

FINANCIAL AND NON-FINANCIAL LOSSES OF THE UKRAINIAN HEALTHCARE SYSTEM RESULTING FROM THE WAR: INSTITUTIONAL, FUNCTIONAL, AND REGIONAL DIMENSIONS¹

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Introduction. The full-scale war launched by Russia on 24 February 2022 has led to the systemic destruction of Ukraine's healthcare system. Beyond direct human losses, the war has resulted in extensive damage to medical infrastructure. Damage or destruction was recorded at 2,551 facilities across 817 healthcare institutions, 327 of which were completely destroyed [1]. The war has also damaged equipment and transport, disrupted supply chains for medicines and medical devices, placed increased strain on healthcare institutions, and substantially increased the population's need for medical care. The estimated needs for the reconstruction and recovery of medical infrastructure amount to USD 19.4 billion over the next 10 years [1]. At the same time, the consequences of the war for the healthcare system are not limited to material damage alone. Human resources, institutional, social, psychological, and medico-demographic losses have reached a significant scale, manifesting in the migration of healthcare workers, health workforce shortages, disruptions in the continuity of care, deteriorated access to medical care, an increased prevalence of mental disorders among the population, and rising rates of disability and mortality.

Analysis of recent research and publications. Significant contributions to the study of the consequences of armed conflicts on medical systems have been made by experts from the World Health Organization (WHO) [2], the World Bank [3], the United Nations Development Program (UNDP) [4], and the Organization for Economic Co-operation and Development (OECD) [5]. Previous studies [6-8] have demonstrated that uncertainty in the healthcare domain requires adaptive governance mechanisms and coordinated institutional responses to maintain public trust and ensure the resilience of healthcare systems. Institutional capacities become particularly important during wartime, when healthcare systems face unprecedented financial and non-financial losses [9, 10]. The study by Barten D., Tin D., Granholm F., et al. analyzes the scale of attacks on Ukraine's healthcare facilities during the first year of the full-scale war and their impact on the functioning of the medical system [11]. The long-term consequences of the war for Ukraine's healthcare system are highlighted in a study by Honevych K., Burkle F., Dzhus M., and Khorram-Manesh A. [12]. At the same time, contemporary research increasingly focuses not only on material damage but also on the institutional resilience of the

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healthcare system and its capacity to ensure the availability of medical care to the population under conditions of prolonged armed conflict. In particular, the findings of a study by Hellowell M., Kalendruz K., Bondar T., Haniukov O., and Habicht J. [13] demonstrate the significant impact of infrastructure destruction, medical workforce shortages, and internal population displacement on the delivery of medical services in frontline regions of Ukraine. Insufficient attention has been paid to the comprehensive assessment of the financial and non-financial losses of the healthcare system, including their institutional and functional consequences, as well as regional differentiation. Furthermore, there remains a limited number of studies that integrate the analysis of direct and indirect financial losses with the human resources, social, psychological, and medico-demographic consequences of the war.

The aim of this research is to comprehensively assess the financial and non-financial losses of Ukraine's healthcare system resulting from the full-scale war, and to determine their impact on the sector's institutional-functional and financial capacity at both national and regional levels.

The main material of the study. The full-scale war has caused significant transformations in the functioning of Ukraine's healthcare system, the consequences of which include both material damage and reduced access to healthcare, loss of human resource potential, and declining public health indicators. In this regard, to comprehensively evaluate the consequences of the war, it is essential to differentiate between the financial and non-financial losses of the healthcare system. According to the approaches of the World Bank, the United Nations, and the European Union applied in the Post-Disaster Needs Assessment (PDNA) methodology, financial losses encompass direct damage caused by the destruction of assets, as well as indirect economic losses related to reduced levels of activity and additional expenses for restoring system functioning [14]. The consequences of the war for the healthcare system are twofold: financial and non-financial losses. This approach aligns with the aforementioned PDNA methodology, which underpins the Rapid Damage and Needs Assessment (RDNA) used to evaluate the impact of the war in Ukraine [15]. According to the World Bank's approaches and the PDNA methodology, it is appropriate to divide losses into direct and indirect [15]. Direct financial losses are associated with physical damage to or destruction of healthcare system assets, as well as additional expenditures required to ensure its continuous operation under wartime conditions. This category includes the destruction and damage to healthcare facilities; the loss of medical equipment, medical transport, and other property; the destruction of stocks of medicines, vaccines, and consumables; additional costs for the treatment of casualties and the implementation of rehabilitation measures; expenses for the remuneration of healthcare workers under increased workload conditions; logistical costs associated with the relocation of medical facilities and the disruption of supply chains; and expenses for ensuring the energy autonomy of medical institutions. Unlike direct losses, indirect financial losses arise from disruptions in economic processes within the healthcare sector and are primarily long-term. These include a reduction in sector funding due to shifts in budgetary priorities; lost revenues of healthcare facilities caused by a decrease in the volume of medical care or population migration; a decline in investment activity and a reduction in capital investments for the development of medical infrastructure; and additional costs associated with the disruption of logistical supply chains. Despite the difficulty of quantitative measurement, these indirect financial losses largely determine the healthcare system's financial sustainability and its capacity to provide the population with necessary medical services in the long term. Non-financial losses encompass the consequences of the war that do not have a direct monetary measure but significantly affect the functioning of the healthcare system and the state of public health. Unlike financial losses, they are evaluated primarily using quantitative and qualitative indicators that characterize changes in human resources, the organization of medical care, and medical and demographic processes [11, 16]. The dynamics of key indicators of direct financial losses in Ukraine's healthcare system in 2022–2025 are presented in Table 1.

Table 1

Dynamics of direct financial losses of Ukraine's healthcare system

Indicator	2022	2023	2024	2025
Number of attacks on healthcare facilities, units	1029	530	580	633
Destruction of medical infrastructure (number of facilities), units	552	241	326	341
Losses of medical transport, units	218	51	123	134
Destruction of stocks of medicines and medical devices (number of attacks on warehouses), units	18	2	9	34

Source: compiled by the authors based on [17–18]

The presented data indicate that the healthcare system sustained the most severe destruction in 2022, when 1,029 attacks on healthcare facilities were recorded, and 552 medical facilities were damaged or destroyed. In the following years, the number of attacks decreased but remained significant: in 2025, 633 attacks and 341 cases of destruction or damage to medical infrastructure were registered. This demonstrates the long-term negative impact of military actions on the sector's functioning. Substantial losses were also inflicted on medical transport, which ensures the operation of emergency medical services and patient transportation. The largest losses were recorded in 2022, when 218 transport units were damaged or lost. A distinct manifestation of direct financial losses was the systematic attacks on warehouses storing medicinal products and medical devices. The most extensive incident occurred in October 2025, when the central warehouse of "Optima-Pharm" in Kyiv, one of the largest pharmaceutical distributors in Ukraine, was destroyed. Total losses were estimated at approximately USD 100 million, resulting in the country temporarily losing nearly 20% of its monthly supply of medicinal products [19]. In April 2025, a warehouse belonging to the "Kusum" pharmaceutical group LLC Gladpharm LTD in Kyiv was completely destroyed as a result of a direct strike by an unmanned aerial vehicle. Finished medicinal products, active pharmaceutical ingredients, excipients, and manufacturing equipment were stored at the facility, with the total losses estimated at approximately UAH 1 billion [20]. In June 2026, another attack targeted "Darnytsia", one of the largest pharmaceutical manufacturing enterprises in Ukraine, located in Kyiv [21]. The destruction of pharmaceutical infrastructure causes not only direct economic losses but also increases the risk of disruptions to the supply of essential medicines to the population. Alongside direct losses, the war has generated a range of indirect financial losses stemming from disruptions to economic processes in the healthcare sector and the need to adapt the system to new operating conditions. Unlike direct losses, these are more difficult to assess quantitatively because they do not always have a tangible form. According to the calculations, these losses amounted to UAH 11.04 billion in 2023. This was driven by a reduction in the volume of certain types of medical care, population migration, shifts in the demand structure for medical services, and disruptions to the operations of healthcare facilities in regions affected by hostilities [20]. Mass attacks on Ukraine's energy infrastructure created an additional financial burden on the healthcare system. To ensure the uninterrupted operation of medical facilities, it became necessary to establish backup power sources. In particular, in 2024, approximately 12,000 generators were purchased for healthcare facilities, enabling the continued operation of hospitals and other medical institutions during emergency and scheduled power outages [22]. The dynamics of key healthcare financing indicators are presented in Figure 1. Table 2 indicates significant losses in the human resource capacity of the healthcare sector resulting from hostilities.

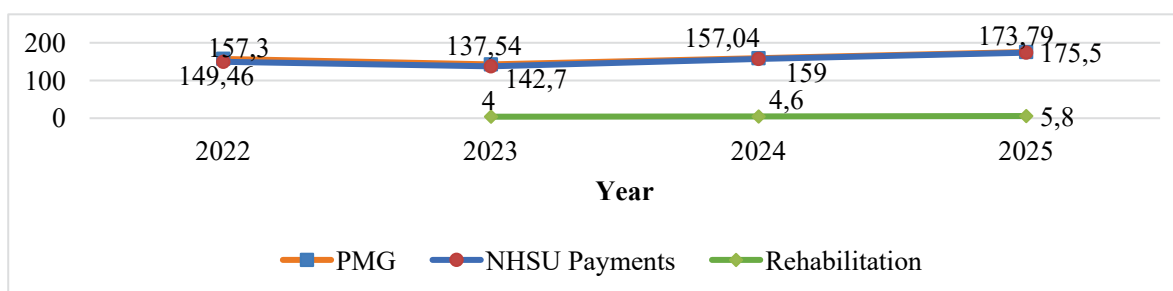


Figure 1. Financial support for the healthcare system of Ukraine, billion UAH

Note: PMG – Medical Guarantees Program; NHSU Payments – Actual payments of the National Health Service of Ukraine to healthcare providers; Rehabilitation – Financing of rehabilitation services

Source: compiled based on data from [23–25]

Table 2

Human resource losses in the healthcare system of Ukraine

Indicator	2022 year	2023 year	2024 year	2025 year
Healthcare worker fatalities, individuals	96	135	103	88
Healthcare worker injuries, individuals	67	74	98	140
Vacant healthcare positions, units	Approx. 500	Approx. 13,000	Approx. 28,000	Approx. 9,500
Number of medical interns, individuals	N/A	7,952	7,348	Approx. 3,000

Source: compiled by the authors based on [26–30]

According to estimates by international and national organizations, primary care registration rates fell to 34.7% in certain areas, whereas prior to the full-scale invasion, this figure exceeded 70% in most regions [31]. In the most severely affected regions, the number of patient visits fell to approximately 66% of pre-war levels, and e-prescription usage decreased nearly fourfold. Simultaneously, the occupation of certain territories and the destruction of healthcare facilities resulted in the loss of access to medical records and information resources. According to available estimates, approximately 20% of the population in temporarily occupied territories lost access to their paper-based medical records, while a significant number of facilities were disconnected from Ukraine's eHealth system. Furthermore, between 60% and 80% of healthcare facilities in the occupied territories ceased operations or were repurposed for military use. This severely limited government oversight and administration of healthcare services. As early as 2022, approximately 30% of households with members living with chronic conditions reported difficulties accessing necessary medical care, and 27% reported a complete lack of such services at their place of residence. In 2024, accessibility challenges remained pressing: 54% of the population required medical care, and nearly 65% reported barriers to obtaining it. Furthermore, approximately 10% of the population lived in settlements where necessary medical services were effectively unavailable [32]. According to sociological studies, one in four residents of Ukraine lacked adequate access to emergency medical services, healthcare facilities, or pharmacies. Internally displaced persons (IDPs) remain a particularly vulnerable group, with approximately 20% lacking access to a family doctor, compared to only 5% among other households. The disruption of continuity of care for patients with chronic conditions has also emerged as a severe issue. Notably, among patients with HIV and tuberculosis, approximately 40.5% missed their prescribed medications for more than ten days, creating additional risks of health deterioration and the spread of infectious diseases of public health concern [33]. The psychological consequences of the war constitute a significant component of non-financial losses and affect both healthcare professionals and the general population. According to studies, approximately half of all physicians exhibit signs of occupational burnout, while over 70% report sleep disturbances and other manifestations of psycho-emotional exhaustion [34]. According to research, 46.5% of the population exhibit symptoms of depression, 46.3% show signs of anxiety disorders, and nearly 70% display indicators of traumatic stress. Simultaneously, between 12% and 20% of the population suffer from symptoms of post-traumatic stress disorder (PTSD), and in total, approximately one-quarter of citizens face mental health disorders of varying severity [35]. According to sociological survey findings, about 30% of Ukrainians postponed visiting a doctor due to financial difficulties, and 27% of the population did not seek medical care at all during the three years of the full-scale war [36]. The dynamics of specific morbidity indicators are presented in Table 3.

Figure 2 illustrates significant medico-demographic losses among the population under wartime conditions.

Table 4 indicates regional disparity in the war's impact on the healthcare system. The highest numbers of attacks on healthcare facilities were recorded in Donetsk (461), Kherson (368), Kharkiv (348), Dnipropetrovsk (183), and Sumy (159) regions. A similar pattern is observed regarding direct financial losses. The heaviest damage was sustained by the Donetsk (UAH 38.6 billion), Kharkiv (UAH 32.7 billion), Luhansk (UAH

Table 3

Dynamics of morbidity indicators in Ukraine

Indicator	2022	2023	2024	2025
Cancer incidence (new cases per 100,000 population)	+233.8	+251.2	+271.1	N/A
Tuberculosis (new cases per 100,000 population)	+45.1	+48.4	+44.2	+38.0
ARVI, including COVID-19 (new cases per 100,000 population)	+9582.5		+12846.2	

Source: compiled by the authors based on [37–40]

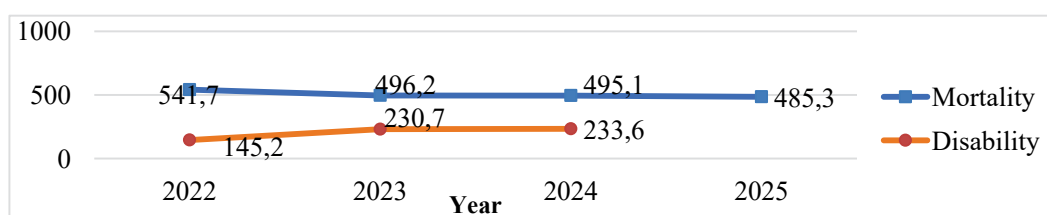


Figure 2. Mortality, newly registered disability cases in Ukraine, thousands

Source: compiled based on [41–42]

18.2 billion), Zaporizhzhia (UAH 17.0 billion), and Kherson (UAH 13.4 billion) regions. Western regions are characterized by minimal losses, which is attributable to the absence of active combat operations on their territory. The war has significantly affected public health indicators. These spatial variations are particularly evident in the Health Index findings. They indicate a deterioration in public health within the regions that experienced the highest wartime impact [45-46]. A particularly complex situation is observed in the frontline and border regions. The highest levels of mental health problems among the population were recorded in the Kherson (78.8%), Zaporizhzhia (77.1%), Kharkiv (73.7%), and Sumy (67.6%) regions.

Table 4

Regional differentiation of the healthcare system losses

Region	Attacks on healthcare (number of incidents)	Direct financial damage (UAH billion)
	2022 – 2025	Feb 2022 – Nov 2024
Vinnitsia	13	0.6
Volyn	1	0
Dnipropetrovsk	183	3,9
Donetsk	461	38,6
Zhytomyr	12	0,9
Zakarpattia	1	0
Zaporizhzhia	132	17
Ivano-Frankivsk	6	0.6
Kyiv	90	12.4
Kirovohrad	2	0,3
Luhansk	97	18.2
Lviv	10	0.4
Mykolaiv	62	8.8
Odesa	37	1.9
Poltava	18	0.7
Rivne	8	0.4
Sumy	159	3.7
Ternopil	5	0.2
Kharkiv	348	32.7
Kherson	368	13.4
Khmelnyskyi	1	1.1
Cherkasy	9	0.2
Chernivtsi	4	0.1
Chernihiv	62	5.9
Autonomous Republic of Crimea	4	n.d.

Source: compiled by the authors based on [43–44]

Elevated rates are also evident in the Odesa region (62.9%), which is frequently targeted by missile and drone attacks. Analysis of medico-demographic indicators demonstrates significant regional variations in the prevalence of specific diseases. The highest cancer incidence rates in 2024 were observed in the Kirovohrad (459.9 cases per 100,000 population), Cherkasy (455.6), Chernihiv (438.8), Khmelnytskyi (426.1), and Sumy regions (373.1) [45]. Tuberculosis incidence also varied substantially across regions. The highest rates in 2024 were recorded in the Dnipropetrovsk (86.2 cases per 100,000 population), Odesa (79.7 cases per 100,000 population), and Kirovohrad (75.4 cases per 100,000 population) regions [38].

Conclusions. This study provided a comprehensive assessment of the financial and non-financial losses incurred by the Ukrainian healthcare system as a result of the war and identified their institutional, functional, and regional dimensions. Based on a synthesis of international approaches to assessing crisis impacts, a classification of healthcare system losses was developed, covering direct and indirect financial losses, as well as human resource, institutional, social, psychological, and medico-demographic losses. The analysis shows that despite the extensive destruction, the state maintained financial support for the sector, as evidenced by increased funding for the Medical Guarantees Program, actual disbursements by the National Health Service of

Ukraine (NHSU), and expenditures on rehabilitation care. Among non-financial losses, the most significant are the human resources, social, and psychological impacts of the war. Research confirms a growing shortage of medical workers, an increase in deaths and injuries among healthcare workers, and disruptions in professional training processes. The findings confirm that the impacts of the war extend far beyond immediate material damage, creating a long-term effect on public health and the nation's demographic development. Regional analysis revealed significant territorial differentiation in losses across the healthcare system. The greatest scale of destruction, attacks on medical infrastructure, and financial losses are concentrated in frontline and de-occupied regions, specifically Kharkiv, Donetsk, Luhansk, Kherson, Zaporizhzhia, and Mykolaiv regions. Simultaneously, the deterioration of public health indicators and the population's psycho-emotional state is observed across nearly the entire country, demonstrating the systemic nature of the war's impact on the healthcare system.

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Daryna Synenko, Postgraduate Student, Sumy State University. **Nataliia Letunovska**, Doctor of Economics, Professor, Associate Professor of the Department of Marketing, Sumy State University. **Yelyzaveta Shchhehelska**, Student, Sumy State University. **Financial and non-financial losses of the Ukrainian healthcare system resulting from the war: institutional, functional, and regional dimensions.**

The article analyzes approaches to assessing various types of healthcare losses. The authors have developed the classification of healthcare losses based on a distinction between financial and non-financial categories. Direct and indirect financial losses were analyzed over time, with particular attention to losses resulting from damage to medical infrastructure, healthcare facilities, physical assets, medical equipment, and vehicles, as well as additional budgetary expenditure required to maintain the uninterrupted operation of the healthcare system under martial law. Particular attention is paid to evaluating the indirect financial consequences associated with reduced healthcare accessibility, disrupted supply chains, rising costs for emergency medical services, and the restoration of damaged facilities. The study examines non-financial losses manifested through human resource, institutional, social, psychological, and medico-demographic war-related impacts. A regional analysis of losses in Ukraine's healthcare system revealed significant territorial variation in the extent of destruction and adverse consequences.

Key words: healthcare system, war-related losses, financial losses, non-financial losses, public health.

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У статті проаналізовано теоретико-методичні підходи до оцінювання втрат у сфері охорони здоров'я та систематизовано наукові підходи до їх класифікації в умовах воєнних конфліктів. Обґрунтовано необхідність комплексного оцінювання наслідків війни, яке передбачає врахування прямих фінансових збитків і нефінансових втрат. Запропонована класифікація втрат дає змогу комплексно оцінити наслідки війни для системи охорони здоров'я. Узагальнено офіційні статистичні дані та результати міжнародних оцінок щодо втрат, яких зазнала національна система охорони здоров'я України внаслідок повномасштабної війни з РФ упродовж 2022–2026 рр. Проведено аналіз втрат, пов'язаних із руйнуванням і пошкодженням медичної інфраструктури, закладів охорони здоров'я, матеріально-технічної бази, медичного обладнання, транспортних засобів, а також із додатковими бюджетними витратами на забезпечення безперервного функціонування системи охорони здоров'я в умовах воєнного стану. Проаналізовано непрямі фінансові наслідки, пов'язані зі зниженням доступності медичних послуг, порушенням логістичних ланцюгів, зростанням витрат на екстрену медичну допомогу та відновленням пошкоджених об'єктів. Досліджено нефінансові втрати, що проявляються у вигляді кадрових, інституційних, соціальних, психологічних і медико-демографічних наслідків війни. Визначено основні тенденції: міграцію медичних працівників, дефіцит кадрового забезпечення, погіршення доступності медичних послуг для населення, зростання навантаження на заклади охорони здоров'я та погіршення показників громадського здоров'я. Проведено регіональний аналіз втрат у системі охорони здоров'я України, який засвідчив значну територіальну диференціацію масштабів руйнувань і негативних наслідків. Запропоновані підходи до оцінювання втрат можуть бути використані органами державної влади, міжнародними партнерами та іншими зацікавленими сторонами для визначення пріоритетів післявоєнного відновлення, розподілу фінансових ресурсів, удосконалення державної політики у сфері охорони здоров'я та підвищення стійкості національної системи охорони здоров'я до майбутніх кризових викликів.

Ключові слова: система охорони здоров'я, воєнні втрати, фінансові втрати, нефінансові втрати, громадське здоров'я.