# FINANCING UKRAINIAN HEALTH CARE SYSTEM UNDER COVID-19 PANDEMIC

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Abstract: With the spread of COVID-19 disease, Ukraine is in the second stage of reforming the health care system and the transition to direct reimbursement of medical expenses to institutions in the industry. The aim of the study was to identify trends and challenges in financing the health care system in Ukraine in the context of COVID-19. The research used a qualitative and quantitative methodology to study the effectiveness of direct financing of the health care system in Ukraine based on data from the World Health Organization Health System Response Monito and the National Health Service of Ukraine. The correlation analysis of connection of relative indicators of financing and morbidity and mortality in regions is carried out.

Keywords: Health Care Financing, Coronavirus Pandemic, Covid-19, Health Care Providers.

## 1 Introduction

The health care system of Ukraine in the context of the spread of COVID-19 is in the second stage of reforming (starting from April 2020). The reforms provide a new funding model that should theoretically provide a rapid response to the spread of COVID-19 coronavirus. The second stage of the reform envisages the integration of the list of free medical services based on the program of medical guarantees. Medical facilities receive funding from the National Health Service based on an agreement that provides for direct funding of municipal medical facilities, depending on the level of the pandemic in different regions of Ukraine. This requires a research of the effectiveness of the new model of financing the health care system.

The aim of the article is to identify trends and challenges in financing the health care system in Ukraine in the context of COVID-19. To achieve this aim, the following tasks are defined:

1. Assess the amount of the health care system funding in Ukraine by various actors at the international, national and regional levels.
2. Identify the features of financing the health care system in Ukraine in the transition to a direct mechanism for providing medical institutions with financial resources depending on the level of morbidity and mortality.

## 2 Literature review

The scientific literature examines the issue of medical capacity and mortality of patients with coronavirus disease depending on health care costs and cost structure (Khan et al., 2020): the level of potential of the health care system, including costs (current health expenditure as a percentage of GDP), and mortality rate. Stribling et al. (2020) found no link between health care spending and UK mortality. For example, the United States has the highest spending rate (17.1% of GDP) and the highest mortality rate, while Thailand has the highest spending rate of 3.8% and one of the lowest mortality rates (Stribling et al., 2020). Similar findings were found in Moris & Schizas (2020), where a correlation analysis revealed a lack of relationship between costs and mortality rates. The example of Greece shows that Greece's limited financial resources are not an obstacle to preventing the spread of COVID-19 (Moris & Schizas, 2020). In the work of Elola-Somoza et al. (2021) also found no correlation between public health expenditure per capita and mortality from COVID-19 among European countries or the Spanish Autonomous Communities. Khan et al. (2020) explains this paradox by the following reasons: the level of centralization of government, which determines the effectiveness of distancing measures, cultural and social factors (public compliance with distance measures regardless of population density), the government's ability to implement health measures that affect treatment outcomes; mortality, the level of government control over measures to combat the spread of coronavirus, the proportion of the population aged 65 and over (especially in developed countries, which is the biggest risk factor). Stribling et al. (2020) distinguishes clusters of countries by the level of health care expenditures from GDP and mortality: 1) Spain, Italy, Great Britain with expenditures of 8.8% – 9.6% and mortality of 55.57 – 66.16 inhabitants per 100 thousand persons; 2) France and Sweden with expenditures of 11% of GDP and mortality of 44 and 52 inhabitants per 100 thousand people, respectively; 3) The Netherlands, Ireland and the United States as excellent countries (mortality of 39 inhabitants per 100 thousand people) with spending rates of 10.1%, 7.2% and 17.1%, respectively. Verelst, Kuylen & Beutels (2020) found that countries with higher health potential (expanding, training and optimizing material and human resources) address workloads more effectively, especially during periods of increased morbidity.

Prante, F. J., Bramucci & Truger (2020) argue that the reduction in the financial resources of Italy's public hospitals over 30 years due to the government's tight fiscal policy has reduced the capacity of medical institutions to provide adequate protection to the population. Significant budget constraints have made it difficult to overcome the negative effects of the pandemic. Similar conclusions were made in the research of Armocida et al. (2020): prolonged fragmentation and reduced funding for Italy, human and technical resources have led to a crisis in the health care system during the spread of the pandemic. An additional negative factor for the success of overcoming the negative consequences of the pandemic was the local responsibility of the authorities for the organization and provision of medical services, the regional location of the National Health Service, the weakness of strategic crisis management (Armocida et al., 2020).

This means, that decentralization of health care management has a negative impact on the success of counteracting the negative effects of the pandemic. Such conclusions were also made in the study of Sharma, Borah & Moses (2021), who proved the positive relationship between the centralized management structure and reactive strategies to overcome the effects of coronavirus. In addition, reactive and proactive coping strategies for COVID-19 depend on funding for health system infrastructure (Sharma, Borah & Moses, 2021).

Thus, the literature considers the health care systems financing in the context of widespread pandemics in the context of the ability of the system and its potential to provide a rapid response to the disease, which depends on the volume and structure of costs, the level of centralization of management and the ability of the government to formulate measures against the spread of the virus and measures to reduce the mortality rate. Currently, there is no direct link between the financing of the medical system and mortality.

## 3 Materials and research methods

This study is based on a qualitative and quantitative methodology for analyzing the financing of the health care system of Ukraine in the context of the spread of coronavirus disease. The qualitative analysis is based on the study of legislative initiatives as a basis for providing the health care system with additional financial resources to respond quickly to

the spread of the virus and morbidity. For the qualitative analysis we used the database of the World Health Organization Health System Response Monitor for the quantitative analysis we used the database and information of the National Health Service of Ukraine, which contains information about: 1) the number of diseases and mortality for the period of 01. 01.2020 – 28.06.2021 in real time (The National Health Service of Ukraine, 2021a); 2) Monthly information on testing and inpatient treatment of patients with COVID-19 on the basis of reports of medical care providers from March 2020 to June 2021 (The National Health Service of Ukraine, 2021b); 3) information on payments to providers of medical services by region for emergency and hospital medical aid for 2020 (The National Health Service of Ukraine, 2021c).

**4 Results**

In Ukraine, current health expenditures in 2018 amounted to 7.72% of GDP (for example, in the EU 9.85% of GDP in 2018, in Poland – 6.33% of GDP in 2018) Bank, 2021). The mortality rate from COVID-19 for the period 01.01.2020 – 28.06.2021 amounted to 52.3 thousand people (National Health Service of Ukraine, 2021a).

Due to the spread of the pandemic, the health care system of Ukraine began to receive additional funds in February-March 2020 with the distribution of state and local budgets. As of April 3, 2020, only UAH 1.25 billion was allocated from the state (central) budget for measures to prevent and combat coronavirus infection. (about 45.2 million US dollars), which are sent in an emergency. According to the decision of the Cabinet of Ministers of March 25, 2020, most of the allocated financial resources (UAH 905.8 million/USD 32.8 million) went to local budgets in the form of subsidies from the state budget. These funds are intended to provide medical institutions that provide secondary (specialized) and tertiary (highly specialized) care during the COVID-19 pandemic. In particular, the funds are directed to infectious diseases hospitals in order to ensure the continuous provision of medical services to the population. The Ministry of Health sent UAH 67.1 million (USD 2.4 million) for the centralized procurement of medical devices to prevent the spread of coronavirus and the regional distribution of purchased products. The Ministry of Internal Affairs, the Ministry of Justice and the Ministry of Health received UAH 249.3 million (USD 9 million) for the purchase of personal protective equipment (PPE) and medical equipment. On March 23, 2020, the Cabinet of Ministers of Ukraine introduced hourly wages for doctors and other medical workers who provide direct assistance to Ukrainian citizens with COVID-19. On April 2, 2020, the president signed a law on additional payments to doctors and other health care workers (who are most at risk in the fight against COVID-19) in the amount up to 300% of salary, while the salary of social workers who provide services at home was increased to 100% of the salary.

At the local level, local authorities allocated funds for the support of medical workers. On April 13, the parliament approved amendments to the budget for 2020 and established the Coronavirus Fund with a budget of 64.7 billion UAH (USD 2.4 billion) to fight the COVID19 pandemic and its consequences. The government approved the procedure of distribution of funds on June 22, 2020. The fund must provide financial support for the health sector, in particular, it is about additional payments to the medical personnel (up to 300% of the salary), purchase of medical equipment, examination tests, PCR analyzers, lung ventilation devices, and PPE, as well as funding of social protection measures of Ukrainian citizens. On May 6, 2020, the government approved a decision to allocate UAH 3.132 billion (USD 116.12 million) for the fight against COVID-19 for, the following related expense items:

- supply of PPE to medical institutions and emergency departments;
- ensuring procurement (works, services) necessary to ensure preparedness for COVID-19 outbreaks and appropriate response measures;
- payment of salaries to health care workers and staff. In addition to the establishment of the Fund to Combat COVID-19, the parliament redistributed expenditures within the state budget for 2020, allocating UAH 15.8 billion (USD 585.6 million) for the provision of medical services to patients with suspected coronavirus or confirmed diagnosis of COVID-19 under the Medical Guarantee Program (PMG).

On April 25, 2020, the Cabinet of Ministers approved a decree approving three separate packages of funding for medical services provided to patients with suspected diagnosis or confirmed diagnosis of COVID-19 under the Medical Guarantee Program. These funding packages include paying for mobile teams that perform tests at home, providing hospitalization assistance, and outpatient treatment for patients with COVID-19.

NHSU (National Health Service of Ukraine), the only provider of medical services, enters into contracts with medical professionals and pays for the provision of medical services to patients with COVID-19. Funding includes payments of up to 300% of the salary for medical staff and medicines for the treatment of patients in hospitals. The additional funding package provided for a one-time payment of 1 month (in April) to hospitals that receive patients with COVID-19 in the absence of a list of institutions that have been retrained to provide medical services to patients with COVID-19.

Amendments to the Law "On the State Budget" for 2020 allowed allocating additional funds for social protection measures:

- UAH 29.7 billion (USD 1.1 billion) received by the Pension Fund;
- UAH 19.5 billion (USD 723.1 million) – Ministry of Social Policy for the needs of citizens who lost their jobs during the epidemic.

As a part of the additional financial resources allocation to combat COVID-19, part of the funds was directed to other sectors: UAH 5.1 million (USD 0.1846 million) sent to the Ministry of Infrastructure to cover the costs associated with the evacuation of Ukrainian citizens from China and Italy; UAH 3 million (USD 0.1089 million) – to the Ministry of Internal Affairs to cover the costs of observing Ukrainian citizens evacuated from China; UAH 4.69 million (0.16682 million USD) – to the Ministry of Defense to cover the costs of delivery of medical products from China; UAH 49.89 million (USD 1.78 million) – to the Security Service of Ukraine for the acquisition and implementation of the Verint NowForce system, necessary for the implementation of measures to prevent the spread of acute respiratory disease COVID-19.

At the regional level, local authorities also provide funding for countering the pandemic. More than UAH 1.78 billion was allocated from regional and municipal budgets (USD 64.6 million) for the purchase of ventilators, test systems, medicines, PPE, disinfectants, resuscitation and intensive care equipment, infectious diseases units and boxes. In addition, a part of these funds is used to increase the salaries of medical workers, for example, the Kyiv administration has allocated almost UAH 10.8 million (0.40 million USD), due to which the salary of medical staff increased 9 times.

The Accounting Chamber of Ukraine has developed an information panel to report expenditures in connection with the distribution of COVID-19 from the state, local and other budgets (trust funds, deposits). The data are based on information on payments made by the State Treasury Service of Ukraine. The purpose of financial transactions is analyzed daily using machine algorithms, due to which the identification of target funds, which are directed to measures to combat the spread of COVID-19. As of April 29, 2020, a total of UAH 1.35 billion was spent on the fight against COVID-19 (USD 49.96 million), including UAH 0.5 billion (USD 18.5 million) from the state budget, UAH 0.8 billion (USD 29.7 million) from local budgets and UAH 0.046 billion (USD 1.69 million) from other sources.

On April 9, the Government and World Bank delegation agreed to the World Bank Assistance Package of 135 million dollars USA to modernize the health care sector and overcoming the consequences of the distribution of COVID-19 pandemic, with 35 million dollars USA is directed straight to the relevant response measures to COVID-19. Ukraine received an additional 150 million dollars USA from the World Bank, in particular, 50 million dollars USA for support of vulnerable population groups during the COVID-19 epidemic and 100 million dollars USA to improve the social protection system. In Ukraine, a "plan of humanitarian response to the COVID-19 pandemic is created by 2020 in Ukraine". According to this plan, by the end of the year from the United Nations, Ukraine received 165 million dollars USA to prevent pandemic and fight against it. These funds are aimed at the needs of the health care system and improvement of the socio-economic situation. In April 2020, the European Commission decided to allocate 190 million euros as a package of financial assistance to Ukraine to support the health care system, its economics, small and medium-sized enterprises, as well as the protection of vulnerable population groups. In addition, the EU sent 13 million euros to meet the humanitarian needs of the Donbass. On April 22, 2020, the President of Ukraine announced an additional decision of the European Commission to allocate 1.2 billion euros to combat coronavirus. The Government of the Republic of Korea has been financed with 700 000 dollars USA to counteract the COVID-19 pandemic. The funds are aimed at acquiring Korean laboratory test systems and support for the Global Humanitarian Response Plan of the United Nations. In addition, powerful financial support provides private sector: enterprises sacrifice funds and equipment for hospitals. For example, a modern laboratory for conducting PCR tests on COVID-19 has been opened in Chernigov's efforts of private business and local authorities. Private companies will break medical workers free of charge, rising fuel ambulances, provide telecommunication services (pay telephone calls from abroad to state hot lines on COVID-19). International partners, including WHO, also provide Ukraine with humanitarian aid.

Ukraine has launched the Anti-CoVID-19 Fund (Anti-COVID-19 Fund, 2021) to fight the SARS-CoV-2 coronavirus and its consequences in order to finance additional payments for health and social expenses arising in the context of the virus spread. The Ministry of Finance of Ukraine makes a disclosure of information about the financial position of the Fund, and the state audit Service provides a continuous control over the use of funds in order to avoid money laundering aimed at the Fund.

The Ministry of Health has been financed at the expense of the Fund's funds in the amount of UAH 20,468,596,6 thousand. As at 31.12.2020 (28% of the total financing of all spheres in the conditions of overcoming the consequences of pandemic). The list of measures to be financed is determined by the decisions of the Cabinet of Ministers of Ukraine. From the general fund budget of Ukraine to the Anti-COVID-19 Fund allocated UAH 20.5 million, in particular: supplies with medical workers (27%), implementation of the Program of State Medical Guarantees for Population Service (26%), Ensuring Restraining and Response System of Public Health on flashes of acute respiratory disease COVID-19 (26%), acquisition of equipment for receiving departments of support healthcare facilities (11%), subvention from the state budget to local budgets to ensure the supply of oxygen for health care institutions (7%), subvention from the state budget local Budgets to provide support establishments of health care in hospital districts by medical equipment 5% (Fig. 1).

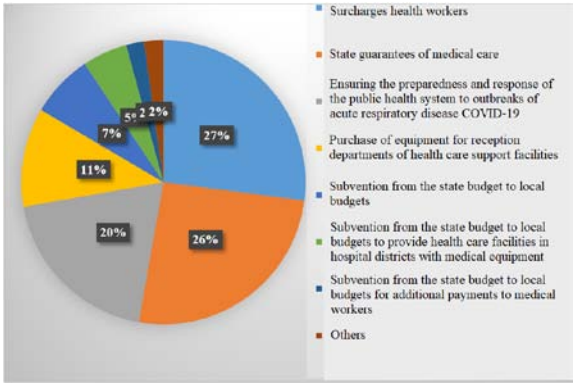



*Figure 1 – Health care funding structure in 2020: Anti-COVID-19 Fund expenditures*
Source: calculated by the author based on the Ministry of Finance of Ukraine (2021)

According to the NHSU, payments to health care providers under the program of medical guarantees for inpatient care for patients with acute respiratory disease COVID-19 amounted to UAH 8.231 billion for 2021 or 14.1% of the amount of payments for all provided medical services (National Health Service of Ukraine, 2021c).

The amount of payment to medical institutions for the provision of emergency medical care amounted to UAH 1.495 billion in 2021 or 2.6% of payments for all medical services. This means that the expenditures from the Anti-COVID-19 Fund, which were received by the Ministry of Health and distributed under budget programs, to finance the services of medical institutions amounted to a total of UAH 18.547 billion for 2020 and UAH 9.725 billion for 2021 (inpatient care UAH 11.406 billion and emergency care UAH 7.140 billion) (National Health Service of Ukraine, 2021c). At the same time, the Ministry of Finance (2021) estimates that UAH 5.265 billion will be allocated to Anti-COVID-19 Fund for financing the CPVC 2308060 "Implementation of the Program of State Guarantees of Medical Services to Population" in 2020. A total of UAH 18,030 billion were allocated to regions to pay for medical services for emergency and inpatient care for COVID-19 patients (Table 1).

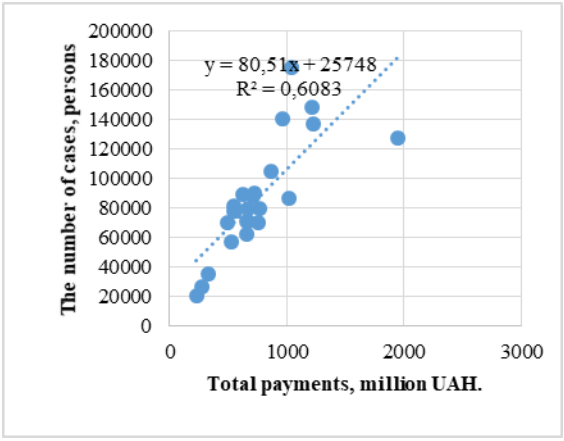
Table 1: The amount of payments to health care providers under the program of medical guarantees in terms of regions of Ukraine in 2020 (for emergency and inpatient care for patients with COVID-19)

| | Emergency medical care, UAH million | Inpatient medical care, UAH million | Total medical care, UAH million |
|---|---|---|---|
| 1. Vinnytsia region | 234,053 | 431,206 | 665,259 |
| 2. Volyn region | 223,561 | 430,517 | 654,078 |
| 3. Dnipropetrovsk region | 446,685 | 594,062 | 1040,747 |
| 4. Donetsk region | 327,652 | 394,228 | 721,88 |
| 5. Zhytomyr region | 220,466 | 486,836 | 707,302 |
| 6. Transcarpathian region | 267,917 | 392,124 | 660,041 |
| 7. Zaporizhzhya region | 260,351 | 608,374 | 868,725 |
| 8. Ivano-Frankivsk region | 329,793 | 684,033 | 1013,826 |
| 9. Kyiv region | 984,403 | 965,601 | 1950,004 |
| 10. Kirovograd region | 134,728 | 95,545 | 230,273 |
| 11. Luhansk region | 109,327 | 166,578 | 275,905 |
| 12. Lviv region | 552,704 | 672,985 | 1225,689 |
| 13. The Nikolaev area | 175,776 | 316,579 | 492,355 |
| 14. Odessa region | 456,842 | 510,202 | 967,044 |

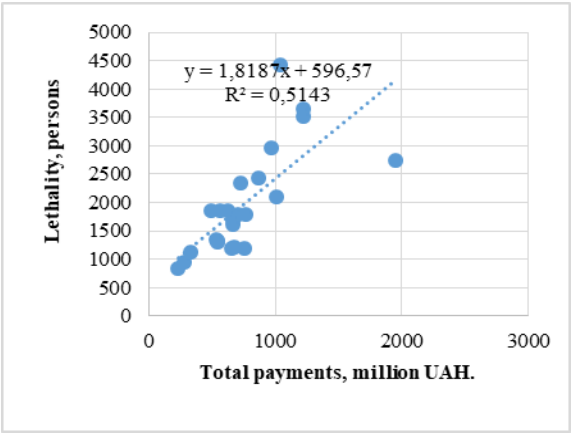
| | | | |
|---|---|---|---|
| 15. Poltava region | 198,621 | 361,196 | 559,817 |
| 16. Rivne region | 291,003 | 383,088 | 674,091 |
| 17. Sumy region | 184,097 | 362,17 | 546,267 |
| 18. Ternopil region | 240,889 | 513,684 | 754,573 |
| 19. Kharkiv region | 560,172 | 659,83 | 1220,002 |
| 20. Kherson region | 134,238 | 197,931 | 332,169 |
| 21. Khmelnytsky region | 226,924 | 400,568 | 627,492 |
| 22. Cherkasy region | 195,3 | 350,751 | 546,051 |
| 23. Chernivtsi region | 251,605 | 516,581 | 768,186 |
| 24. Chernihiv region | 172,542 | 356,246 | 528,788 |
| Total | 7179,6 | 10850,9 | 18030,6 |
| Average value | 299,2 | 452,1 | 751,3 |
| Standard deviation | 190,6 | 187,6 | 364,4 |

Source: National Health Service of Ukraine (2021c).

The average value of payments for services under the program of medical guarantees was UAH 751.3 million with a significant difference for UAH 364.4 million depending on the region, which means that regional peculiarities of the spread of the pandemic were taken into account. For example, the number of medical service providers affected by COVID-19 is different in different regions of Ukraine: the average value at the end of December 2020 was 19.8 service providers with a difference of 5.3 units. By comparison, at the end of April 2020, the average number of providers of medical services was 9.6 with a difference of 4. This allows making an assumption about the link between the financing of medical institutions under the program of providing medical guarantees and the regional capacity of medical institutions to organize specialized providers of medical services for patients with COVID-19. In addition, there is a middle level of link between payment for medical services and mortality: regions with higher level of funding have higher mortality rates (Figure 2). This could mean that the providers of medical services received financial resources for emergency and specialized assistance to patients in the event of increased morbidity, and as a result – a higher mortality risk. Accordingly, the direct mechanism of reimbursement of funds for the services of medical institutions is effective, as it allows to direct resources to the regions with the highest level of consumption and pressure (see Fig 2a,b).




a)




b)

*Figure 2 – Relationship between funding of health care providers under the health guarantee program and morbidity (a), mortality (b) from COVID-19 in the regions of Ukraine, 2020*

Source: calculated by the author based on the National Health Service of Ukraine (2021a; 2021c).

The identified relationship between funding depending on the level of morbidity indicates a positive effect of reforming the health care system, which during the crisis meets the needs of medical institutions in financial resources depending on the load. From April to December 2020, the number of medical institutions for the treatment of patients increased by 245 units (Table 2), respectively, increased the number of medical teams from 908 in April 2020 to 2535 in December 2020.

Table 2: Information on medical service providers for patients with COVID-19, medical teams of service providers, detected cases of illness and mortality in the regions of Ukraine, 2020

| | Total payments, UAH million | Number of providers, April 2020 | Medical teams April 2020 | Number of providers December 2020 | Medical teams December 2020 | Cases were identified (01.01.2020-28.06.2021), persons | Mortality (01.01.2020-28.06.2021), persons |
|---|---|---|---|---|---|---|---|
| 1. Vinnytsia | 665,259 | 9 | 39 | 25 | 115 | 71078 | 1690 |
| 2. Volyn | 654,078 | 9 | 41 | 19 | 109 | 70798 | 1196 |
| 3. Dnepropetrovsk | 1040,747 | 11 | 45 | 28 | 147 | 175599 | 4428 |
| 4. Donetsk | 721,88 | 12 | 8 | 25 | 115 | 90570 | 2348 |
| 5. Zhytomyr | 707,302 | 12 | 50 | 21 | 131 | 88409 | 1785 |
| 6. Transcarpathian | 660,041 | 6 | 25 | 17 | 94 | 62083 | 1603 |
| 7. Zaporizhzhya | 868,725 | 19 | 68 | 21 | 130 | 104568 | 2436 |
| 8. Ivano-Frankivsk | 1013,826 | 13 | 99 | 26 | 160 | 86654 | 2097 |
| 9. Kyiv | 1950,004 | 9 | 48 | 21 | 109 | 127302 | 2742 |
| 10. Kirovograd | 230,273 | 5 | 19 | 7 | 39 | 20614 | 839 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11. Luhansk | 275,905 | 5 | 23 | 10 | 50 | 26560 | 941 |
| 12. Lviv | 1225,689 | 11 | 42 | 23 | 169 | 137395 | 3650 |
| 13. Mykolayiv | 492,355 | 8 | 22 | 18 | 92 | 69944 | 1846 |
| 14. Odessa | 967,044 | 7 | 30 | 18 | 91 | 140557 | 2975 |
| 15. Poltava | 559,817 | 10 | 30 | 24 | 109 | 77817 | 1855 |
| 16. Rivne | 674,091 | 5 | 27 | 15 | 94 | 79471 | 1205 |
| 17. Sumy | 546,267 | 9 | 25 | 17 | 86 | 77857 | 1318 |
| 18. Ternopil | 754,573 | 16 | 62 | 27 | 119 | 70023 | 1199 |
| 19. Kharkiv | 1220,002 | 17 | 57 | 22 | 109 | 148500 | 3522 |
| 20. Kherson | 332,169 | 9 | 22 | 11 | 52 | 35738 | 1133 |
| 21. Khmelnytsky | 627,492 | 3 | 6 | 23 | 123 | 88887 | 1859 |
| 22. Cherkasy | 546,051 | 6 | 26 | 21 | 96 | 81719 | 1307 |
| 23. Chernivtsi | 768,186 | 13 | 68 | 19 | 112 | 79940 | 1792 |
| 24. Chernihiv | 528,788 | 7 | 26 | 18 | 84 | 57519 | 1344 |
| Total | 18030,6 | 231.0 | 908.0 | 476.0 | 2535.0 | 2069602.0 | 47110 |
| Average value | 751,3 | 9.6 | 37.8 | 19.8 | 105.6 | 86233.4 | 1962.9 |
| Standard deviation | 364,4 | 4.0 | 21.5 | 5.3 | 31.4 | 37620.9 | 924.3 |

Source: calculated by the author based on the National Health Service of Ukraine (2021a; 2021b).

This data allows us to assume that the financing of the health care system, in particular the legislative establishment of additional payments to health care workers, Legislative establishment of funding of measures for rapid response to the spread of the pandemic (medications, protective equipment, etc.) contributed to better organization of medical institutions and teams within the institutions and their growth.

The average provider of medical services to patients with coronavirus in 2020 received UAH 37.9 million, depending on the level of the disease in the region, and one team received UAH 7.1 million of the costs. At the same time, the average number of cases per medical facility was 4285 cases and per medical team – 806 cases. One hospital had an average of 99 coronavirus-related deaths, and one medical team had 19 deaths (Table 3).

Table 3: Relative indicators of efficiency of financing of health care system in the conditions of pandemic spread in the regions of Ukraine, 2020

| Region | Ratio of payments to the number of providers, UAH million / provider | Ratio of payments to the number of teams, UAH million / provider | Number of cases / number of providers | Number of cases / number of teams | Mortality / number of providers | Mortality / number of teams |
|---|---|---|---|---|---|---|
| 1. Vinnytsia | 26.6 | 5.78 | 2843.1 | 618.1 | 67.6 | 14.7 |
| 2. Volyn | 34.4 | 6.00 | 3726.2 | 649.5 | 62.9 | 11.0 |
| 3. Dnepropetrovsk | 37.2 | 7.08 | 6271.4 | 1194.6 | 158.1 | 30.1 |
| 4. Donetsk | 28.9 | 6.28 | 3622.8 | 787.6 | 93.9 | 20.4 |
| 5. Zhytomyr | 33.7 | 5.40 | 4210.0 | 674.9 | 85.0 | 13.6 |
| 6. Transcarpathian | 38.8 | 7.02 | 3651.9 | 660.5 | 94.3 | 17.1 |
| 7. Zaporizhzhya | 41.4 | 6.68 | 4979.4 | 804.4 | 116.0 | 18.7 |
| 8. Ivano-Frankivsk | 39.0 | 6.34 | 3332.8 | 541.6 | 80.7 | 13.1 |
| 9. Kyiv | 92.9 | 17.89 | 6062.0 | 1167.9 | 130.6 | 25.2 |
| 10. Kirovograd | 32.9 | 5.90 | 2944.9 | 528.6 | 119.9 | 21.5 |
| 11. Luhansk | 27.6 | 5.52 | 2656.0 | 531.2 | 94.1 | 18.8 |
| 12. Lviv | 53.3 | 7.25 | 5973.7 | 813.0 | 158.7 | 21.6 |
| 13. Mykolayiv | 27.4 | 5.35 | 3885.8 | 760.3 | 102.6 | 20.1 |
| 14. Odessa | 53.7 | 10.63 | 7808.7 | 1544.6 | 165.3 | 32.7 |
| 15. Poltava | 23.3 | 5.14 | 3242.4 | 713.9 | 77.3 | 17.0 |
| 16. Rivne | 44.9 | 7.17 | 5298.1 | 845.4 | 80.3 | 12.8 |
| 17. Sumy | 32.1 | 6.35 | 4579.8 | 905.3 | 77.5 | 15.3 |
| 18. Ternopil | 27.9 | 6.34 | 2593.4 | 588.4 | 44.4 | 10.1 |
| 19. Kharkiv | 55.5 | 11.19 | 6750.0 | 1362.4 | 160.1 | 32.3 |
| 20. Kherson | 30.2 | 6.39 | 3248.9 | 687.3 | 103.0 | 21.8 |
| 21. Khmelnytsky | 27.3 | 5.10 | 3864.7 | 722.7 | 80.8 | 15.1 |
| 22. Cherkasy | 26.0 | 5.69 | 3891.4 | 851.2 | 62.2 | 13.6 |
| 23. Chernivtsi | 40.4 | 6.86 | 4207.4 | 713.8 | 94.3 | 16.0 |
| 24. Chernihiv | 29.4 | 6.30 | 3195.5 | 684.8 | 74.7 | 16.0 |
| Total | 37.9 | 7.1 | 102840.3 | 19351.7 | 99.0 | 18.6 |
| Average value | 37.7 | 7.1 | 4285.0 | 806.3 | 99.0 | 18.6 |
| Standard deviation | 14.9 | 2.7 | 1404.1 | 261.6 | 174.2 | 29.4 |

Source: calculated by the author based on the National Health Service of Ukraine (2021a; 2021b; 2021c).

These relative indicators of health care system financing indicate that institutions with a higher level of financing accordingly had a higher level of burden.

Correlation analysis of significant indicators of health care system financing and morbidity, mortality based on data from Ukrainian regions in 2020 (Table 4) shows a high direct correlation between the level of payments to providers and the level of morbidity (the correlation is 0.703), the level of mortality (the correlation is 0.501). The correlation analysis reveals a direct correlation between funding and mortality.

Therefore, the main trend in the financing of the health care system in the context of the spread of the pandemic is the effective distribution of financial resources for the provision of emergency and hospital medical care by specialized medical institutions.

Table 4: Correlation analysis of relative indicators of financing the health care system and morbidity, mortality based on data from the regions of Ukraine for 2020

| | Ratio of payments to the number of providers, UAH million / provider | Ratio of payments to the number of teams, UAH million / provider | Number of cases / number of providers | Number of cases / number of teams | Mortality / number of providers | Mortality / number of teams |
|---|---|---|---|---|---|---|
| Ratio of payments to the number of providers, UAH million / provider | 1,000 | | | | | |
| Ratio of payments to the number of teams, UAH million / provider | 0,945 | 1,000 | | | | |
| Number of cases / number of providers | 0,703 | 0,642 | 1,000 | | | |
| Number of cases / number of teams | 0,604 | 0,673 | 0,920 | 1,000 | | |
| Mortality / number of providers | 0,596 | 0,531 | 0,799 | 0,716 | 1,000 | |
| Mortality / number of teams | 0,501 | 0,564 | 0,724 | 0,796 | 0,922 | 1,000 |

Source: calculated by the author based on the National Health Service of Ukraine (2021a; 2021b; 2021c).

**5 Discussion**

Control of health care costs affects the level of system capacity and mortality of the population because of the coronavirus disease. A fair distribution of financial resources reinforces the ability of the nation to protect itself from the effects of the pandemic. Khan et al. (2020) found that countries with higher budgets for health care more accurately detect the incidence of disease and mortality and provide more tests per million people. This study found that assistance from developed countries and international organizations ensures a rapid response to the spread of the pandemic, efficient allocation of funds for various countermeasures and dynamic control of the disease. At the same time, a new model of direct financing was found to be able to allocate costs among regions depending on the level of disease incidence and the needs of health care providers. Khan et al. (2020) found "the significant positive association between national expenditure on healthcare and COVID-19 fatalities. The proportion of healthcare expenditure did not insulate nations from negative COVID-19 outcomes". This is explained by the structure of expenditures: for general health care (medicines and medical supplies, prevention of infections), research. Another reason is the level of government control over financial costs (Khan et al., 2020). However, this study revealed the dependence between the need for funding and the amount of funding. Accordingly, this correlation encourages providers of medical services to provide emergency and hospital medical care more efficiently, to respond to cases of illness more quickly and to provide direct financing of services.

Onofrei et al. (2021) argue that under the conditions of modernization of the health care system the pressure on the state budget is growing, and that the spread of the pandemic is particularly detrimental to the budgetary capacities and the ability to respond effectively to the disease. This research has shown an increase in pressure on the state and local budgets due to the growth of the disease, but the pressure has been reduced due to the international financing of the health care system.

Despite the fact that Ukraine has a low level of current spending on health care, in the conditions of pandemics and crisis the allocation of additional financial resources at the national and local level will ensure the growth of the health care system capacity to respond to the disease. Although there is no direct link between ensuring reduced mortality and costs (Khan et al., 2020; Stribling et al., 2020; Elola-Somoza et al., 2021), costs in a crisis environment are important for reducing the workload, stimulating the organization of work of health care providers and medical teams. While Moris & Schizas (2020) showed the absence of a correlation between costs and mortality rates based on correlation analysis, this study examines the correlation between financing and the level of morbidity and mortality. This is due to the need of medical institutions to ensure payment for medical teams: a higher level of morbidity leads to a greater pressure on the work of medical staff, and therefore requires a higher level of remuneration of labor. According to Moris & Schizas (2020), which found that even with limited resources, Greece was able to prevent the spread of COVID-19 (Moris & Schizas, 2020), this study also revealed a quick response of the government to the spread of the pandemic and the provision of funding for medical institutions.

As Verelst, Kuylen & Beutels (2020) found, countries with high potential in the field of health care (expansion, training and optimization of material and human resources) are more effective in solving the problems of pressure, especially during periods of increasing incidence. This research also revealed an increase in the level of the health care system's potential due to the national centralized and local funding and solving the problems of imposition by directing funds to the organization of health care providers.

**6 Conclusion**

The study revealed the tendencies of financing the health care system in Ukraine in the context of the spread of coronary diseases. First, funding is provided at the international, national and local levels, which has ensured the capacity of medical institutions to counteract the disease. Second, the model of direct financing of the cost of emergency and hospital care ensured the distribution of funds depending on the level of morbidity and mortality, which determined the level of pressure on the system as a whole. This reallocation of funds enabled medical personnel to be paid for one year at a time and stimulated the organization of specialized medical care for coronavirus patients at the regional level. Thirdly, the study showed no link between funding and mortality: the funding of interventions does not ensure a reduction in morbidity and mortality. However, a direct link has been revealed: the level of morbidity determines financing: the level of payments to providers of medical care for coronavirus patients is increasing due to the increased burden on medical staff.

Further research should be aimed at identifying financing mechanisms at the national and local level in the context of the spread of coronavirus disease.

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**Primary Paper Section:** A

**Secondary Paper Section:** AH, AQ