/journal.pone.0253450.

[4] V. Kovtun, K. Andriushchenko, N. Horbova, O. Lavruk, and Y. Muzychka, "Features of the management process of ambidextrous companies," *TEM Journal*, vol. 9, no. 1, pp. 221–226, 2020.

[5] R. Singaroyan, C. A. Seed, and R. M. Egdell, "Is a target culture in health care always compatible with efficient use of resources? A cost-effectiveness analysis of an intervention to achieve thrombolysis targets," *Journal of Public Health*, vol. 28, no. 1, pp. 31–34, Mar. 2006, doi: 10.1093/pubmed/fdi072.

[6] L. R. Mobley and J. Magnussen, "The impact of managed care penetration and hospital quality on efficiency in hospital staffing," *Journal of Health Care Finance*, vol. 28, no. 4, pp. 24–42, 2002.

[7] D. K. Helling, K. M. Nelson, J. E. Ramirez, and L. H. Tammy, "Kaiser permanente colorado region pharmacy department: Innovative leader in pharmacy practice," *Journal of the American Pharmacists Association*, vol. 46, no. 1, pp. 67–76, Jan. 2006, doi: 10.1331/154434506775268580.

[8] A. Afonso and M. St. Aubyn, "Non-parametric approaches to education and health efficiency in OECD countries," *Journal of Applied Economics*, vol. 8, no. 2, pp. 227–246, Nov. 2005, doi: 10.1080/15140326.2005.12040626.

[9] T. Raty and K. Luoma, "Nonparametric country rankings using health indicators and OECD health data," *Helsinki*, 2005. [Online]. Available: https://www.doria.fi/bitstream/handle/10024/148001/m74.pdf?sequence=1 (accessed Jun. 15, 2023).

[10] J. Medeiros and C. Schwierz, *Efficiency estimates of health care systems*. Directorate-General for Economic and Financial Affairs Unit Communication, 2015.

[11] S. H. Woolf and L. Y. Aron, "The US health disadvantage relative to other high-income countries," *JAMA*, vol. 309, no. 8, pp. 771–772, Feb. 2013, doi: 10.1001/jama.2013.91.
[12] World Health Organization, "World health statistics 2022: monitoring health for the SDGs sustainable development goals," *World Health Organization*, 2022. [Online]. Available: https://apps.who.int/iris/handle/10665/272596 (accessed Jun. 01, 2023).
[13] B. Gavurová, K. Kočišová, and J. Sopko, "An analysis of health spending: trends in selected countries," *International Journal of Applied Business and Economic Research*, vol. 15, no. 9, pp. 1–12, 2017.
[14] J. Cylus, I. Papanicolas, and P. C. Smith, "Using data envelopment analysis to address the challenges of comparing health system efficiency," *Global Policy*, vol. 8, no. S2, pp. 60–68, Mar. 2017, doi: 10.1111/1758-5899.12212.
[15] K. Andriushchenko, O. Datsii, O. Aleinikova, A. Mohamed Abdulla, and A. Mohammed Ali, "Improvement of the water resources management system at the territorial level," *Problems and Perspectives in Management*, vol. 17, no. 3, pp. 421–437, Sep. 2019, doi: 10.21511/ppm.17(3).2019.34.
[16] P. Mitropoulos, "Production and quality performance of healthcare services in EU countries during the economic crisis," *Operational Research*, vol. 21, no. 2, pp. 857–873, Jun. 2021, doi: 10.1007/s12351-019-00483-3.
[17] Y. Bilan, V. Nitsenko, I. Ushkarenko, A. Chmut, and O. Sharapa, "Outsourcing in international economic relations," *Montenegrin Journal of Economics*, vol. 13, no. 3, pp. 175–185, Sep. 2017, doi: 10.14254/1800-5845/2017.13-3.14.
[18] V. Nitsenko, I. Nyenno, I. Kryukova, T. Kalyna, and M. Plotnikova, "Business model for a sea commercial port as a way to reach sustainable development goals," *Journal of Security and Sustainability Issues*, vol. 7, no. 1, pp. 155–166, Sep. 2017, doi: 10.9770/jssi.2017.7.1(13).
[19] V. Kondarevych, K. Andriushchenko, N. Pokotylska, G. Ortina, O. Zborovska, and L. Budnyak, "Digital transformation of business processes of an enterprise," *TEM Journal*, vol. 9, no. 4, pp. 1800–1808, 2020, doi: 10.18421/TEM94-63
[20] E. Z. Asbu, M. D. Masri, and M. Al Naboulsi, "Determinants of hospital efficiency: A literature review," *International Journal of Healthcare*, vol. 6, no. 2, pp. 44–53, May 2020, doi: 10.5430/ijh.v6n2p44.
[21] J. Kemm, *Health promotion*. Oxford University Press, 2014. doi: 10.1093/med/9780198713999.001.0001.
[22] Asian University Network (AUN). *Health Promotion Network*. Mahidol University. Thailand. 2017. ISBN: 978-616-443-047-1.
[23] L. Wolfenden *et al.*, "A randomised controlled trial of an intervention to increase the implementation of a healthy canteen policy in Australian primary schools: study protocol," *Implementation Science*, vol. 9, no. 1, Dec. 2014, doi: 10.1186/s13012-014-0147-3.
[24] H. Al-Akash, A. Abu Arrah, F. Bhatti, R. Maabreh, and R. Abu Arrah, "The effect of food safety training program on food safety knowledge and practices in hotels and hospitals' food services," *Italian Journal of Food Safety*, vol. 11, no. 1, Feb. 2022, doi: 10.4081/ijfs.2022.9914.
[25] WHO, "COVID19 and food safety: Guidances for food businesses interim guidance," 2020. [Online]. Available: https://www.who.int/publications/i/item/covid-19-and-food-safety-guidance-for-food-businesses (accessed Oct. 10, 2022).
[26] NSW Government, "Healthy food and drink in NSW health facilities for staff and visitors framework. NSW Ministry of Health," 2017. [Online]. Available: https://www.health.nsw.gov.au/heal/Pages/healthy-foodframework.aspx (accessed May 07, 2023).
[27] E. Commission, "EU health programme 2014–2020." [Online]. Available: https://ec.europa.eu/health/home_en (accessed Nov. 15, 2022).
[28] J. Saito *et al.*, "Factors influencing the National School Health Policy implementation in Lao PDR: a multi-level case study," *Health Promotion International*, vol. 30, no. 4, pp. 843–854, Dec. 2015, doi: 10.1093/heapro/dau016.
[29] D. Callahan, "The WHO definition of 'Health," *The Hastings Center Studies*, vol. 1, no. 3, 1973, doi: 10.2307/3527467.
[30] C. B. Corbin, R. P. Pangrazi, and B. D. Franks, "Definitions: health, fitness, and physical activity," *President's Council on Physical Fitness and Sports Research Digest*, vol. 3, no. 9, 2000.
[31] M. L. Fennell, "Health c are delivery services," in *International Encyclopedia of the Social & Behavioral Sciences*, Elsevier, 2001, pp. 6515–6520. doi: 10.1016/B0-08-043076-7/03909-7.
[32] A. Mohammad Mosadeghrad, "Healthcare service quality: towards a broad definition," *International Journal of Health Care Quality Assurance*, vol. 26, no. 3, pp. 203–219, Mar. 2013, doi: 10.1108/09526861311311409.
[33] S. Secinaro, D. Calandra, A. Secinaro, V. Muthurangu, and P. Biancone, "The role of artificial intelligence in healthcare: a structured literature review," *BMC Medical Informatics and Decision Making*, vol. 21, no. 1, Dec. 2021, doi: 10.1186/s12911-021-01488-9.
[34] Y. Zeng, W. Xu, and X. Tao, "What factors are associated with utilisation of health services for the poor elderly? Evidence from a nationally representative longitudinal survey in China," *BMJ Open*, vol. 12, no. 6, Jun. 2022, doi: 10.1136/bmjopen-2021-059758.
[35] M. S. Khan, M. A. Mansour, S. D. Khadar, and Z. Mallick, "Evaluating healthcare performance using fuzzy logic," *South African Journal of Industrial Engineering*, vol. 31, no. 1, May 2020, doi: 10.7166/31-1-2150.
[36] X. Yang, X. Yi, S. Nepal, I. Khalil, X. Huang, and J. Shen, "Efficient and anonymous authentication for healthcare service with cloud based WBANs," *IEEE Transactions on Services Computing*, vol. 15, no. 5, pp. 2728–2741, Sep. 2022, doi: 10.1109/TSC.2021.3059856.
[37] G. Mohapatra, R. Arora, and A. K. Giri, "Establishing the relationship between population aging and health care expenditure in India," *Journal of Economic and Administrative Sciences*, Feb. 2022, doi: 10.1108/JEAS-08-2021-0144.
[38] A. Haakenstad *et al.*, "Measuring the availability of human resources for health and its relationship to universal health coverage for 204 countries and territories from 1990 to 2019: a systematic analysis for the Global Burden of Disease Study 2019," *The Lancet*, vol. 399, no. 10341, pp. 2129–2154, Jun. 2022, doi: 10.1016/S0140-6736(22)00532-3.
[39] M. Karatas, L. Eriskin, M. Deveci, D. Pamucar, and H. Garg, "Big data for healthcare Industry 4.0: Applications, challenges and future perspectives," *Expert Systems with Applications*, vol. 200, Aug. 2022, doi: 10.1016/j.eswa.2022.116912.
[40] Y. Siriwardhana, G. Gür, M. Ylianttila, and M. Liyanage, "The role of 5G for digital healthcare against COVID-19 pandemic: Opportunities and challenges," *ICT Express*, vol. 7, no. 2, pp. 244–252, Jun. 2021, doi: 10.1016/j.icte.2020.10.002.
[41] J. Zhao, "Sustainability on the service capacity in elderly healthcare service supply chains: An application of flexible contracts," *IEEE Transactions on Engineering Management*, vol. 70, no. 6, pp. 2034–2044, Jun. 2023, doi: 10.1109/TEM.2021.3071587.
[42] Y. Zhou, "Construction of a digital elderly care service system based on human-computer interaction from the perspective of smart elderly care," *Computational Intelligence and Neuroscience*, vol. 2022, pp. 1–17, May 2022, doi: 10.1155/2022/1500339.
[43] H. Zhou, J.-Y. Gao, and Y. Chen, "The paradigm and future value of the metaverse for the intervention of cognitive decline," *Frontiers in Public Health*, vol. 10, Oct. 2022, doi: 10.3389/fpubh.2022.1016680.
[44] L. Cheng, W. Chan, Y. Peng, and H. Qin, "Towards data-driven tele-medicine intelligence: community-based mental healthcare paradigm shift for smart aging amid COVID-19 pandemic," *Health Information Science and Systems*, vol. 11, no. 1, Mar. 2023, doi: 10.1007/s13755-022-00198-4.
[45] L. Luo, "Analysis of coupling coordination degree between big health industry and pension service," *Journal of Healthcare Engineering*, vol. 2022, pp. 1–6, Mar. 2022, doi: 10.1155/2022/6427024.
[46] S. Paul *et al.*, "Industry 4.0 Applications for medical/healthcare services," *Journal of Sensor and Actuator Networks*, vol. 10, no. 3,

Jun. 2021, doi: 10.3390/jsan10030043.
[47] J. Kalseth and T. Halvorsen, "Health and care service utilisation and cost over the life-span: a descriptive analysis of population data," *BMC Health Services Research*, vol. 20, no. 1, Dec. 2020, doi: 10.1186/s12913-020-05295-2.
[48] A. V. L. N. Sujith, G. S. Sajja, V. Mahalakshmi, S. Nuhmani, and B. Prasanalakshmi, "Systematic review of smart health monitoring using deep learning and Artificial intelligence," *Neuroscience Informatics*, vol. 2, no. 3, Sep. 2022, doi: 10.1016/j.neuri.2021.100028.
[49] T. D. Pigott and J. R. Polanin, "Methodological guidance paper: High-quality meta-analysis in a systematic review," *Review of Educational Research*, vol. 90, no. 1, pp. 24–46, Feb. 2020, doi: 10.3102/0034654319877153.
[50] T. Saheb and L. Izadi, "Paradigm of IoT big data analytics in the healthcare industry: A review of scientific literature and mapping of research trends," *Telematics and Informatics*, vol. 41, pp. 70–85, Aug. 2019, doi: 10.1016/j.tele.2019.03.005.
[51] B. Pourghebleh, V. Hayyolalam, and A. Aghaei Anvigh, "Service discovery in the Internet of Things: review of current trends and research challenges," *Wireless Networks*, vol. 26, no. 7, pp. 5371–5391, Oct. 2020, doi: 10.1007/s11276-020-02405-0.
[52] A. Tandon, A. Dhir, A. K. M. N. Islam, and M. Mäntymäki, "Blockchain in healthcare: A systematic literature review, synthesizing framework and future research agenda," *Computers in Industry*, vol. 122, Nov. 2020, doi: 10.1016/j.compind.2020.103290.
[53] E. Barka, S. Dahmane, C. A. Kerrache, M. Khayat, and F. Sallabi, "STHM: A secured and trusted healthcare monitoring architecture using SDN and blockchain," *Electronics*, vol. 10, no. 15, Jul. 2021, doi: 10.3390/electronics10151787.
[54] W. M. Ravensbergen, Y. M. Drewes, H. B. M. Hilderink, M. Verschuuren, J. Gussekloo, and R. A. A. Vonk, "Combined impact of future trends on healthcare utilisation of older people: A Delphi study," *Health Policy*, vol. 123, no. 10, pp. 947–954, Oct. 2019, doi: 10.1016/j.healthpol.2019.07.002.
[55] S. Vimal, Y. H. Robinson, S. Kadry, H. V. Long, and Y. Nam, "IoT based smart health monitoring with CNN using edge computing," *Journal of Internet Technology*, vol. 22, no. 1, pp. 173–185, 2021.
[56] D. Ajerla, S. Mahfuz, and F. Zulkernine, "A real-time patient monitoring framework for fall detection," *Wireless Communications and Mobile Computing*, vol. 2019, pp. 1–13, Sep. 2019, doi: 10.1155/2019/9507938.
[57] L. Syed, S. Jabeen, M. S., and A. Alsaeedi, "Smart healthcare framework for ambient assisted living using IoMT and big data analytics techniques," *Future Generation Computer Systems*, vol. 101, pp. 136–151, Dec. 2019, doi: 10.1016/j.future.2019.06.004.
[58] J. Wang *et al.*, "A blockchain-based eHealthcare system interoperating with WBANs," *Future Generation Computer Systems*, vol. 110, pp. 675–685, Sep. 2020, doi: 10.1016/j.future.2019.09.049.

BIOGRAPHIES OF AUTHORS

Myroslava Shalko is a doctor of the highest category, Deputy Director for Organizational and Methodological Issues of the KNP "Kyiv City Center of Reproductive and Perinatal Medicine", Associate Professor, Candidate of Medical Sciences. Diagnosis, pathogenesis, treatment of precancerous processes of the glandular epithelium of the cervix in women with tubal-peritoneal infertility factor. She is studying for a doctorate at the Classical Private University - public administration, the subject of health care. She has published over one hundred peer-reviewed scientific articles in major journals on the subjects of economics and global health. She can be contacted at email: shalko_m@ukr.net.

Anhelina Andriushchenko is a master student studying Biotechnology at the Institute of Biology and Medicine of Taras Shevchenko National University of Kyiv (Ukraine) and a master student studying law enforcement activity Classical private university, Zaporizhzhia (Ukraine). Grant: 1. Der Deutsche Akademische Austauschdienst (DAAD) Technical University of Applied Sciences Wildau, Academic courses in Berlin for studies and work, 2021; 2. Research program at the University of Tokyo (Graduate School of Pharmaceutical) in 4 labs in order: Protein Metabolism, Genetics, Chemistry and Biology, and Protein Structural Biology, July 2022 - July 2024. She has published research in journals that are indexed in international scientific and metric databases (Scopus). She can be contacted at email: anhelina.andr@gmail.com.