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Impacts of the Pandemic on Hospital Liquidity: A Study on Public and Philanthropic SUS Hospitals

Impactos da Pandemia na Liquidez Hospitalar: Um Estudo de Hospitais Públicos e Filantrópicos do SUS

Milena Pedelhes
Universidade de Brasília
milenapedelhes@hotmail.com

Mariana Guerra
Universidade de Brasília
profamarianaguerra@gmail.com

Mateus César Nogueira
Universidade de Brasília
mateuscesar6@hotmail.com

César Tibúrcio da Silva
Universidade de Brasília
cesartiburcio@unb.br

RESUMO
O estudo objetivou investigar os determinantes da liquidez hospitalar e relacioná-la com períodos de redução da oferta de serviços de saúde. Para tanto, utilizou-se um modelo de dados em painel com os indicadores, quantidade de leitos e tempo médio de permanência dos pacientes (TMP), e uma variável dummy para captar os efeitos da pandemia de COVID-19 no desempenho financeiro dos hospitais brasileiros. A amostra foi composta por 69 hospitais públicos e filantrópicos que prestam serviços ao Sistema Único de Saúde (SUS), com atendimento de média e alta complexidade, no período de 2018 a 2023. Entende-se que, de forma geral, maior lucratividade está relacionada com a disponibilidade sustentada de serviços, enquanto margem mais baixas podem gerar cortes na oferta de leitos. Essa relação pode variar, ainda, dado o tipo de hospital - público ou filantrópico, revelando vulnerabilidades no tipo de financiamento dessas organizações. Os resultados evidenciaram que o TMP e liquidez corrente tem relação significativa e positiva, indicando que internações mais longas se correlacionaram com maior capacidade de solvência de curto prazo. Por outro lado, a variável quantidade de leitos tem relação negativa e significativa com a liquidez, sugerindo que a ampliação da capacidade instalada pode impor pressões financeiras às organizações. A variável COVID-19 não mostrou significância estatística, possivelmente devido à natureza temporária dos impactos, à defasagem entre efeitos e registros financeiros ou a políticas compensatórias. Os resultados destacam a importância de integrar variáveis assistenciais à análise financeira, evidenciando como a dinâmica interna dos hospitais afeta sua solvência no curto prazo.
Palavras-chave: Liquidez. Endividamento. Organizações Hospitalares. SUS.

ABSTRACT
The study aimed to investigate the determinants of hospital liquidity and relate them to periods of reduced healthcare service provision. To this end, a panel data model was employed, using operational indicators, the number of beds, and the average length of patient stay, along with a dummy variable to capture the effects of the COVID-19 pandemic on the financial performance of Brazilian hospitals. The sample consisted of 69 public and philanthropic hospitals providing medium- and high-complexity care within the Brazilian Unified Health System (SUS) from 2018 to 2023. Overall, it is understood that higher profitability is associated with the sustained availability of services, whereas lower margins may lead to reductions in bed supply. This relationship may also vary depending on the hospital type—public or philanthropic—revealing vulnerabilities in the financing structure of these organizations. The results showed that the average length of stay and current liquidity have a significant and positive relationship, indicating that longer hospitalizations are correlated with greater short-term solvency capacity. Conversely, the number of beds variable has a negative and significant relationship with liquidity, suggesting that expanding installed capacity can impose financial pressures on organizations. The COVID-19 variable did not show statistical significance, possibly due to the temporary nature of its impacts, the lag between effects and financial records, or the implementation of compensatory public policies. The results highlight the importance of integrating care-related variables into financial analysis, demonstrating how hospitals' internal dynamics affect their short-term solvency.
Keywords: Liquidity. Debt. Health Organizations. SUS.

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1 INTRODUCTION

The determinants of hospitals' economic and financial conditions are varied and may be influenced by multiple factors, including financial, operational, and political elements. Among financial and operational factors, the capital structure has been highlighted (Mccue & Ozcan, 1992), as well as occupancy and efficiency rates (Kwon et al., 1999) and profitability (Pedelhes & Guerra, 2020). With respect to political factors, payment rules for health services (Grossman et al., 1992) and market conditions (Mccue & Ozcan, 1992; Berger et al., 2020) have been emphasized.

Brazilian hospitals operate within a particular context that requires a differentiated analysis of their economic and financial conditions when compared to studies from the United States and other countries whose public health systems are not universal. The Brazilian Unified Health System (SUS), established by the 1988 Constitution, allows the public health network to be complemented by private-sector services to ensure population access. However, according to Mello et al. (2017), rather than simple coexistence, the interdependence between the State and the private sector is a defining characteristic of SUS. The authors have also noted a consensual understanding regarding the public manager's limited capacity to regulate the contracted private sector, whose influence is largely shaped by its installed capacity.

Andrade et al. (2022) have added that hospitals frequently operate with limited autonomy in budget execution, with few incentives for efficient resource allocation. This study focuses specifically on liquidity, assuming that this indicator objectively synthesizes the immediate solvency capacity of organizations and is particularly relevant in contexts characterized by budget instability, dependence on public transfers, and unpredictability in funding sources—conditions that are recurrent in the Brazilian hospital sector. In general, higher profitability is understood to be associated with sustained service availability, whereas lower margins may lead to reductions in the supply of beds. This relationship may also vary according to hospital type—public or philanthropic—revealing vulnerabilities in their financing structures, especially during crises such as the COVID-19 pandemic.

Within this context, the present study considers public and private nonprofit hospitals that provide high-complexity care to SUS; in other words, those that offer inpatient beds to SUS. The investigation advances the research developed by Pedelhes and Guerra (2020). Specifically, the objective of this study is to examine the determinants of hospital liquidity and relate it to periods of reduced supply of health services, namely the COVID-19 pandemic. To this end, a panel data model is employed using operational indicators (number of beds and

patients' average length of stay), in addition to a dummy variable to capture the effects of the COVID-19 pandemic on organizational performance.

The focus on operational indicators—number of beds and average length of stay—when assessing liquidity is pertinent to the context of the COVID-19 health crisis. It is argued that, during the pandemic, the dynamics of service provision may have shifted substantially, with a possible increase in patients' length of stay due to disease-related complications and a reduction in elective services, given the need for hospitals to allocate their productive capacity to respond to pandemic-related demands (OCDE, 2023).

During the pandemic, multiple health services were discontinued or experienced reduced availability, including trauma-related care. At the same time, there was a noticeable change in user behavior, as many individuals avoided seeking health services due to fear of contamination, leading to a substantial decline in hospital admissions across different specialties (Campos & Canabrava, 2020).

Although the literature has addressed a variety of challenges faced by hospitals during the COVID-19 pandemic (Medeiros, 2020; Silva et al., 2022), few studies have examined the effects of the health crisis on the financial performance of these organizations. Therefore, this study may offer relevant contributions by enabling a comparative analysis with the post-pandemic period, deepening the understanding of COVID-19's effects on the financial sustainability of Brazilian hospitals.

In addition to considering the period of the health crisis, this study contributes to the literature by highlighting the financial liquidity of public and philanthropic hospitals in Brazil, underscoring the importance of understanding these organizations' capacity to sustain their operations (Barbosa et al., 2021). Regarding philanthropic hospitals, Pinheiro Filho (2017) has noted the limited number of national publications on the subject, which contrasts with the sector's recognized importance for the public health network.

By addressing both public and philanthropic hospitals, this study also contributes to the analysis of the impacts of the COVID-19 pandemic, which exposed structural weaknesses in the Brazilian health system, including deficiencies in service network organization, challenges in hospital management, and difficulties in administering public resources (Santos et al., 2021; Costa et al., 2021).

Given the vulnerabilities highlighted by the health crisis, this study also advances the field of Accounting by expanding the understanding of factors that influence liquidity and the financial performance of public and philanthropic hospitals linked to SUS. By integrating economic-financial indicators with the hospital management context, the research reinforces

the role of accounting as a tool for analysis, planning, and decision support in public-sector organizations.

It is important to note that financial predictability and stability are especially relevant in public health systems such as Brazil's, where providers often operate under limited budgets, face delays in public transfers, and bear healthcare costs that are not always covered by SUS reimbursement rates (Guerra, 2010). However, although the analysis of such costs is relevant to the study of hospital sustainability, this investigation is limited to the synthetic data publicly available in the Balance Sheet and the Statement of Income, which do not allow for a detailed assessment of healthcare costs.

2 THEORETICAL FRAMEWORK

Since the establishment of SUS in the late 1980s, the Brazilian hospital sector has operated under a mixed model of financing—characterized by diverse funding sources and mechanisms, although still insufficient in volume—and service provision, with the public sector supplemented by the private sector. This model has remained consolidated despite increasing financial pressures and demographic demands. The importance of this system is underscored by the fact that surgical volumes in Brazil remain below international recommendations, with an average of 2,020 surgeries per 100,000 inhabitants annually, highlighting persistent challenges in supply and access (Sá et al., 2021; Costa et al., 2021). In this context, theoretical and practical concerns revolve around the relationship between hospital profitability and the continuity of service provision.

Overall, the assessment of the financial condition of public and philanthropic hospitals providing services to SUS is widely recognized as an essential step for formulating sustainable management policies and maintaining the continuous delivery of health services. However, this analytical process is particularly challenging due to the management dynamics of these organizations, which are often subject to state regulation and rigid public financing mechanisms that restrict their financial autonomy and limit their capacity for planning and investment (Souza, 2013).

According to Souza (2013), the historical inefficiency of financial management and accumulation of hospital debt exacerbate the resource scarcity that constrains the financing of service provision. Additional factors also extend beyond the control of these entities, such as the population's socioeconomic conditions, public policies related to health and education, legislation concerning health care and the use of technologies and medications, as well as

internal aspects of complex hospital management, including workforce qualification and turnover, installed infrastructure, and mortality rates (Nakamura et al., 2004).

In the literature, several studies have sought to identify the determinants of hospital performance by analyzing financial and operational indicators such as profitability, entity size, sector, asset tangibility, growth, profitability ratios, operational risk, and bankruptcy risk, among others (Avelar et al., 2015; Guerra & Gonçalves, 2014; Mccue & Ozcan, 1992).

Controversies persist, as some studies have indicated that certain private hospitals prioritize financially profitable services, potentially limiting access to unprofitable but essential care (Horwitz & Nichols, 2022). The consequences of this gap include potential inequalities in access and quality of care, with public and philanthropic hospitals absorbing a large portion of health demands despite substantial financial constraints. There is thus a compromise in the adequate allocation of resources within SUS (Lindrooth et al., 2013).

Beyond socioeconomic and political contexts, the literature advances in its financial analysis of the determinants of hospital sustainability, highlighting variables such as hospital size, occupancy rate, average length of stay, and location (e.g., Kwon et al., 1999; Souza et al., 2014).

An important national study on the subject is Couttolenc et al. (2004, apud La Forgia & Couttolenc, 2009), which examined hospital performance in Brazil. The objective was to measure hospital efficiency using the following indicators: bed turnover, bed occupancy, average length of stay, staff per bed, surgical productivity, technology use, efficiency, and quality (e.g., mortality rates and staff qualifications).

After measuring efficiency, Couttolenc et al. (2004, apud La Forgia & Couttolenc, 2009) identified the determinants of performance, incorporating variables such as unit size, staff per bed, bed turnover, emergency rates relative to patient discharges, quality of care, complexity, technology, teaching status, governmental sphere (state, municipal, or federal), and ownership (private or public).

A study by Bem et al. (2014) sought to identify the main factors that may affect hospital liquidity levels in a sample of public hospitals in Poland. The authors found a positive relationship between debt ratio and liquidity, and between profitability ratio and liquidity, whereas the relationship between hospital size and financial liquidity was not statistically significant.

Pedelhes and Guerra (2020) investigated the determinants of indebtedness in public, university, and philanthropic hospitals providing services to SUS in 2015, 2016, and 2017 and

found statistical significance for return on assets, bankruptcy risk, average length of stay, hours worked per occupied bed, occupancy rate, and organizational nature.

The present study continues the discussion proposed by Bem et al. (2014) and Pedelhes and Guerra (2020) on hospitals providing services to SUS by directing the analysis toward the payment capacity of these organizations, namely current liquidity. It also incorporates the COVID-19 pandemic (2020 and 2021) as a relevant factor to explore its potential impacts on the financial sustainability of public and philanthropic hospitals.

Regarding COVID-19 in Brazil, studies by Varjão and Marcomini (2022), Guidolin et al. (2023), and Costa et al. (2025) have been referenced. Other works comparing pre- and post-pandemic data consider various countries around the world (Rhodes et al., 2023; Jalilian et al., 2023; Lee, 2024). According to the OECD (2023), the COVID-19 pandemic highlighted the need for sufficient hospital beds and flexibility in their use to accommodate unexpected increases in demand for intensive care. However, an excess supply of hospital beds may lead to overuse and increased costs since many patients can be effectively treated on the same day in hospitals or primary care units. Therefore, and still according to the OECD (2023), it is necessary to balance the guarantee of sufficient bed capacity with its implications for the financial capacity of organizations.

Despite these references, the literature contains few studies addressing service interruptions due to financial difficulties within organizations, whether or not related to COVID-19 (Callado & Callado, 2023; Hu et al., 2022). The type of ownership—and consequently the type of service financing—is also a factor affecting service continuity (Panitz et al., 2023; Sá et al., 2021).

Finally, the concern raised by Hu et al. (2022) emphasizes the importance of robust capital liquidity management in maintaining operational stability, ensuring staff well-being, and enabling an effective hospital response to health crises. For the authors, rapidly adjusting capital liquidity during outbreaks and planning for long-term effects are crucial to the financial resilience of institutions. They therefore reinforce the need for new research to enhance these strategies and establish ideal benchmark parameters for hospital liquidity.

3 METHODOLOGY

This study employed a quantitative analysis using panel data from 2018 to 2023 for 69 Brazilian hospitals that provide services to SUS. Limited to public data, the information required to calculate the average length of stay was obtained from the Health Information System (TABNET), linked to DATASUS (the SUS Database), including the number of

hospitalizations and the total days of patient stay in each hospital unit. The number of beds in each hospital was retrieved from the National Registry of Health Establishments (CNES).

Financial indicators were calculated using secondary public data extracted from the Financial Statements (e.g., Balance Sheet and Statement of Income) available on the websites of the hospitals analyzed. To obtain these documents, an internet search was conducted using keywords that could facilitate access to the financial statements of hospital organizations. For example, searches followed the structure: "hospitais" + "santa casa" + "balanço patrimonial" or "demonstrações contábeis" or "prestação de contas." The indicators and categorical variables included in the econometric model are listed in Table 1.

Table 1

Variables included in the analysis model

Variable	Formula	Expected Result
Current Liquidity	Current Assets / Current Liabilities	Explained variable
Beds	Total number of beds	Negative
Average Length of Stay (ALS)	Days of stay / Total hospitalizations	Negative
COVID	0 – years 2018, 2019, 2022, and 2023; 1 – years 2020 and 2021	Negative

Note: Prepared by the author.

As previously noted, the focus on the operational indicators—number of beds and average length of stay—for assessing liquidity is pertinent to the context of the COVID-19 health crisis. It is argued that, during the pandemic, there may have been a substantial shift in the dynamics of service delivery, with a potential increase in patient length of stay due to disease-related complications, as well as a reduction in the provision of elective services, given the need for hospitals to redirect their productive capacity to meet pandemic-related demand (OECD, 2023).

Equation 1 presents the model used, in which the dependent variable is the current liquidity of hospital organizations, and the independent variables are: Beds, ALS, and COVID.

$$LC = \beta_0 + \beta_1 Beds + \beta_2 ALS_n + Covid + \varepsilon \qquad \text{Equation (1)}$$

The current ratio is widely used in the financial analysis literature to assess an

organization's ability to meet its short-term and immediate obligations (Souza et al., 2009; Veloso & Malik, 2010). As a reference parameter, it is conventionally established that the current ratio should exceed 1, which indicates the sufficiency of current assets to cover short-term liabilities and, therefore, ensures the minimum financial stability required for the continuity of organizational activities (Barbosa et al., 2021).

The variable Beds represents the total number of beds available in each hospital and serves as an indicator of the organization's installed capacity. A larger number of beds tends to be associated with a greater volume of services, which may generate additional revenue through government transfers, insurance plans, or other funding sources. This increase in revenue flows may contribute to the expansion of current assets, supporting stronger liquidity. However, an expansion in the number of beds also entails higher operational costs, including personnel expenses, equipment maintenance, and the acquisition of hospital supplies.

The Average Length of Stay (ALS) represents the average number of days patients remain hospitalized. As noted by La Forgia and Couttolenc (2009), this is an essential indicator of efficiency in the use of hospital resources, and its variation is directly related to the severity of the cases treated. In general, more severe and chronic conditions require longer hospitalizations. There is no evidence, however, that longer ALS values are associated with improvements in care quality or clinical outcomes. Moreover, unnecessary or prolonged hospital stays may artificially inflate the bed occupancy rate and indicate low capacity for resolving cases. Shorter ALS values may, on the other hand, reflect premature discharges or unavoidable deaths, which from a cost perspective could require subsequent hospitalization in other institutions (Marinho et al., 2001). Because higher ALS values represent longer hospitalization periods, which may compromise the hospital's operational efficiency, this variable is expected to present a negative relationship with liquidity.

The COVID dummy variable refers to the period defined as the Public Health Emergency of National Importance (ESPIN) by the Ministry of Health, established in Ordinance No. 188/GM/MS of February 4, 2020 (Brazil, Ministry of Health, 2020), and revoked by Ordinance No. 913/GM/MS of April 22, 2022 (Brazil, 2022). It assumes the value 1 for 2020 and 2021, and the value 0 for 2018, 2019, 2022, and 2023.

A negative relationship is expected between the COVID variable and the current ratio because the sharp increase in demand for care and the rise in operational costs compromised the liquidity of public hospitals. Based on OECD (2023), it is argued that during the pandemic the average cost per patient may have increased due to: (i) higher consumption of hospital

supplies (personal protective equipment, oxygen, specific medications, mechanical ventilation equipment); (ii) intensive use of intensive care unit beds, which have higher per-bed costs than regular admissions; (iii) a prolonged average length of stay for COVID-19 patients, often exceeding 10 days and increasing expenses with meals, nursing care, and diagnostic tests; and (iv) emergency hiring and overtime payments due to workload surges and staff absences caused by infection. It is assumed that these factors increased total operating costs without a proportional rise in revenue; however, although relevant to the argument, the present study did not measure changes in total operating costs and adopts this premise accordingly. As previously mentioned, the study relied exclusively on publicly available data, which prevents an accurate measurement of operational costs.

During the pandemic, elective surgeries and outpatient consultations were also suspended. Based on OECD (2023), it is understood that this reduced operating revenue, particularly in philanthropic hospitals that depend partially on remunerated services not covered by the SUS schedule. In this scenario, it is assumed that there was a net effect of reduced revenue inflows and the maintenance (or increase) of fixed expenses, which may have reduced liquidity.

The organizations largely depend on government transfers which, although increased at certain times, were not always made available quickly or sufficiently to cover additional expenses. This mismatch between revenue and expenditures may have intensified pressure on available financial resources, hindering the maintenance of financial balance during the period analyzed.

In the case of financial indicators, the data encompass the entire productive structure of the organization, including both private beds (not linked to the SUS) and public beds or those allocated to the SUS. Conversely, the operational indicators refer exclusively to production destined for the SUS. This limitation arises from the availability of accounting data, which are not segregated between SUS and non-SUS revenues.

The study also presents limitations related to the restricted availability of financial statements from philanthropic and public hospitals online. Furthermore, it was necessary to exclude from the analysis the financial statements of foundations or entities responsible for managing multiple hospitals, because operational data were accessed individually. Finally, some variables that may influence the organizations' financial conditions, such as geographic location and socioeconomic or epidemiological factors, were not included in this research.

The data used in this study were organized in Microsoft Excel® spreadsheets and analyzed using the R® statistical software. The Hausman Test was initially applied, and its

result indicated that the fixed-effects model was the most appropriate. To verify the assumptions of the estimated model, several diagnostic tests were conducted. The Breusch-Pagan test was used to identify heteroskedasticity in the residuals. The results showed rejection of the null hypothesis of homoskedasticity, indicating that the residuals exhibit non-constant variance across observations. Serial autocorrelation was investigated using the Wooldridge test for panel data with fixed effects. The result presented a borderline F-statistic, suggesting that there is no strong statistical evidence to confirm first-order autocorrelation, although it cannot be entirely ruled out.

To assess independence among panel units, the Pesaran cross-sectional dependence test was applied, which did not indicate correlation among residuals across units. This result suggests that individual effects may be considered statistically independent over time. The normality of residuals was assessed using the Shapiro-Wilk test, which indicated a significant violation of this assumption. In this context, the analysis must be limited to the sample data, and projections or inferences for other observational units are not possible.

Given the evidence of heteroskedasticity and the possibility of within-unit autocorrelation, the Arellano robust standard-error correction was employed. This approach ensures the consistency of the estimated coefficients and the robustness of the significance tests applied.

4 RESULTS ANALYSIS

4.1 DESCRIPTIVE ANALYSIS

The sample of this study consists of philanthropic and public hospitals, with the former representing the majority and accounting for 57% of all units. The distribution of hospitals across Brazil reveals a significant concentration in the Southeast, which contains 78.26% of the analyzed units. The remaining regions exhibit substantially lower representation: the North accounts for 8.70% of hospitals, the South for 5.80%, the Northeast for 4.35%, and the Center-West holds the smallest share, with only 2.90%.

Table 2 presents the descriptive statistics of the variables included in the panel regression analysis, classified according to the legal status of hospital organizations. For public hospitals, it is observed that the current ratio recorded an average of 0.96, with a standard deviation of 0.97 and values ranging from 0.13 to 4.53. These results indicate considerable dispersion among the units, suggesting heterogeneity in their short-term capacity to meet financial obligations. Some hospitals present levels close to or above 1, which reflects balance

between current assets and liabilities, whereas others operate with reduced liquidity, demonstrating resource constraints.

This variation may reflect differences in regional characteristics, organizational size, financial management practices, and administrative efficiency, in addition to the impact of state financing and regulatory mechanisms that condition autonomy and economic performance. It is observed that 66.7% of the analyzed units registered liquidity below 1 in at least three of the years considered, and eight hospitals maintained liquidity below this threshold throughout the entire period analyzed.

Table 2

Descriptive statistics of operational indicators by hospital type

Nature	Measure	CL	ALS	Total beds
Public	Maximum	4.53	12.36	519
	Mean	0.96	5.26	212.41
	Minimum	0.13	1.32	51
	Standard deviation	0.97	2.02	104.95
Philanthropic	Maximum	3.43	12.60	796
	Mean	0.91	4.56	180.30
	Minimum	0.01	2.36	36
	Standard deviation	0.55	1.36	120.58

Note: CL – current liquidity; ALS – average length of stay. Prepared by the authors.

In the case of philanthropic hospitals, current liquidity showed an average of 0.91, with a standard deviation of 0.55, ranging from 0.01 to 3.43. As observed in the public group, the mean is close to the reference value of 1, indicating that these institutions also generally maintain a limited capacity to meet short-term obligations. However, the lower standard deviation suggests greater homogeneity among philanthropic units, possibly resulting from more similar financing structures and management models. Among the establishments analyzed, ten units recorded liquidity below 1 in all six years evaluated, while another twenty-four showed this same indicator below 1 in at least three of the years considered.

Both public and philanthropic hospitals presented mean current liquidity values close to the minimum recommended threshold for financial balance. Nevertheless, many units still exhibited liquidity levels below expectations in more than one of the analyzed years. This condition is consistent with recurring diagnoses in the specialized literature, which for decades have highlighted financial difficulties in hospitals within the Brazilian health system (Cunha

et al., 2014). Moreover, the data suggest that public hospitals demonstrate a slight advantage in terms of financial stability and a lower frequency of situations in which available resources are insufficient to cover immediate obligations.

The evolution of current liquidity values is presented in Figure 1. From 2018 to 2023, philanthropic hospitals showed a consistently upward trend, with current liquidity increasing from 0.8222 to 0.9582—a 16.5% growth indicating a progressive strengthening of their capacity to honor short-term commitments. In contrast, public hospitals experienced deterioration in the indicator, which declined from 1.0785 to 0.9331 (a 13.5% reduction), suggesting increasing pressure on their working capital structure.

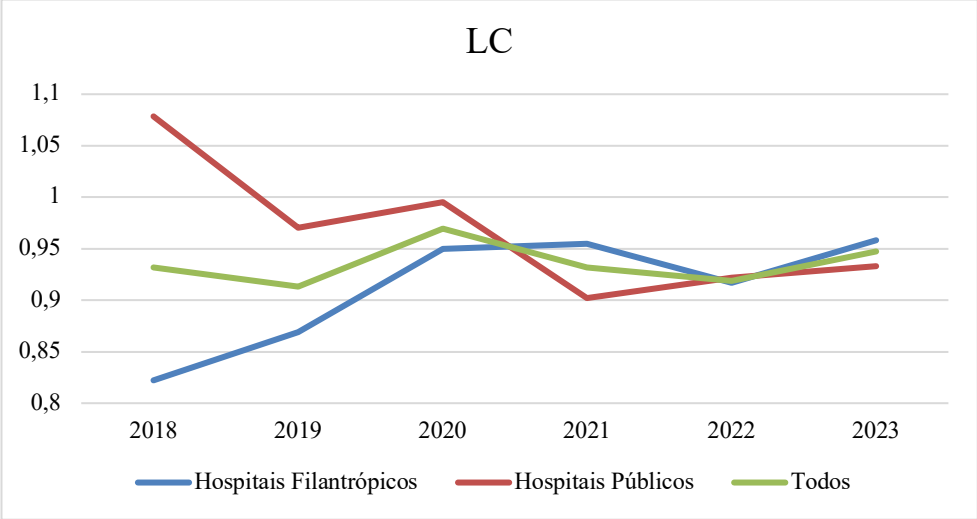
During the pandemic years, the rise in philanthropic hospitals' current liquidity from 0.87 to 0.95 suggests greater balance between short-term assets and liabilities, possibly due to emergency agreements, extraordinary transfers, and financial support measures aimed at ensuring the continuity of services provided to the SUS. Even so, the indicator remained below unity (current liquidity < 1) throughout the period, demonstrating that philanthropic organizations maintained a structural liquidity constraint despite the observed improvement.

In public hospitals, however, an opposite pattern was observed. Current liquidity decreased from 0.97 in 2019 to 0.92 in 2021, reflecting a reduction of approximately 5.2% during the pandemic period—contrary to expectations of budgetary reinforcement in an emergency context. This result is attributable to three main factors: (i) budgetary rigidity, which limits the reallocation of resources in crisis situations; (ii) pressure on operating expenses amid high demand for hospitalizations and rising care costs; and (iii) a possible lag between the execution of extraordinary expenditures and the actual release of additional credits by government entities.

Even with this slight decline, the indicator remained above 0.9 throughout the period (ranging from 1.0785 in 2018 to 0.9201 in 2021), indicating relatively stable financial management, although with a reduced safety margin in the face of cyclical fluctuations.

Figure 1

Evolution of the current liquidity indicator in the hospitals included in the sample



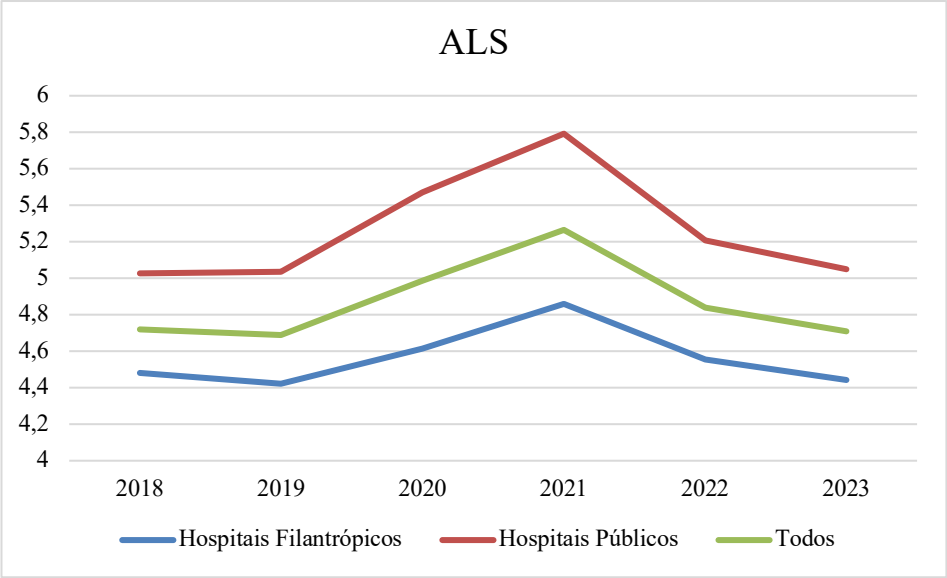
Note: CL – current liquidity. Prepared by the authors.

Regarding the Average Length of Stay (ALS), public hospitals recorded a mean of 5.26 days, with values ranging from 1.32 to 12.36 days and a standard deviation of 2.02. Philanthropic hospitals, in turn, exhibited a lower mean of 4.56 days, with a range between 2.36 and 12.6 days and a standard deviation of 1.35. These results indicate that, on average, patients remain hospitalized for a longer period in public hospitals, which may reflect greater case complexity or lower bed turnover efficiency. The higher dispersion of values in public hospitals also suggests greater heterogeneity in the care profiles of the units comprising this group.

During the pandemic years, an increase in ALS was observed in both hospital groups, as shown in Figure 2. Among philanthropic hospitals, ALS rose from 4.42 days in 2019 to 4.86 days in 2021, an accumulated increase of approximately 10%, while in public hospitals the indicator increased from 5.03 to 5.79 days, representing an expansion of about 15% over the same period. This lengthening of hospital stays may be associated with structural and operational changes in hospital workflows during the pandemic and with the greater complexity of COVID-19 cases. The study by Santos et al. (2021) confirms this trend by demonstrating that hospitalizations related to coronavirus had a longer duration than those for the treatment of acute respiratory failure and pneumonia or influenza.

Figura 1

Evolution of ALS in the hospitals included in the sample



Note: ALS – Average Length of Stay. Prepared by the authors.

Regarding the variable Beds, public hospitals have an average of 212.41 beds, with values ranging from 51 to 519 and a standard deviation of 104.95. In contrast, philanthropic hospitals presented an average of 180.3 beds, ranging from 36 to 796, with a higher standard deviation of 120.58. It is important to highlight that, according to sector regulations, philanthropic hospitals must allocate at least 60% of their beds to the provision of services to the SUS, with the remaining beds used for private care or through agreements with health insurance plans.

Figure 3 presents the evolution of the number of beds during the analyzed period. Both groups experienced an increase in bed capacity, with a marked rise during the pandemic years of 2020 and 2021. This expansion reflects the need to increase hospital capacity to meet the high care demand caused by COVID-19, aligning with the national effort to restructure the hospital network and create emergency beds. The results of this study corroborate the findings of Kock and Poleto (2021), who identified a substantial increase in ICU beds in Brazil, with growth of 88.3% compared to the beginning of the pandemic. Additionally, the authors observed a higher concentration of these beds in the South and Southeast regions when analyzed in absolute numbers.

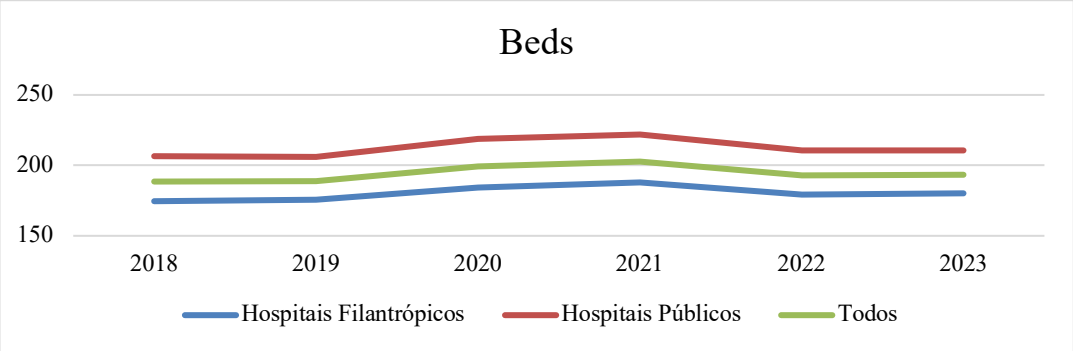
In public hospitals, the increase was even more pronounced: the average number of beds rose from 206.0 in 2019 to 221.9 in 2021, representing an increase of approximately 15.9 beds. Among philanthropic hospitals, the pattern was similar: the average number of beds

increased from 175.7 to 187.9, corresponding to growth of about 12.2 beds during the most critical period of the pandemic. This expansion demonstrates the complementary role of philanthropic institutions in hospital care and their capacity for temporary scaling during the crisis.

Between 2021 and 2022, there was a reduction of more than 4% in the number of beds in the sample, resulting from the deactivation of temporary beds and the structural reorganization of the units. In 2023, the values stabilized near pre-pandemic levels, indicating a gradual return to regular installed capacity.

Figure 3

Evolution of bed capacity



Note: Prepared by the authors.

4.2 Multivariate Analysis

Table 3 presents the results obtained through the panel data model. As mentioned in the Methodology section, given the evidence of heteroscedasticity and the possibility of intra-unit autocorrelation, the robust correction of standard errors based on the Arellano estimator was employed, which simultaneously adjusts for heteroscedasticity and autocorrelation within panel units. This approach, widely recognized in the literature, contributes to more precise and reliable statistical inferences. Thus, the consistency of the estimated coefficients and the robustness of the applied significance tests are ensured.

The variable Beds presented a negative and statistically significant coefficient (β = -0.00156, p = 0.0057), as expected. This result indicates that an increase in the number of beds is associated with a reduction in the current liquidity of the units analyzed. In financial terms, such an association may suggest that the expansion of hospital capacity compromises, in the short or medium term, the resources available to cover obligations, thereby reducing the entity's liquidity. The present study diverges from Bem et al. (2014), whose analysis did not

show a significant association between capital liquidity and hospital size or the number of beds.

Table 3

Model results

Variable	**Coefficient (β)**	**Standard Error**	**t-value**	**p-value**
Beds	-0,00156**	0,00056	-2,78	0,0057
ALS	0,09294*	0,04699	1,98	0,0488
COVID	0,01119	0,02683	0,42	0,6770
Observations		**404**		
R^2		**0.037**		
Adjusted R^2		**-0.170**		
F Statistic		**4.193*** (df = 3; 332)		

Note: ALS – Average Length of Stay; COVID – dummy variable equal to 1 for the years 2020 and 2021. Statistical significance levels: * p<0.1; ** p<0.05; *** p<0.01. Prepared by the authors.

According to Ramos et al. (2015), medium- and large-sized hospitals tend to achieve better performance in operational indicators such as bed occupancy and bed turnover rates, which would indicate operational gains associated with the expansion of installed capacity. However, the literature also indicates that hospital costs follow a U-shaped curve, with hospitals of approximately 230 beds positioned at the optimal scale point, whereas very small or excessively large units tend to experience diseconomies. This occurs because, beyond a certain point, hospitals have already amortized their fixed costs, and further increases in service volume require additional investments that compromise efficiency.

This behavior may be related to the increase in fixed and operational costs resulting from maintaining beds, especially in contexts of high idleness or low occupancy rates. This is particularly relevant in organizations dependent on public funding with budget ceilings or production-based remuneration, in which installed capacity alone does not guarantee greater inflows of financial resources.

The variable ALS (Average Length of Stay) presented a significant and—contrary to expectations—positive coefficient (β = 0.09294; p = 0.0488), indicating that longer average hospital stays are associated with an increase in the current liquidity of the organizations analyzed. This result differs from the initial expectations because prolonged hospital stays are typically associated with higher resource consumption and potential operational inefficiency, linked to the misalignment between revenue realization and organizational liabilities. However, the data suggest that stable revenue flows generated by longer stays during the period

analyzed—possibly due to emergency financial transfers during the pandemic—favored financial balance.

In the study by Pedelhes and Guerra (2020), ALS showed a negative relationship with indebtedness, with most hospitals in the sample being philanthropic, as in the present study. When interpreting variations in ALS, factors such as technical efficiency, quality of care, and clinical severity must be considered. Thus, a high ALS may also signal low efficiency in hospital resource management (Martins & Portela, 2010). Specifically in public hospitals, prolonged stays, when not justified by severity, may reflect deficiencies in the health system, resulting in increased operational costs without a corresponding financial gain, thereby exerting greater pressure on resources and not necessarily increasing liquidity.

The variable COVID did not present statistical significance ($\beta = 0.01119$; $p = 0.6770$), making it impossible, based on the data analyzed, to assert that the pandemic context directly affected the current liquidity of the organizations during the observed period. Although the literature indicates that the pandemic imposed significant pressures on hospital costs and revenues (Medeiros, 2020; Silva et al., 2022), it is possible that negative effects were offset by measures such as emergency agreements, direct contractual arrangements, and extraordinary financial transfers. Another plausible explanation is that the financial impacts of the pandemic were temporary and had already been absorbed by the organizations in the subsequent years, thereby diluting the effect across the historical series used in the analysis.

This result diverges from Lee (2024), whose study identified that the variable COVID-19 had a negative and statistically significant impact on the financial performance of Korean hospitals. In that case, performance was measured using profitability indicators such as Operating Margin and Total Margin, suggesting that the financial performance metric used may influence the detection of pandemic effects across different dimensions of hospital performance.

Overall, the results indicate that operational factors, such as bed availability and care dynamics measured by average length of stay, have greater explanatory power over variations in current liquidity than conjunctural variables such as the direct impact of the COVID-19 pandemic.

Thus, despite the health crisis, the practical implications of the findings highlight the importance of the operational structure of organizations. Reassessing state regulation and the rigid public financing mechanisms that limit financial autonomy and restrict planning and investment capacity (Souza, 2013) appears to be essential for the sustainability of Brazilian hospitals providing services to the SUS. Public policymakers must recognize the direct

relationship between sustainability and the continuity of service provision in public and philanthropic hospitals—even though they are nonprofit, such organizations must ensure the continuity of cash flows to meet their various liabilities.

In this regard, Owsley et al. (2024) point to the need for integrated health system planning that aligns financial incentives with quality and equity goals, including payment model design and investment policies that support the financial health of hospitals.

4 FINAL CONSIDERATIONS

The literature shows few studies that address the interruption of healthcare services resulting from the financial difficulties of hospital organizations, whether or not related to COVID-19. In this context, the present study aimed to investigate the determinants of hospital liquidity and to relate them to periods of reduced healthcare service provision, namely the COVID-19 pandemic. A panel data model was employed, focusing on operational indicators (number of beds and patients' average length of stay) and a dummy variable to capture the effects of the COVID-19 pandemic on the financial performance of Brazilian hospital organizations.

The regression results revealed a significant and positive relationship between the Average Length of Stay (ALS) and Current Liquidity, indicating that longer hospital stays were correlated with a greater capacity of the entities to meet their short-term obligations. The relationship between the variable Beds and Liquidity was negative and significant, suggesting that hospitals with greater installed capacity tend to face increased pressure on their liquidity. This finding is inferred to result from the operational costs associated with maintaining this capacity.

The COVID variable did not present statistical significance, indicating that, within the dataset analyzed, the pandemic context could not be directly linked to changes in the liquidity of the organizations. This may be associated with the temporary nature of the impacts, time lags between events and accounting indicators, or the mitigating effect of emergency public policies. The practical implications of these findings highlight the importance of the operational structure of organizations. A reassessment of regulatory frameworks and rigid public financing mechanisms—which, as noted by Souza (2013), often restrict institutional financial autonomy and limit planning and investment capacity—becomes essential. Such revisions are indispensable to strengthen the economic and financial sustainability of Brazilian hospitals linked to the SUS.

The continuity of healthcare service provision has been debated for decades. Within the

SUS, hospital organizations face structural limitations, underfunding, and operational challenges, which may intensify in times of crisis. Understanding the factors that influence the liquidity and financial performance of these hospitals is essential for strengthening institutional management and guiding more effective public policies capable of ensuring that hospital units fulfill their essential responsibilities in healthcare provision and access.

Given the findings and limitations of this study, it is recommended that future research deepen the analysis of the determinants of hospital liquidity by incorporating additional variables related to healthcare and financial performance, such as mortality rate, bed occupancy rate, case complexity metrics, patient profiles, and regional characteristics that reflect demand pressures and social responsibility. Qualitative research with hospital managers may also help elucidate strategies adopted to mitigate the effects of bed underutilization or to adjust financial flows during crises. Future studies are further encouraged to examine organizational structure, including the identification of decision-makers' profiles and responsibilities in financial and administrative areas, as well as governance and planning mechanisms that directly influence economic sustainability. Particular attention should be given to understanding how these governance structures balance the tension between social responsibility and financial viability, especially in scenarios of budgetary constraints and limited managerial autonomy—characteristics of public and philanthropic hospitals in the Brazilian context.

REFERENCES

Andrade, M. V., Reis, C. B., Santos, I. S., & Lima-Costa, M. F. (2018). Desafios do sistema de saúde brasileiro. In Instituto de Pesquisa Econômica Aplicada (Ed.), *Desafios da nação: artigos de apoio* (Vol. 2, pp. 359–414). Instituto de Pesquisa Econômica Aplicada.

Avelar, E. A., Borges, S. L., Pereira, H. R., & De Souza, A. A. (2015). Análise De Variáveis Determinantes De Endividamento Em Hospitais Brasileiros. *XVIII SEMEAD- Seminários em Administração.*

Barbosa, D. M. S., de Souza, A. A., & Ribeiro, J. E. (2021). Um Índice de Avaliação do Desempenho Operacional e Econômico-Financeiro de Hospitais sem fins Lucrativos no Brasil. *Revista Mineira de Contabilidade*, *22*(3), 72-85. https://doi.org/10.51320/rmc.v22i3.1252

Brasil. Ministério da Saúde. (2020, 3 de fevereiro). *Portaria nº 188, de 3 de fevereiro de 2020. Declara Emergência em Saúde Pública de importância Nacional (ESPIN) em decorrência da infecção humana pelo novo Coronavírus (2019-nCoV).* https://bvsms.saude.gov.br/bvs/saudelegis/gm/2020/prt0188_04_02_2020.html

Brasil. Ministério da Saúde. (2022, 22 de abril). *Portaria nº 913, de 22 de abril de 2022. Declara o encerramento da Emergência em Saúde Pública de importância Nacional (ESPIN) em decorrência da infecção humana pelo novo coronavírus (2019-nCoV) e revoga a Portaria GM/MS nº 188, de 3 de fevereiro de 2020.* https://www.planalto.gov.br/CCIVIL_03/Portaria/PRT/Portaria-913-22-MS.htm

Bem, A., Prędkiewicz, K., Prędkiewicz, P., & Ucieklak-Jeż, P. (2014). Determinants of hospital's financial liquidity. *Procedia Economics and Finance*, *12*, 27-36. https://doi.org/10.1016/S2212-5671(14)00317-7

Berger, M., Sommersguter-Reichmann, M., & Czypionka, T. (2020). Determinants of soft budget constraints: How public debt affects hospital performance in Austria. *Social Science & Medicine*, *249*, 112855. https://doi.org/10.1016/j.socscimed.2020.112855

Callado, A. A. C.; Callado, F. M. R. A. (2023). Operational performance and budget constraints: case study in a Public Hospital specialized in Hematology. Management Control Review, 7(1), 28-37.

Campos, F. C. C., Canabrava, C. M. (2020). O Brasil na UTI: atenção hospitalar em tempos de pandemia. *Saúde Em Debate*, *44*(spe4), 146–160. https://doi.org/10.1590/0103-11042020E409

Costa, D. C. A. R., Bahia, L., Carvalho, E. M. C. L. de., Cardoso, A. M., & Souza, P. M. S. (2020). Oferta pública e privada de leitos e acesso aos cuidados à saúde na pandemia de Covid-19 no Brasil. *Saúde Em Debate*, *44*(spe4), 232–247. https://doi.org/10.1590/0103-11042020E415

Costa, D., Moreira, J. P. D. L., Cardoso, A. M., Mattos, L. V., Andrietta, L. S., Bahia, L. (2021). Crise econômica e disparidades no gasto, oferta e utilização de serviços públicos e privados de saúde no Brasil no período entre 2011 e 2019. *Cad. Saúde Pública, 38*(10). https://doi.org/10.1590/0102-311XPT262221

Costa, N. do R., Pinto, R. R. C., & Jatobá, A. (2025). Austeridade fiscal, COVID-19 e as metrópoles: um estudo de caso sobre a resiliência do financiamento das ações e serviços públicos de saúde no Brasil. *Ciência & Saúde Coletiva, 30*(6). https://doi.org/10.1590/1413-81232025306.21872024

Cunha, F., Souza, A. A., & Ferreira, C. O. (2014). Análise do endividamento de hospitais filantrópicos. *XVII SEMEAD-Seminários em Administração.*

Grossman, M., Goldman, F., Nesbitt, S. W., & Mobilia, P. (1993). Determinants of interest rates on tax-exempt hospital bonds. *Journal of Health Economics*, *12*(4), 385-410. https://doi.org/10.1016/0167-6296(93)90002-V

Guerra, M., & de Oliveira Gonçalves, A. (2014). Model of Allocating Public Financial Resources to Brazilian Hospital Organizations that Provide Highly Complex Health Care Services. *The Open Medicine Journal*, *1*(1). http://dx.doi.org/10.2174/1874220301401010078

Guidolin, A. P., David, G., Rossi, P. L. (2023). The public healthcare financing policy in brazil: challenges for the post-pandemic future. *Revista de Economia Contemporânea, 27*. https://doi.org/10.1590/198055272715

https://doi.org/10.1590/198055272715

Horwitz, J. R., Nichols, A. (2022). Hospital service offerings still differ substantially by ownership type. *Health Affairs, 41,*(3), 331-340. https://doi.org/10.1377/hlthaff.2021.01115

Hu, X., Jin, W., Yang, A., & Hu, Z. (2022). Management of capital liquidity in public hospitals under the epidemic situation of COVID-19. *Frontiers in public health*, *10*, 977221. https://doi.org/10.3389/fpubh.2022.977221

Jalilian, H., Riahi, M. S., Heydari, S., Taji, M. (2023). Performance analysis of hospitals before and during the COVID-19 in Iran: A cross-sectional study. *PLoS One, 18*(6). doi: 10.1371/journal.pone.0286943.

Kwon, I. W., Stoeberl, P. A., Martin, D., & Bae, M. (1999). Determinants of hospital bad debt: multivariate statistical analysis. *Health services management research*, *12*(1), 15–24. https://doi.org/10.1177/095148489901200102

Kock, K., & Poleto, M. B. (2021). Análise da evolução da covid-19 e número de leitos de uti nos estados brasileiros no primeiro semestre de 2020. https://doi.org/10.1590/SciELOPreprints.1695

La Forgia, G. M., & Couttolene, B. F. (2009). Desempenho hospitalar no Brasil: em busca da excelência. Singular.

Lee, J. H. (2024). Impact of the COVID-19 pandemic on the financial performance of hospitals according to hospital characteristics in Korea: An observational study. *Medicine*, *103*(34), e39467. https://doi.org/10.1097/MD.0000000000039467

Lindrooth, R. C., Konetzka, R. T., Navathe, A. S., Zhu, J., Chen, W., Volpp, K. G. (2013). The

impact of profitability of hospital admission on mortality. *Health Serv Res, 48*, 792-809. https://doi.org/10.1111/1475-6773.12026

Marinho, A., Moreno, A. B., & Cavalini, L. T. (2001). Avaliação descritiva da rede hospitalar do Sistema Único de Saúde. Instituto de Pesquisa Econômica Aplicada (Ipea). *Texto para Discussão*, *848*.

Marinho, Alexandre; Moreno, Arlinda Barbosa; Cavalini, Luciana Tricai. Avaliação descritiva da rede hospitalar do Sistema Único de Saúde (SUS). 2001.

Martins, M., Portella, M. C., & Noronha, M. F. D. (2010). Desempenho hospitalar: avaliação do tempo de permanência e mortalidade entre prestadores no Estado do Rio de Janeiro. In *A gestão do SUS no âmbito estadual: o caso do Rio de Janeiro* (pp. 241-278). https://doi.org/10.7476/9788575415924.0012

McCue, M. J., & Ozcan, Y. A. (1992). Determinants of capital structure. *Journal of Healthcare Management*, *37*(3), 333-346.

Medeiros, E. A. S. (2020). Desafios para o enfrentamento da pandemia COVID-19 em hospitais universitários. In *SciELO Preprints*. https://doi.org/10.1590/1984-0462/2020/38/2020086

Mello, G. A., Pereira, A. P. C. de M., Uchimura, L. Y. T., Iozzi, F. L., Demarzo, M. M. P., & Viana, A. L. d'Ávila. (2017). O processo de regionalização do SUS: revisão sistemática. *Ciência & Saúde Coletiva*, *22*(4), 1291–1310. https://doi.org/10.1590/1413-81232017224.26522016

Nakamura, W. T., Martin, D. M., & Kimura, H. (2004). Indicadores contábeis como determinantes do endividamento das empresas brasileiras. *Encontro Anual da Associação Nacional dos Programas de Pós-Graduação em Administração–Enanpad*, *28*.

OECD (2023). Health at a Glance 2023: OECD Indicators, OECD Publishing, Paris. https://doi.org/10.1787/7a7afb35-en.

Owsley, K. M., Hasnain-Wynia, R., Rooks, R. N., Tung, G. J., Mays, G. P., Lindrooth, R. C. (2024). US Hospital Service Availability and New 340B Program Participation. *JAMA Health Forum, 5*(5). doi:10.1001/jamahealthforum.2024.0833

Panitz, L. M., Prata, D. N., Rodrigues, W. (2023). Análise do desempenho dos hospitais públicos e privados que atendem ao Sistema Único de Saúde. *Cad. Saúde Pública, 40*(9). https://doi.org/10.1590/0102-311XPT156023

Pedelhes, M., & Guerra, M. (2020). Análise do endividamento de hospitais prestadores de serviços de alta complexidade no SUS. *RAHIS-Revista de Administração Hospitalar e Inovação em Saúde*, *16*(4), 21-32. https://doi.org/10.21450/rahis.v16i4.6089

Pinheiro Filho, F. P. (2017). Hospitais Filantrópicos e sua relação com o Sistema de Saúde Brasileiro: dependência e limites para a expansão da rede pública de serviços de saúde. *I Seminário de Políticas Públicas e Desenvolvimento Territorial–SEPPU. Universidade de Araraquara*.

Ramos, M. C. de A., Cruz, L. P. da, Kishima, V. C., Pollara, W. M., Lira, A. C. O. de, & Couttolenc, B. F. (2015). Avaliação de desempenho de hospitais que prestam atendimento pelo sistema público de saúde, Brasil. *Revista De Saúde Pública*, *49*, 43. https://doi.org/10.1590/S0034-8910.2015049005748

Rhodes, J. H., Santos, T., & Young, G. (2023). The Early Impact of the COVID-19 Pandemic on Hospital Finances. *Journal of healthcare management / American College of Healthcare Executives*, *68*(1), 38–55. https://doi.org/10.1097/JHM-D-22-00037

Sá, L. A., Covre, E. R., Melo, W. A., Gomes, R. M., Tostes, M. F. P. (2021). Relação público-privado nas internações cirúrgicas pelo Sistema Único de Saúde. *Rev. Latino-Am. Enfermagem, 29*. 10.1590/1518-8345.4901.3467

Santos, H. L. P. C. D., Maciel, F. B. M., Santos Junior, G. M., Martins, P. C., & Prado, N. M. D. B. L. (2021). Gastos públicos com internações hospitalares para tratamento da covid-19 no Brasil em 2020. *Revista de saúde pública*, *55*, 52. https://doi.org/10.11606/s1518-8787.2021055003666

Silva, M. de F. C. da, Vieira, E. T., & Kamimura, Q. P. (2022). O impacto econômico da pandemia pelo Covid-19 nos hospitais públicos e privados / The economic impact of the Covid-19 pandemic on public and private hospitals. Brazilian Journal of Development, 8(4), 31352–31374. https://doi.org/10.34117/bjdv8n4-561

Souza, A. A. de, Guerra, M., Lara, C. O., Gomide, P. L. R., Pereira, C. M., & Freitas, D. A. (2009). Controle de gestão em organizações hospitalares. *Revista de Gestão*, 16(3), 15–29. https://doi.org/10.5700/rege370

Souza, A. A. de, Xavier, A. G., Lima, L. C. de M., & Guerra, M. (2013). Análise de custos em hospitais: comparação entre os custos de procedimentos de urologia e os valores repassados pelo sistema único de saúde. *ABCustos*, 8(1). https://doi.org/10.47179/abcustos.v8i1.331

Souza, A., Avelar, E., Silva, E., Tormin, B., & Gervásio, L. (2015). Uma Análise Financeira dos Hospitais Brasileiros entre os Anos de 2006 a 2011. *Sociedade, Contabilidade e Gestão*, 9(3). https://doi.org/10.21446/scg_ufrj.v9i3.13329

Varjão, Julia Santos; Marcomini, Gilson Rogério. Análise de informações contábeis de um hospital e o impacto da pandemia. *Revista Scientia Vitae*, v. 13, n. 36, p. 15-31, 2023.

Veloso, G. G., & Malik, A. M. (2010). Análise do desempenho econômico-financeiro de empresas de saúde. *RAE Eletrônica*, 9(1). https://doi.org/10.1590/s1676-56482010000100003

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