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THE IMPACT OF THE COVID-19 PANDEMIC ON THE FINANCIAL RISK OF HOSPITAL OPERATIONS IN POLAND

Magdalena GĄDEK[1]*, Arkadiusz GÓRSKI[2]

[1] Wroclaw University of Science and Technology; magdalena.gadek@pwr.edu.pl, ORCID: 0000-0002-7153-8022
[2] Wroclaw University of Science and Technology; arkadiusz.gorski@pwr.edu.pl, ORCID: 0000-0003-3595-9820
* Correspondence author

Purpose: The main objective of the research was to find an answer to the research question: What impact on the financial risk of hospital operations in Poland was the COVID-19 pandemic?
Design/methodology/approach: The following research methods were used to achieve the research objective: critical analysis of the subject literature, financial data analysis, ratio analysis, statistical inference using selected statistical tests with the use of the IBM SPSS Statistics.
Findings: At the stage of analysis of the literature, it was shown that the pandemic theoretically had an impact on the financial situation of hospitals, as confirmed by other studies, therefore, the impact of the pandemic should also be visible in the area of financial risk of hospital operations. However, the literature review carried out did not confirm the existence of research in this area. In connection with the existing cognitive gap, we conducted empirical studies that did not confirm the adopted detailed hypotheses. It should be considered that the COVID-19 pandemic did not have a statistically significant impact on the financial risk of hospitals in Poland.
Research limitations/implications: It should be emphasized that three financial risk measures were adopted, the number of financial risk measures should be expanded in future studies. Authors also propose to extend the research to include the use of measures that take into account the sources of risk. Authors encountered limitations of the conducted research, although the research sample was statistically adequate, but it could be more numerous, however, for many hospital units full financial data was missing and had to be rejected from the analyzed sample.
Originality/value: The paper fills a research gap by empirically assessing the impact of the COVID-19 pandemic on hospital financial risk in Poland. It offers novel insights based on volatility measures and is addressed to healthcare managers, policymakers, and researchers in health economics.
Keywords: hospitals in Poland, financial situation of hospitals, financial risk of hospital operations, impact of the pandemic on hospital operations in Poland.
Category of the paper: Research paper.

1. Introduction

Hospitals, like other organizations, operate in a turbulent, unstable economic, economic and political environment where changes are sudden and unpredictable. The contemporary environment is characterized by researchers as fragile, restless, nonlinear and incomprehensible, in which there are phenomena of the "black swan" type, which included the COVID pandemic, which in Poland began officially with the announcement of the state of the epidemic by the Minister of Health in March 2020 and lasted until May 2022. Naruć (2023, p. 181) it points out that throughout Europe, the pandemic has not only had a negative impact on the economies of individual countries, but also on the financial situation of economic operators and thus on the lives of hundreds of millions of people around the world. The pandemic also had a significant impact on limiting access to healthcare and, consequently, on the financial and financial situation of hospitals. The aim of the article is to assess the impact of the COVID-19 pandemic on the financial risk of hospital operations in Poland, together with to present the results of research on this issue. The research covered the years 2018-2021, and financial data were obtained from the EMIS Platform. The test sample consisted of 362 entities classified as a hospital, according to PKD code 86.10.Z. The theoretical and empirical considerations allowed to verify the main research question: What impact on the financial risk of hospital operations in Poland was the Covid-19 pandemic?, by verifying the main research hypothesis: "The COVID-19 pandemic had an impact on the financial risk of hospital operations in Poland".

2. Hospital as an organization

Analyzing the literature items in the field of management sciences in the context of the definition of an organization, it can be noted that they are characterized by diversity, which results from the way the topic is treated. Bielski (1992, p.73) draws attention to two main approaches, which systematize the definition of an organization, occurring in the literature of the subject. The author distinguishes the pre-system and system categories, to which the concept of organization can be included. In the pre-system approach, the term organization occurs most often in three basic objective, attribute and functional meanings (Koźmiński, Piotrowski, 2000, p. 29; Zieleniewski, 1981, pp. 266-267). The system approach of an organization groups definitions derived from system theory and cybernetics. One of the most well-known, and according to Nyczaj (2001, p. 12) is the definition of R.L. Ackoff, from which it follows that an organization has the ability to change or correct its goals or methods and tools by which it is supposed to achieve its goals. Making a choice of purpose, methods or tools is

an unambiguous expression of will, characteristic of human behavior. This is due to the fact that the organization is man-made and its key element is people. The work station and organizational units listed in the literature as subsystems perform a specific function for which they are responsible. The organization, as well as each of its elements, undertakes activities oriented on purpose, the main goal is called a mission, is clearly defined and defines the meaning of the existence of the organization in its environment. The mere existence of a group of elements pursuing a common goal does not define an organization as a system. An organization is a set of elements between which certain relationships must occur. These relationships define the flow of information and resources needed for the functioning of components, and thus to achieve their goals, which in turn leads to the achievement of the goals of the organization, that is, the realization of its mission. The components of the organization are therefore dependent on each other and also characterized by mutual matching. The interconnectedness and interdependence of the elements of the system suggest the existence of a certain internal ordering of the whole, which manifests itself in the structuring of the organization. This means that the organization is hierarchical. In the organization as a system, there is not only an element of superior nature to the others, it also performs strictly defined managerial and control functions (Bielski, 1992, pp. 73, 82-83; Chudy, Kabat, Pietraszewski, 2006, p. 62; Koźmiński, Piotrowski, 2000, p. 30; Nyczaj, 2001, pp. 12-13).

The implementation of the research objective required the assumption that a hospital, which, in accordance with the Act on Medical Activity, is a[1] medical establishment *in which a medical entity performs medical activities such as hospital services,* is also an organization. In the light of the above considerations, a hospital will be defined as a specific type of system created by humans, in which people are the most important component of it. The hospital as a system consists of elements. These elements combined together carry out the mission, that is, the main purpose of the organization's existence, recorded in accordance with the applicable law. The elements stand out among each other goals, that is, they perform specific functions in the hospital. The hospital system is characterized by internal consistency and alignment of elements, as well as structuring and hierarchization. In a hospital, one of the subsystems must perform a controlling role, that is, manage the remaining elements in such a way as to achieve the desired effect, which is to carry out the mission and contribute to the success of the whole.

[1]Act of 15 April 2011 On medical activity, Journal of Laws of 2011, No. 112, item 654.

3. The hospital environment as an organization in the context of the COVID-19 pandemic

The hospital as an organization operates in an environment. The literature of the subject defines the environment of an organization as a collection of elements not forming part of the system, but at the same time remaining in some relation to it (Bielski, 1992, p. 134). These relationships are called relationships because the organization is an open system. They are bilateral in nature, expressed in the fact that the organization influences the environment and the environment affects the organization. The company draws from the environment specific resources, and at the same time returns to the environment elements created as a result of the processes taking place in it. Sudoł emphasizes that the company serves the environment and needs to learn the environment [...] It is a learning system of the environment (Sudol, 2002, p. 62), thanks to which it can increase its effectiveness.

An organization's environment consists of elements related to each other and the organization. These elements may directly or indirectly affect its activities. In the literature of the subject, the most common division of the whole environment of the organization is the division into the surrounding, closer and further environment, that is, due to the direction of action. The closer environment is called direct or task-oriented, it directly affects every organization and is a specific environment for each, moreover it is institutionalized. The environment, further called indirect or general, is characterized by universalism, that is, it is the same for all organizations. It contains elements that indirectly affect the situation of the company (Bielski, 1992, p. 136; Kautsch, 2010, p. 68; Witczak, 2009, p. 132).

Nowadays, knowledge of the environment is becoming increasingly important for the functioning of any organization, including hospitals, due to its variability over time. Literature studies in this area indicate that organizations currently operate in a hypervariable environment, which is defined by BANI's theory built on the basis of earlier scientific achievements – VUCA theory. The environment referred to as BANI is characterized by fragility, brittle), and restlessness (nonlinear, and is often incomprehensible) for participants of the organization. The functioning of enterprises, including hospitals, in the vicinity of BANI forces to take appropriate actions, within the framework of RAAT. The researchers indicate that this type of environment forces organizations and its participants to build organizational resilience, awareness of changes, ability to quickly adapt to changes and transparency of actions and processes in the organization, in order to reduce the misunderstanding of the external and internal environment (Wick, 2020).

In such an environment, phenomena called black swans appear. black swans). Kisielnicki (2021, p. 23) refers to the work of Table, which defines them as unpredictable events with a very low probability of occurrence, resulting in extremely negative economic and social consequences. It should be noted that the COVID-19 pandemic, which is an event classified as a "black swan" phenomenon, had a significant impact on each of the components of the closer and further environment, and thus on the operations of hospitals in Poland. In this context, considering the characteristics of the environment due to its variability, it should be noted that the occurrence of the pandemic has also exacerbated the negative effects of ambient variability, increasing uncertainty about future events and, as a consequence, may have contributed to increased risks for hospital operations, including financial risks.

4. Financial risk of hospitals and measures

Risk is an ambiguous and complex concept used in many fields of science, not only in social sciences. Hadyniak (Monkiewicz, Gąsiorkiewicz, 2012, p. 34) emphasizes that risk accompanies any action, and results from uncertainty about its results. The author refers to Knight's breakthrough work, who first organized these two concepts – risk and uncertainty, specifying that risk is measurable, that is, it concerns future events whose probability of occurrence is calculable, uncertainty cannot be approximated by statistical methods, it is not subject to mathematical estimates (Kuziak, 2011, p. 16). The literature of the subject characterizes different concepts, approaches and types of risk, and defines the risk management process. In the context of this Article, it is necessary to define the financial risk of hospital operations and to set the measures to determine its level.

Jajuga, Jajuga (1996, p. 99) presents financial risk as part of the internal risk of an organization and defines it as arising from the use of largely foreign capital to finance its operations. Dudycz also expresses this view (2011, p. 197), who notes that in strengthening adverse effects in conditions of weak economic situation there is mainly a risk associated with the acquisition of foreign capital. In subsequent works, Jajuga (2018, p. 26) defines financial risk as risk causing financial effects in an entity that is exposed to them, and this group includes market, credit, operational, liquidity, legal and business risks and events. The author also points out that some of the listed risks are specific to a given type of activity and do not occur in the case of other entities. In this paper, we will consider the financial risk of the hospital as defined by Jajuga, Jajuga (1996, p. 99), taking into account the liquidity risk (as the possibility of the entity not paying current liabilities on time) and the solvency risk of the entity (the value of the entity's assets is not higher than the value of liabilities) (Jajuga, 2018, pp. 37-38).

Since there are many types of risk in an organization's operations, there are also many risk measures that can be distinguished by the nature of the random variable, the dimension of the risk analyzed, as well as the analysis of the effects and sources of risk (Kuziak, 2011, p. 98). For the purposes of answering the research question, we take the measure taking into account the effects of risk, i.e. the coefficient of variation, as the most appropriate tool for measuring financial risk. Jajuga points out that the idea of measuring risk using volatility measures comes from Makowitz's portfolio theory. According to it, the greater the volatility of the rate of return (or other variable risk), the greater the risk (2018, p. 62). Dudycz, on the other hand, emphasizes that the coefficient of variation, unlike the standard deviation, has the value of comparability, because regardless of the size of the expected value, it shows what part of this value is the standard deviation (Dudycz, 2011, p. 186).

After conducting the literature research, including *ex post studies*, we will focus on the effects of the pandemic by measuring financial risk using the volatility index, examining the volatility of leverage, liquidity volatility and volatility of the general debt ratio of hospitals.

5. The COVID-19 pandemic and the operation of hospitals

According to the World Health Organization (WHO) (WHO Coronavirus (COVID-19) Dashboard…), the coronavirus has been reported in 223 countries, areas and territories of the world, and the total number of confirmed cases of coronavirus infection in Europe at the end of 2022 exceeded 269 million people, of which more than 2.2 million people died. The development of the coronavirus pandemic resulted in far-reaching socio-economic disruptions, including the economic crisis (Flag-Geruszyńska, 2020, p. 389; Demirbaş, Bozkurt, Yorğun, 2020, p. 153; Kowalski, 2020, p. 254). The scale of the pandemic, the observed failure of health systems related to the number of cases, the desire to reduce the number of victims and the escalation of the pandemic forced most countries to introduce a number of restrictions, restrictions, prohibitions and orders (Tachmatzidis, 2020, p .ix), which negatively affected the socio-economic situation without leaving out any country. Governments have begun to implement a variety of compensatory measures, intervening in the markets to maintain the existence of businesses and jobs. A number of support programs have appeared in various areas of the state's functioning, from the economy, through culture, sport, as well as health protection (SPOZ; Kotliński, Mizak, Żukowska, 2020, p. 619). To sum up, from the point of view of the subject of this article dealing with the impact of the pandemic on the financial risk of hospitals, it is important to take into account the characteristics of the government's actions in support of the health care system in Poland, as they were a factor determining the financial situation of hospitals.

When considering the impact of the pandemic on hospital finances, it should be pointed out that the increased number of hospitalized infected with coronavirus is a burden, but on the other hand, a number of planned treatments were canceled, which relieved the system. Working in life-threatening conditions forced the introduction of financial incentives for medical staff, which increased the cost of employment, even despite the lack of employment growth. On the other hand, the state budget reacted and allocated higher expenditures on the health care system, at the expense of increasing the deficit. In Poland, the consequence of this state of affairs was the amendment in 2021 of the "Act on health care services financed from public funds", which included, among other things, a plan to increase expenditures on health care, which, ultimately, in 2027, are to reach 7%. It should be noted that in the years before the pandemic this level oscillated around 5% of GDP.

Analyzing the statistical data covering health care expenditures included in the National Health Account in the years 2013-2023 we can see a clear, steady annual increase, with the highest increases both in nominal and percentage terms compared to the previous year, taking place in the years 2021 and 2022, as presented in Figure 1. that when analyzing public expenditure, neither private nor direct household expenditure was taken into account, considering that it had no significant impact on the financial situation of hospitals.

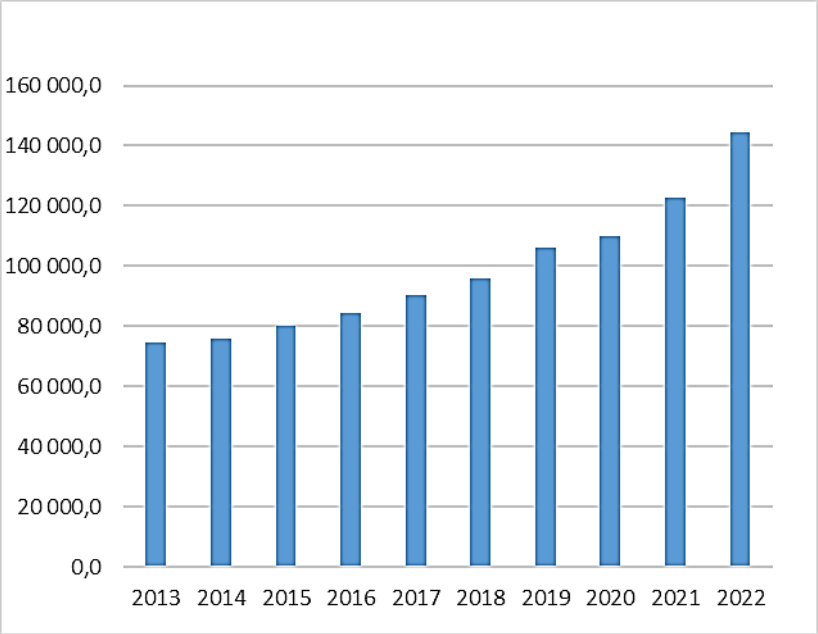

Figure 1. Public expenditure on health care in Poland in the years 2013-2022 [in PLN m].

Source: Own study based on data from CSO.

When assessing the increase in health care expenditures, we conclude that during the pandemic it was noticeable, but when analyzing the level of spending as a percentage of GDP, in relative terms, the increases were not so pronounced.

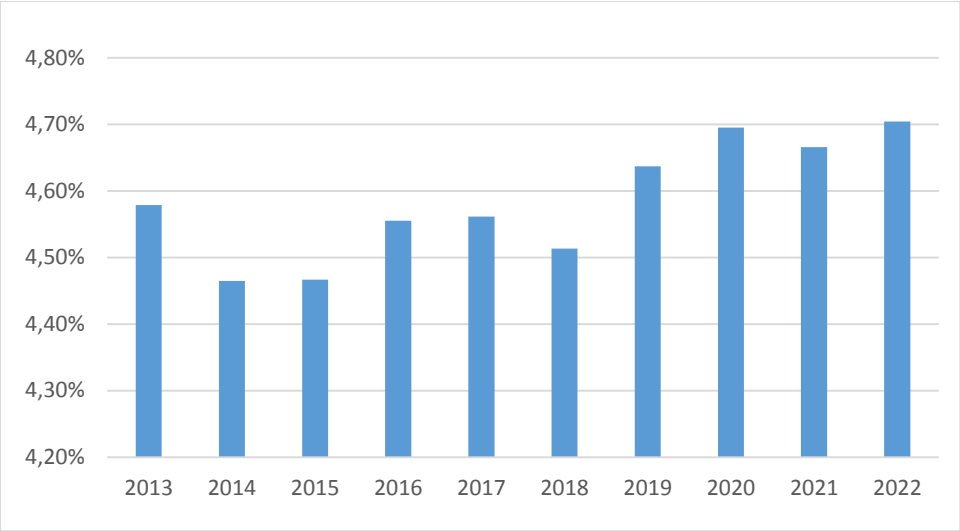

Figure 2. Public expenditure on health care in Poland in 2013-2022 as % of GDP.

Source: Own study based on data from CSO.

Between 2013 and 2022, health care expenditure represents between less than 4.4% and 4.7% of GDP, an increase of almost 0.2% of GDP is visible between 2018 and 2020, but it can be clearly stated, that the percentage of expenditure in relation to GDP was stable and during the pandemic we are noticing a slight increase. The effect of the pandemic and the adopted amendments to the financing Act should be visible only in the following years, according to estimates in 2023 public expenditure in relation to GDP accounted for about 5.8% and here there is a clear increase, while this period is not the subject of research and the data are estimates.

The nominal increase in public health spending has been significant and the percentage increases in this spending year-on-year during the pandemic are clear. A deeper analysis shows in this respect a clear correlation with the GDP growth of the country in nominal terms.

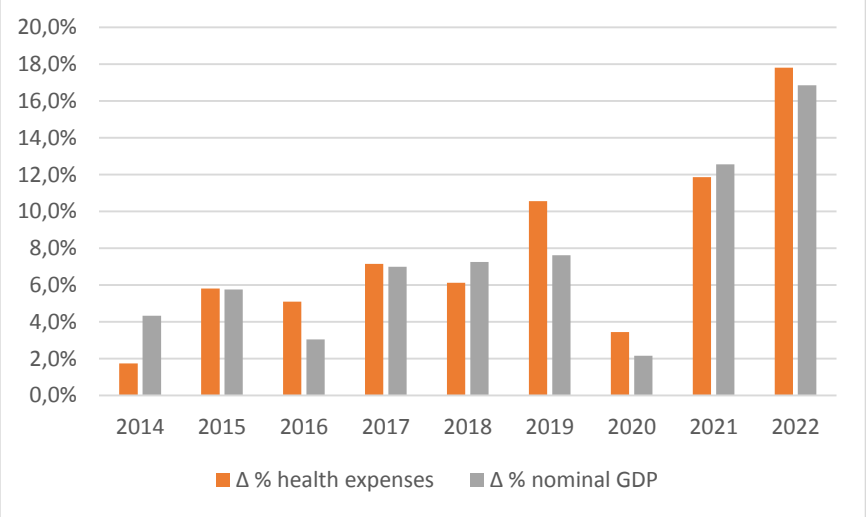

Figure 3. Percentage change in nominal public expenditure on health care with a percentage change in nominal GDP level in Poland in the years 2013-2022.

Source: Own study based on data from CSO.

In conclusion, a significant increase in spending in percentage terms occurred in 2021 and 2022. It should be noted that the increase in spending in percentage terms between 2019 and 2022, with the exception of 2021, was higher than the increase in nominal GDP. We also noted that nominal growth in public health spending was largely the result of a significant increase in GDP, with a relatively slight increase in the percentage of health spending relative to GDP. Referring the obtained results to the research results presented in the literature (Bukowski, 2020, pp. 29-31), we note that the real results do not coincide with the models of expenditure prediction where the linear regression based on GDP showed a negative slope.

Due to the need to provide a broad view on the examined issues, the importance of cost factors, which resulted from the number of hospitalizations caused by complications resulting from SARS-CoV-2 coronavirus infection, at the same time reducing the number of planned treatments, as well as increasing the salaries of medical staff.

By the end of 2022, when we consider the number of infections during the pandemic, we note that significant waves of infections occurred in 2020, 2021 and 2022.

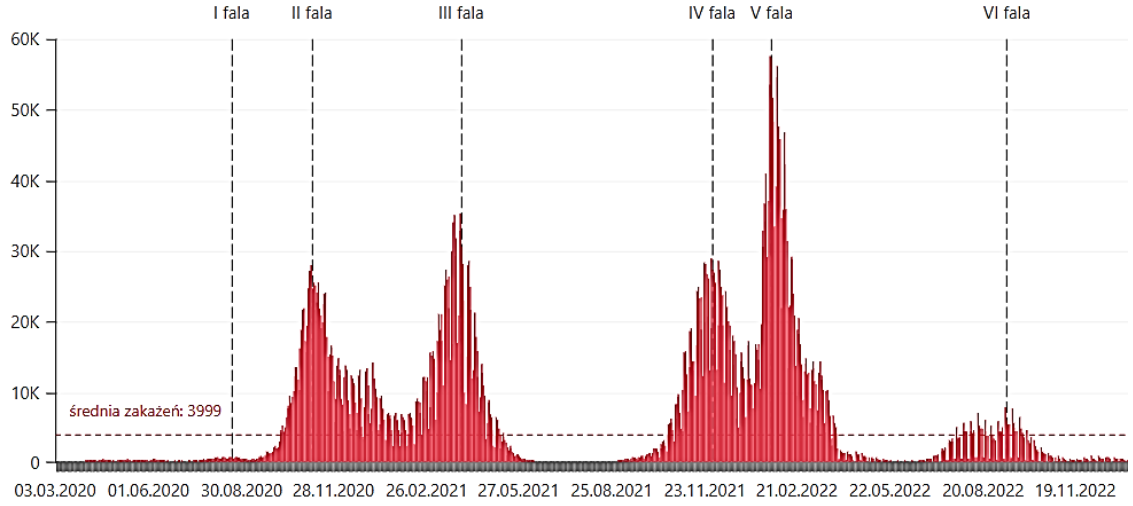

Figure 4. Daily number of confirmed SARS-CoV-2 infections in Poland.

Source: https://koronawirusunas.pl/, 25.01.2025.

Important from the perspective of cost factors analysis is information about how much the pandemic increased the number of health services, as presented in subsequent charts.

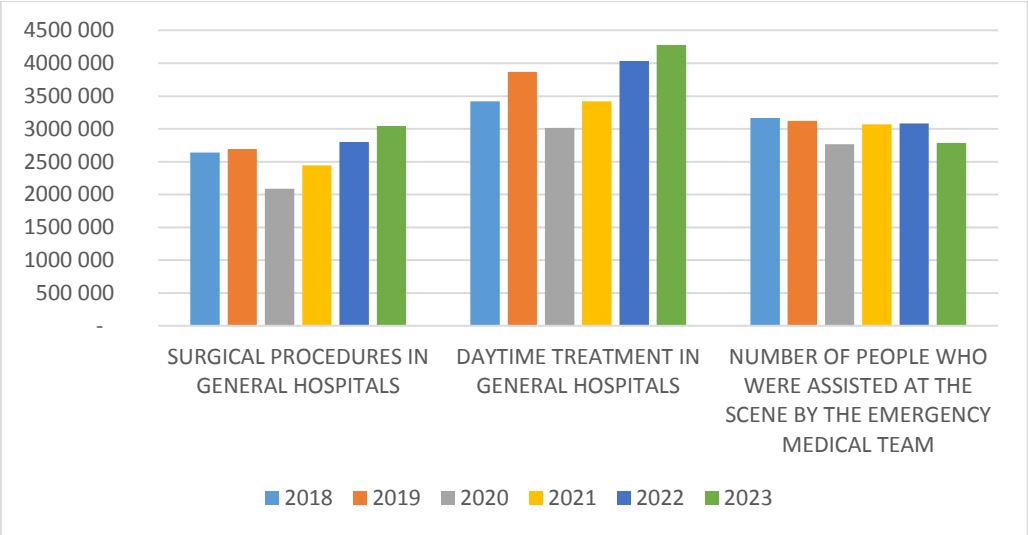

Figure 5. Selected statistics of health benefits [in units/persons].

Source: Own study based on data from the Central Statistical Office, 25.01.2025.

The presented statistics clearly show that the number of benefits in 2019 and 2020 was lower than in years before the pandemic. Only in 2022 did the number of benefits increase compared to 2019. However, the services provided by the emergency medical services show a downward trend. In general, it can be concluded that during the pandemic the number of services decreased, with increasing public expenditure on health care. The considerations are complemented by data on person-days in hospitals, which with the pandemic decreased and by 2023 did not return to the level of 2019.

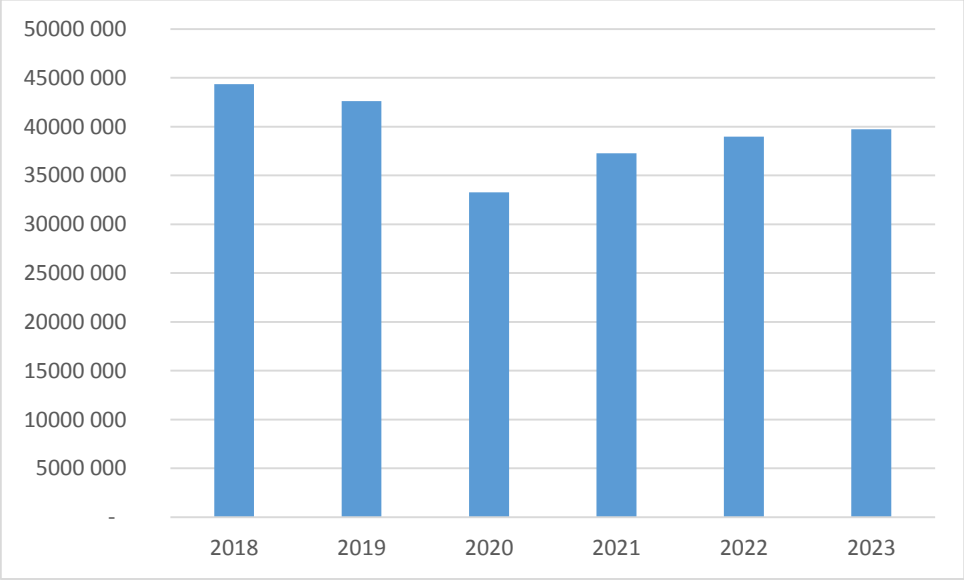

Figure 6. Number of person-days in hospitals.

Source: Own study based on GUS.

Based on the analyzes conducted, there are grounds to assume that the increase in public expenditure on health care should have a positive impact on the financial situation of hospitals, especially as the real level of expenditure, taking into account inflation, also increased.

According to the data presented, the situation of hospitals during the pandemic improved, which can be explained by the increase in nominal expenditures for health care, together with a slight increase in the percentage of public spending in GDP, with a reduced number of health services, especially visible in the number of person-days in hospitals. In the context of the research question under consideration, one can assume the research hypothesis that the COVID-19 pandemic had an impact on the financial risk of hospital operations in Poland.

6. Research results and conclusions

In the introduction, the research problem was outlined, which was reduced to the main research question: What impact on the financial risk of hospital operations in Poland had the Covid-19 pandemic? Conclusions from the literature allowed to outline the main research hypothesis H1: The COVID-19 pandemic had an impact on the financial risk of hospitals in Poland. In order to verify the main research hypothesis, we constructed specific hypotheses: HS1: The COVID pandemic had an impact on the level of financial risk measured by the volatility of financial leverage, HS2: The COVID pandemic had an impact on the level of financial risk measured by the volatility of the liquidity ratio, HS3: The COVID pandemic had an impact on the level of financial risk measured by the volatility of the solvency ratio. At the stage of formulating the conceptual model, three categories of variables that are not measurable (latent variables – no direct measurement) were proposed: Leverage, liquidity ratio and solvency ratio. All indicators are based on selected observable variables, which are then calculated in accordance with the formulas adopted in the literature of the subject, thanks to which we infer the size of the tested variable. The measure of the financial leverage of the audited hospital is the ratio of the operating profit to the gross profit (EBIT/EBT) in a given reporting year. The current liquidity ratio measure is the ratio of current assets to current liabilities in a given reporting year. The measure of the hospital solvency ratio is the ratio of the balance sheet total to the total liabilities of the hospital in a given reporting year.

In the procedure, we decided on the deliberate selection of the research sample, which constituted hospitals within the meaning of the Act on Medical Activity from the territory of the Republic of Poland. Data from the Central Statistical Office indicate that in the years 2018-2021 the average number of entities was 896 units. The research was conducted on a group of 362 hospitals, which is 40.40% of the research sample. Bearing in mind the need to maintain a 95% confidence level, with the assumed fraction size 0.5 and a maximum error of 5%, the minimum size of the test sample was met ($N > 296$). The research covered the years 2018-2021, and financial data were obtained from the EMIS Platform. The analysis of the acquired data was carried out using the IBM SPSS Statistical package.

The results of Kolmogorov-Smirnov tests showed that the distributions of all risk measures studied do not coincide with the normal distribution ($p<0.01$), which forced the need to select non-parametric statistical tools for statistical inference of assumed research hypotheses.

In order to verify the first HS1 specific hypothesis: The COVID pandemic had an impact on the level of financial risk measured by the volatility of financial leverage, a non-parametric Mann-Whitney U test was used for two independent trials, which allowed for verification of the HT1 statistical hypothesis: the average spread of the leverage ratio before the pandemic is not equal to the average spread of the volatility ratio during the pandemic. The alternative hypothesis test showed that there are no grounds for rejecting it, so there are no significant differences between the distribution of the leverage ratio before the pandemic and during the pandemic ($U = 60499.000$, $p = 0.074 > 0.05$).

In order to verify the second HS2 specific hypothesis: The COVID pandemic had an impact on the level of financial risk measured by the volatility of the liquidity ratio, a non-parametric Mann-Whitney U test was used for two independent trials, which allowed verification of the HT1 statistical hypothesis: the average distribution of the volatility ratio before the pandemic is not equal to the average spread of the volatility ratio over the pandemic period. The alternative hypothesis test showed that there are no grounds for rejecting it, so there are no significant differences between the distribution of the liquidity ratio before the pandemic and during the pandemic ($U = 68257.500$, $p = 0.215 > 0.05$).

In order to verify the third specific hypothesis of HS3: The COVID pandemic had an impact on the level of financial risk measured by the volatility of the solvency ratio, a non-parametric Mann-Whitney U test was used for two independent trials, which allowed verification of the statistical hypothesis HT1: the average distribution of the solvency ratio variation coefficient before the pandemic is not equal to the average spread of the coefficient of variation over the pandemic period. The alternative hypothesis test showed that there are no grounds for rejecting it, so there are no significant differences between the distribution of the solvency ratio before the pandemic and during the pandemic ($U = 69495.500$, $p = 0.106 > 0.05$).

To sum up the results obtained, we conclude that none of the three detailed hypotheses have been confirmed. The study showed that there is no statistical basis to conclude that the COVID-19 pandemic had a significant impact on financial risk measured by the volatility of financial leverage, liquidity and solvency of hospitals in Poland.

7. Summary

The main objective of the research was to find an answer to the research question: What impact on the financial risk of hospital operations in Poland was the COVID-19 pandemic? At the stage of analysis of the literature, it was shown that the pandemic theoretically

had an impact on the financial situation of hospitals, as confirmed by other studies (Naruć, 2023, pp. 185-192), therefore, the impact of the pandemic should also be visible in the area of financial risk of hospital operations. However, the literature review carried out did not confirm the existence of research in this area. In connection with the existing cognitive gap, we conducted empirical studies that did not confirm the adopted detailed hypotheses. It should therefore be considered that the COVID-19 pandemic did not have a statistically significant impact on the financial risk of hospitals in Poland. It should be emphasized that three financial risk measures were adopted, and the studies concerned differences in the distribution of the coefficient of variation of these indicators. We believe that the number of financial risk measures should be expanded in future studies. We also propose to extend the research to include the use of measures that take into account the sources of risk.

Finally, it should be added that the authors encountered limitations of the conducted research, although the research sample was statistically adequate, but it could be more numerous, however, for many hospital units full financial data was missing and had to be rejected from the analyzed sample.

References

1. Act of 2 March 2020 on special solutions related to the prevention, prevention and combating of COVID-19, other infectious diseases and crisis situations caused by them. Journal of Laws 2020, item 374.
2. Act on Medical Activity of 15 April 2011, Journal of Laws of 2011 No. 112, items 654, https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20111120654/U/D20110654Lj.pdf, 13.01.2025.
3. Bielski, M. (1992). *Organizacje, istota, struktury, procesy* [Organizations, essence, structures, processes]. Lodz: Wydawnictwo Uniwersytet Lodzki.
4. Bukowski, H. et al. (2020). *The impact of COVID-19 on the Polish health care system*. Warsaw.
5. Central Statistical Office. *Health expenditure 2021-2023*, 31.07.2024.
6. Chudy, S., Kabat F., Pietraszewski, M. (2006). *Ekonomika przedsiębiorstw, część 1*, [Economics of enterprises part, 1]. Poznań: EMPI Publishing House.
7. Demirbaş, D., Bozkurt V., Yorğun, S. (2020). The Effects of the Covid-19 Pandemic on Social Policies. In: *The COVID-19 Pandemic and Its Economic, Social, and Political Impacts*. Turkey, DOI: 10.26650/B/SS46.2020.006, 26.01.2025.
8. Dudycz, T. (2011). *Analiza finansowa jako narzędzie zarządzania finansami przedsiębiorstwa* [Financial analysis as a financial management tool of the enterprise]. Wrocław: Indigo Zahir Media.

9. Flaga-Gieruszyńska, K. (2020). Consequences of COVID-19 Pandemic on the Example of Quarantine and Isolation in the Polish Legal System. *European Research Studies Journal, Vol. XXIII, Special Iss. 2*, 388-399.
10. Jajuga, K. (2018). *Zarządzanie ryzykiem* [Risk Management]. Warsaw: PWN.
11. Jajuga, K., Jajuga, T. (1996). *Inwestycje* [Investments]. Warsaw: PWN.
12. Kaczmarek, T. (2008). *Ryzyko i zarządzanie ryzykiem. Podejście interdyscyplinarne* [Risk and Risk management. Interdisciplinary approach]. Warsaw: Difin.
13. Kautsch, M. (ed.) (2010). *Zarządzanie w opiece zdrowotnej* [Management in Health Care]. *New challenges*. Warsaw: Wolters Kluwer Polska sp. z o.o.
14. Kisielnicki, J. (2021). *Teoria "czarnego łabędzia" a przewidywanie kryzysów i katastrof* [Black Swan Theory and Prediction of crises and disasters]. *Przegląd Organizacji, No. 4(975)*, Warsaw: TNOiK.
15. Koźmiński, A.K., Piotrowski, W. (2000). *Zarządzanie: Teoria i praktyka* [Management: Theory and Practice]. Warsaw: PWN.
16. Kuziak, K. (2011). *Pomiar ryzyka przedsiębiorstwa. Modele pomiaru i ich ryzyko* [Enterprise risk measurement. Measurement models and their risks]. Wroclaw: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.
17. Mąkiewicz, J., Gąsiorkiewicz, L. (2010). *Zarządzanie ryzykiem w organizacjach* [Risk management of organizations]. Warsaw: C.H. Beck.
18. Naruć, W. (2023). The Impact of the COVID-19 Pandemic on the Financial Situation of Hospitals in Europe. *WSEAS Transactions on Business and Economics, Vol. 20.*
19. Nyczaj, K. (2001). Concepts: organization and organizational structure. *Organization Review, no. 2.* Warsaw.
20. Regulation of the Council of Ministers of 25 March 2022 on the establishment of certain restrictions, orders and prohibitions in connection with the outbreak of the epidemic state (Journal of Laws of 2022, item 679).
21. Regulation of the Minister of Health of 13 March 2020 on declaring an epidemic threat in the territory of the Republic of Poland (Journal of Laws of 2020, item 433).
22. Smith, W. (2020). *European Research Studies Journal, Vol. XXIII, Special Iss. 3.*
23. Spoz, A., Kotliński, G., Mizak, A., Żukowska, H. (2020). Public Aid for Relieving the Effects of COVID-19 Pandemic. *European Research Studies Journal, Vol. XXIII, Special Iss. 2.*
24. Sudoł, S. (2002). *Przedsiębiorstwo. Podstway nauki o przedsiębiorstwie, Teoria i praktyka zarządzania* [Enterprise. Fundamentals of Enterprise Science, theories and practice of management]. Toruń: Wydawnictwo Dom i Ogród.
25. Tachmatzidis, I. (2020). Covid-19 Pandemic: Socio-Economic. Psychological and Philosophical Issues on Security. *European Research Studies Journal, Vol. XXIII, Special Iss. 3.*
26. The Act on Public-funded Health Care Benefits.

27. WHO Coronavirus (COVID-19) Dashboard, https://covid19.who.int/, 20.01.2025.
28. Wick, K. (2020). VUCA is dead – long live BANI, followed by Cascio Jamais, Facing the Age of Chaos, https://www.batterman.ch/en/vuca-is-dead-long-life-bani/, 15.04.24.
29. Witczak, I. (ed.) (2009). *Ekonomika szpitala - uwarunkowania, elementy, zasady* [Economics of the hospital - conditioning, elements, rules]. Warsaw: CeDeWu sp. z o.o.
30. Zieleniewski. J. (1981). *Organizacja i zarządzanie* [Organization and Management]. Warsaw: PWN.