



AN EVALUATION OF HEALTHCARE INSTITUTIONS' EFFICIENCY IN TÜRKİYE USING THE PABON LASSO MODEL: AN INSTITUTION-TYPE BASED ANALYSIS FOR THE PERIOD 2002–2023

Melek YAĞCI ÖZEN^{1*}


¹Osmaniye Korkut Ata University, Faculty of Health Sciences, Department of Gerontology, 80000, Osmaniye, Türkiye

Abstract: This study aims to analyze the efficiency of Ministry of Health, university, and private hospitals in Türkiye between 2002 and 2023 using the Pabon Lasso Model. To evaluate hospital efficiency, the indicators of Bed Occupancy Rate (BOR), Bed Turnover Rate (BTR), and Average Length of Stay (ALOS) were utilized. Data were obtained from the Ministry of Health's Health Statistics Yearbook (2023). The collected data were organized using Excel software, and the Pabon Lasso Graph was applied during the analysis process. Three different hospital types were assessed by dividing the period into phases within the framework of the Pabon Lasso Model. It was determined that the efficiency of Ministry of Health hospitals improved between 2007 and 2019 with the implementation of the Health Transformation Program, but performance declined during the 2020–2023 period due to the impact of the COVID-19 pandemic. University hospitals were generally positioned in Region IV throughout the analysis period, characterized by high bed occupancy rates and low turnover rates. Private hospitals, on the other hand, demonstrated a stable efficiency profile within the boundaries of Region II after 2005, achieving rapid patient turnover through agreements with the Social Security Institution despite low bed occupancy rates. Hospital efficiency in Türkiye exhibits significant variation across hospital types. The Health Transformation Program substantially improved efficiency, particularly in Ministry of Health and private hospitals, while the COVID-19 pandemic led to temporary setbacks. These findings underscore the necessity for institution-specific strategic planning and the development of flexible and adaptive health policies.

Keywords: Pabon lasso model, Hospital efficiency, Health transformation program, COVID-19, Health policies, Türkiye

*Corresponding author: Osmaniye Korkut Ata University, Faculty of Health Sciences, Department of Gerontology, 80000, Osmaniye, Türkiye

E mail: melekyagciozen@hotmail.com (M. YAĞCI ÖZEN)

Melek YAĞCI ÖZEN  <https://orcid.org/0000-0003-0314-247X>

Received: May 02, 2025

Accepted: June 24, 2025

Published: July 15, 2025

Cite as: Yağcı Özen M. 2025. An evaluation of healthcare institutions' efficiency in Türkiye using the Pabon Lasso model: An institution-type-based analysis for the period 2002–2023. *BSJ Health Sci*, 8(4): 165-171.

1. Introduction

Performance and efficiency are two fundamental concepts at the core of contemporary health policies. Particularly in developing countries, rising hospital costs, increasing demand for healthcare services, and rapid advancements in medical technologies pose significant challenges in planning and resource management for healthcare administrators and policymakers (Mehrtak et al., 2014; Kalhor et al., 2014). Hospitals, as the most expensive and critical components of health systems, account for 60% to 80% of total healthcare expenditures, thereby playing a decisive role in the financial sustainability of these systems (Shaqura et al., 2021).

The efficient utilization of healthcare resources has become not only an economic imperative but also an ethical responsibility. Inefficiencies such as unnecessary hospital admissions, prolonged lengths of stay, and low bed turnover rates undermine hospital performance, weaken the quality of healthcare services, and escalate costs (Dopeykar and Meskarpour Amiri, 2020).

Therefore, monitoring and evaluating hospital performance is not merely a managerial necessity but also a strategic obligation for protecting public health.

Various methods have been developed in the literature to measure hospital performance. The Balanced Scorecard, pyramid models, regulatory audits, third-party evaluations, and several statistical approaches are among these methods (Kaplan and Norton, 2001; Mehrtak et al., 2014). These models are widely used to establish managerial control mechanisms and to rationalize resource allocation. However, many of these approaches have limited multidimensional analysis capabilities, making them insufficient for simultaneously evaluating resource efficiency.

At this point, the Pabon Lasso Model, developed by Pabon Lasso in 1986, stands out by offering the ability to assess hospital performance through three key indicators simultaneously: Bed Occupancy Rate (BOR), Bed Turnover Rate (BTR), and Average Length of Stay (ALOS). The model integrates these three indicators into a two-



dimensional graph, positioning each hospital within one of four regions, thereby providing both a visual and analytical representation of performance (Goshtasebi et al., 2009; Mohammadkarim et al., 2011; Moradi et al., 2017). This framework enables comparative evaluations between hospitals, analysis of strengths and weaknesses, and supports strategic decision-making processes.

The advantage of the Pabon Lasso Model lies not only in monitoring performance but also in offering managers a more holistic and structural perspective on healthcare service delivery. Especially in developing countries, where resources are limited and needs are high, this model has become a highly practical tool for decision-makers (Mohammadkarim et al., 2011; Khalilabad et al., 2020).

This study aims to analyze the performance of different types of healthcare institutions (Ministry of Health, university, and private hospitals) in Türkiye between 2002 and 2023 using the Pabon Lasso Model. Through a long-term data analysis applying the Pabon Lasso Model,

this research seeks to provide original contributions at both empirical and managerial levels. It is particularly significant in demonstrating how this model, often limited to single-year or short-term applications in the literature, can be strategically utilized with multi-year datasets.

2. Materials and Methods

This descriptive-analytical study evaluated the service efficiency of different types of hospitals (Ministry of Health, university, and private hospitals) providing healthcare services in Türkiye between 2002 and 2023, based on three key indicators: Bed Occupancy Rate (BOR), Bed Turnover Rate (BTR), and Average Length of Stay (ALOS). The Pabon Lasso Model applied in this study integrates these three fundamental indicators and positions the resulting data on a two-dimensional graph, categorizing each hospital's performance into one of four regions.

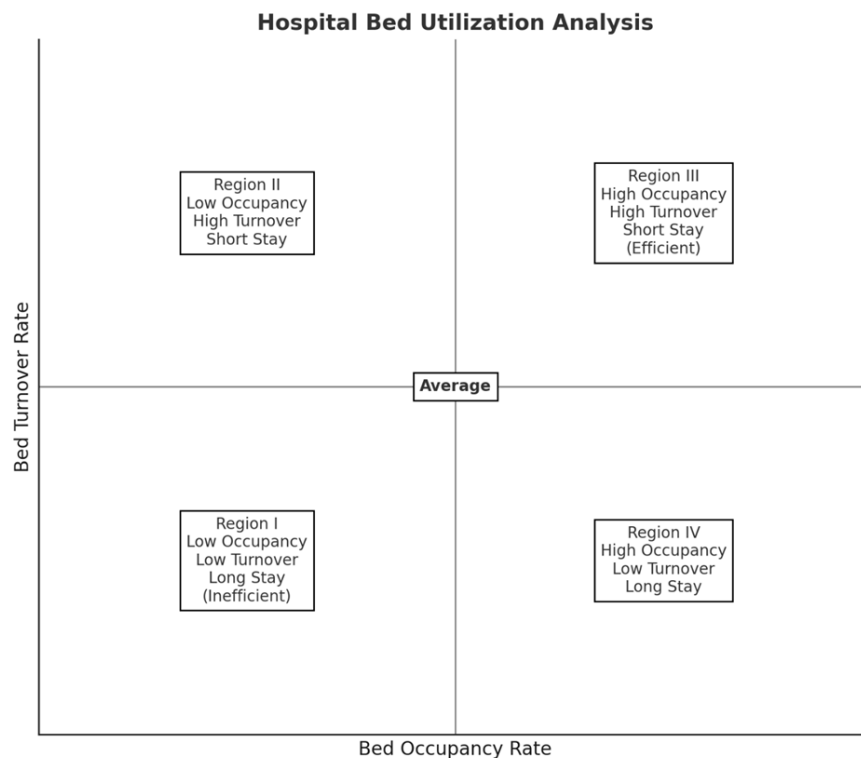


Figure 1. Pabon Lasso Modeli (Pabon Lasso, 1986).

2.1. According to the Pabon Lasso Model

Hospitals located in Region I are characterized by a low bed occupancy rate and a low bed turnover rate. Therefore, these hospitals are considered inefficient institutions (Mehrtak et al., 2014).

Region II is defined by a low occupancy rate but a high bed turnover rate. Typically, maternity hospitals and centers providing short-term treatment services are found in this region. These hospitals have unused bed capacity, while patient circulation is relatively high (Younsi, 2014).

Hospitals in Region III exhibit both high bed occupancy

rates and high bed turnover rates. This indicates effective and efficient utilization of resources within these hospitals (Kalhor et al., 2016).

Region IV is characterized by a lower turnover rate and a high occupancy rate. Institutions in this region generally provide services to patients requiring long-term hospitalization and involve higher costs (Khalilabad et al., 2020).

The data used in this study were obtained from the 2023 Health Statistics Yearbook published by the Ministry of Health. The collected data were organized using Excel software, and the Pabon Lasso Graph was employed

during the analysis process. This method enabled a detailed annual evaluation of hospital bed utilization efficiency and revealed performance differences among institutions. Table 1 presents the values of bed occupancy

rate, average length of stay, and bed turnover rate according to different hospital types. The relevant data were extracted from the 2023 Health Statistics Yearbook.

Table 1. Bed occupancy rate, average length of stay, and bed turnover rate by type of institution

Years	Bed Occupancy Rate			Average Length of Stay			Bed Turnover Rate		
	MoH	University	Private	MoH	University	Private	MoH	University	Private
2002	60.6	69.8	32	5.7	8.6	3.1	38.8	29.7	37.5
2003	61.4	72.9	33.1	5.6	8.5	3	39.7	31.5	40.8
2004	68.2	74.7	35.1	5.6	8.3	2.8	44.8	32.9	46.2
2005	65.2	79.2	42	5.2	8.2	2.7	45.8	35.3	57
2006	67.5	79.7	48	5.2	7.8	2.4	47.9	37.4	74.3
2007	64.8	76.5	46	4.7	6.9	1.8	50.7	40.8	93.4
2008	63.8	84.4	50.7	4.5	6.6	1.8	52.1	46.4	101.9
2009	65	80.7	50.3	4.6	6.1	2	51.4	48.6	92.1
2010	64.3	72.9	50.8	4.4	6.2	2	52.9	43.1	91.1
2011	66.4	73.6	53.6	4.3	5.8	2	55.9	46.2	95.6
2012	66.4	76.7	51.5	4.3	6.1	2.3	56.3	45.6	81.8
2013	69.3	74.1	50.5	4.4	6	2.2	57.9	45.2	83.2
2014	71.1	76.7	56.1	4.3	5.9	2.4	59.8	47.4	83.9
2015	71.7	75.5	59.6	4.3	5.6	2.5	60.5	49.3	86.6
2016	68.7	76	60.3	4.4	5.7	2.6	56.9	48.9	85.9
2017	69	73.4	61.4	4.5	5.6	2.7	56.2	48	83.8
2018	68	69.5	61.8	4.5	5.5	2.8	55	46.5	80.1
2019	67.3	69.8	60.7	4.6	5.3	3	54	48.3	78
2020	50	57.7	56.1	5.2	5.7	3	35.2	36.8	68.1
2021	52.8	63.6	58.1	5	5.4	3	38.7	43.3	70.9
2022	56.1	66.9	57.0	4.7	5.2	2.8	43.9	46.6	73.9
2023	58.8	65.0	50.9	4.7	5.2	2.8	45.9	45.3	67.4

Source: Ministry of Health, 2023 health statistics yearbook.

3. Results

In this study, the Pabon Lasso Graph was utilized to analyze hospital bed utilization efficiency. The Pabon Lasso method provides a comparative assessment of institutional performance by simultaneously visualizing three key indicators that evaluate efficiency in healthcare service delivery.

The indicators represented in the graph are as follows:

- Bed Occupancy Rate (BOR): Displayed on the horizontal axis (as a percentage), indicating the proportion of hospital bed usage.
- Bed Turnover Rate (BTR): Shown on the vertical axis, reflecting how many times a bed is used within a year.
- Average Length of Stay (ALOS): Represented by curves on the graph. ALOS indicates the average duration of hospitalization per patient and is calculated using the formula:

$$ALOS = (365 \times BOR) / BTR.$$

In the Pabon Lasso graph, the ALOS curves were determined based on the arithmetic mean of annual data

for each hospital type during the period 2002–2023. Accordingly:

- The average ALOS was calculated as 4.8 days for Ministry of Health (MoH) hospitals,
- 6.4 days for university hospitals,
- And 2.5 days for private hospitals.

The graph was constructed using these reference ALOS values, with each hospital type represented by different colors and markers. Additionally, the years were indicated to emphasize temporal changes, and year labels were designed to match the corresponding institutional colors.

Figure 2 demonstrates the bed utilization efficiency of Ministry of Health, university, and private hospitals over the period 2002–2023 using the Pabon Lasso Graph. Institutions are plotted annually, allowing for a visual assessment of performance trends through the application of ALOS curves.

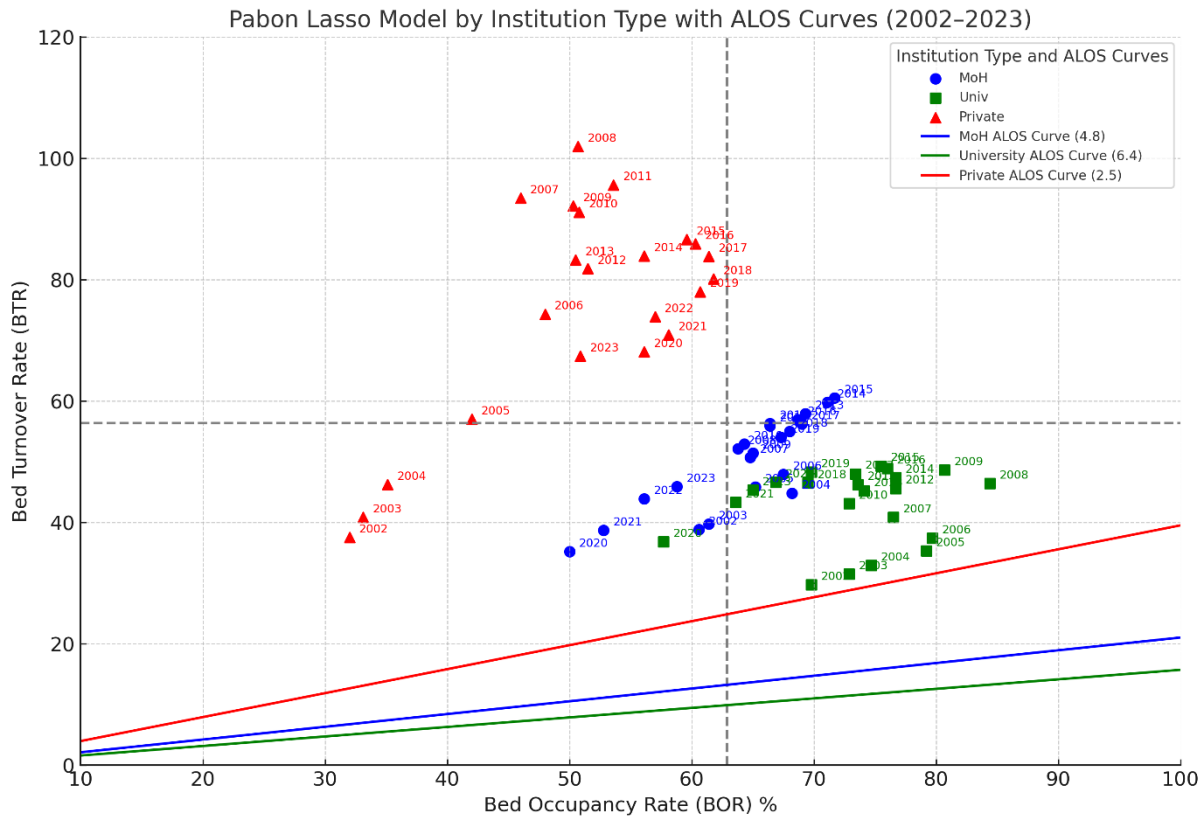


Figure 2. Pabon lasso graph for the period 2002–2023 by hospital type.

4. Discussion

Numerous indicators have been proposed in the literature to measure hospital performance. In this study, multiple indicators were utilized to evaluate the performance of different types of healthcare institutions (Ministry of Health, university, and private hospitals) in Türkiye. The Pabon Lasso Graph categorizes institutions into four primary performance regions based on the axes of Bed Occupancy Rate (BOR) and Bed Turnover Rate (BTR).

4.1. Ministry of Health (MoH) Hospitals According to the Pabon Lasso Model

For the evaluation of MoH hospitals' efficiency, performance indicators were divided into four distinct periods.

4.1.1. Period 1: Performance indicators for 2002–2003

During this period, MoH hospitals were positioned in Region I of the Pabon Lasso Graph, reflecting structural issues in healthcare service delivery. Low bed occupancy rates, low bed turnover rates, and prolonged average lengths of stay indicated inefficient use of resources within the healthcare system. Challenges in accessing healthcare services, infrastructural deficiencies, bureaucratic inefficiencies, and inequalities in service delivery were among the primary reasons for initiating the Health Transformation Program (HTP) (Republic of Türkiye Ministry of Health, 2003). The main objectives of HTP were to improve accessibility, enhance service efficiency, increase patient satisfaction, and ensure the effective use of healthcare resources. The positioning of

MoH hospitals in Region I during 2002–2003 is considered a reflection of pre-HTP inefficiencies. Similarly, Yiğit and Kumru (2016) reported that hospitals in Türkiye were located in Region I in 2003, indicating low hospital efficiency during this period (Yiğit & Kumru, 2016).

4.1.2. Period 2: Performance indicators for 2004–2006

This period marks the initial phase following the implementation of HTP. An increase in bed occupancy rates was observed; however, bed turnover rates remained low. The presence of extended lengths of stay and the rising patient load due to increased demand led to higher capacity utilization, although overall efficiency had yet to be achieved.

4.1.3. Period 3: Performance indicators for 2007–2019

This period is characterized by high bed occupancy rates, high turnover rates, and shorter lengths of stay, reflecting the intended outcomes of the Health Transformation Program. For MoH hospitals, this was the most efficient period. Çalışkan (2016) found that 25% of hospitals were located in the efficient region when evaluating the performance of Public Hospital Unions. Similarly, Taşkaya (2020) reported that training and research hospitals in Türkiye were positioned in the efficient region in 2017, which aligns with the findings of this study (Çalışkan, 2016; Taşkaya, 2020).

4.1.4. Period 4: Performance indicators for 2020–2023

The effects of the COVID-19 pandemic, which began in

December 2019 and rapidly spread worldwide, were evident during this period. This era was characterized by the postponement of elective surgeries, limited outpatient services, and a focus on emergency and COVID-19 cases. Consequently, MoH hospitals were positioned in Region I, with notably low bed occupancy rates. The need for intensive care services and prolonged treatment durations for COVID-19 patients also led to a decline in bed turnover rates. A study evaluating the bed utilization performance of general hospitals reported similar findings, indicating that performance indicators in 2020 reached their lowest levels due to the impact of the pandemic (Işıkcelik & Ağırbaş, 2023).

4.2. University Hospitals According to the Pabon Lasso Model

For the evaluation of university hospitals' efficiency using the Pabon Lasso Model, performance indicators were categorized into three distinct periods.

4.2.1. Period 1: Performance indicators 2002–2019

Between 2002 and 2019, university hospitals were consistently positioned in Region IV. This positioning is characterized by high bed occupancy rates coupled with low bed turnover rates. Additionally, the prolonged average length of stay in university hospitals further supports this classification. The data indicate that these hospitals primarily managed complex cases requiring extended hospitalization, contributing to their sustained presence in Region IV.

4.2.2. Period 2: Performance indicators 2020–2021

During the COVID-19 pandemic, university hospitals shifted to Region I in 2020 and 2021. This shift is attributed to the postponement of non-emergency surgeries and the limitation of outpatient services, as hospitals focused predominantly on COVID-19 cases.

4.2.3. Period 3: Performance indicators 2022–2023

In the post-pandemic normalization period (2022–2023), university hospitals returned to Region IV. This repositioning can be explained by their continued focus on complex and long-term treatments, resulting in high bed occupancy rates and low turnover rates. The nature of university hospitals, which typically handle specialized and prolonged care cases, remains a key factor influencing this performance pattern.

4.3. Private Hospitals According to the Pabon Lasso Model

For the evaluation of private hospitals' efficiency using the Pabon Lasso Model, performance indicators were divided into two distinct periods.

4.3.1. Period 1: Performance indicators 2002–2004

Before and immediately after the implementation of the Health Transformation Program (HTP), access to private hospitals largely depended on individuals' ability to pay out-of-pocket. During this period, private hospitals primarily served high-income groups and had a limited patient base. The integration of the private sector into the healthcare system was still limited at this stage.

4.3.2. Period 2: Performance indicators 2005–2023

The HTP introduced structural changes that affected not only public hospitals but also private hospitals. In 2005,

private hospitals were allowed to establish agreements with the Social Security Institution (SSI), significantly altering their role within the healthcare system. This enabled citizens to access contracted private hospitals at lower costs, in addition to public hospitals. The encouragement of private investments in the health sector led to a notable increase in the number of private hospitals. Through integration into the healthcare system, private hospitals transitioned from an inefficient position in Region I to Region II on the Pabon Lasso Graph. With SSI agreements and increased patient access, private hospitals improved their bed turnover rates, focused on short-term hospitalizations, and enhanced their commercial efficiency. This transformation positioned private hospitals as more active and dynamic players within Türkiye's healthcare system.

4.4. General Evaluation According to the Pabon Lasso Model

The analysis of performance indicators for different hospital types (Ministry of Health, university, and private hospitals) in Türkiye between 2002 and 2023 using the Pabon Lasso Model clearly reveals the structural transformations and policy impacts within the healthcare system. Throughout this period, the Health Transformation Program (HTP) and the COVID-19 pandemic emerged as the two primary factors influencing hospital efficiency.

MoH hospitals, which exhibited low bed occupancy and turnover rates prior to HTP, experienced increased capacity utilization following the program's implementation, achieving peak efficiency between 2007 and 2019 with high occupancy, high turnover rates, and shorter lengths of stay. However, during 2020–2023, the pandemic led to a decline in efficiency, resulting in a more restricted service delivery structure.

University hospitals, due to their complex case profiles and extended treatment durations, consistently demonstrated high occupancy rates and low turnover rates throughout the analysis period. Aside from the temporary decline in efficiency during the pandemic, no significant structural changes were observed in their performance. This stability aligns with their core mission focused on research, education, and advanced treatment within the healthcare system.

Regarding private hospitals, these institutions exhibited inefficiency before HTP due to limited access and low patient volumes. However, after 2005, with SSI agreements and incentives for private investment, they underwent rapid transformation. By focusing on short-term hospitalizations and accelerating patient turnover, private hospitals enhanced their commercial efficiency and moved into more efficient regions on the Pabon Lasso Graph.

In summary, healthcare policies implemented in Türkiye, along with global health crises, have led to varying performance shifts across hospital types. The Health Transformation Program significantly improved efficiency in MoH and private hospitals, while its impact on university hospitals remained limited due to their

structural characteristics. The pandemic, on the other hand, caused temporary efficiency losses across all hospital types. These findings highlight the healthcare system's resilience capacity and demonstrate how policy interventions yield differentiated effects depending on hospital type.

5. Conclusion

This study analyzed the efficiency levels of Ministry of Health, university, and private hospitals in Türkiye between 2002 and 2023 using the Pabon Lasso Model, highlighting the impact of health policies on hospital performance. The findings indicate that the Health Transformation Program (HTP) significantly improved efficiency, particularly in Ministry of Health and private hospitals. University hospitals, due to their structural characteristics, demonstrated a stable performance characterized by high bed occupancy rates and low turnover rates. The COVID-19 pandemic led to temporary efficiency losses across all hospital types, causing substantial changes in healthcare service delivery.

In conclusion, health policies and crisis periods in Türkiye's healthcare system have produced varying impacts depending on hospital type. This underscores the need for flexible and institution-specific strategies to ensure sustainable efficiency in healthcare services. Future studies are recommended to provide more comprehensive analyses by incorporating additional factors such as patient satisfaction, financial sustainability, and service quality.

6. Limitations

This study has several limitations. Firstly, the analysis relied solely on data from the 2023 Health Statistics Yearbook published by the Ministry of Health Republic of (Türkiye Ministry of Health, 2023). Additionally, only three indicators—Bed Occupancy Rate (BOR), Bed Turnover Rate (BTR), and Average Length of Stay (ALOS)—were considered, while other performance metrics such as cost, patient satisfaction, and service quality were not evaluated.

Moreover, the structural nature of the Pabon Lasso Model focuses exclusively on quantitative data, without accounting for qualitative factors such as service scope, patient profiles, and case complexity across hospital types. This limitation is particularly relevant for institutions like university hospitals that manage long-term and complex cases. Furthermore, extraordinary circumstances such as the COVID-19 pandemic during the analysis period may have caused deviations in certain years' data.

7. Recommendations

This study focused solely on the case of Türkiye, limiting the generalizability of the results to healthcare systems in other countries. Therefore, future research should address these limitations by utilizing more comprehensive data sources, incorporating additional

performance indicators, and conducting international comparisons.

Author Contributions

The percentages of the author' contributions are presented below. The author reviewed and approved the final version of the manuscript.

	M.Y.Ö.
C	100
D	100
S	100
DCP	100
DAI	100
L	100
W	100
CR	100
SR	100
PM	100
FA	100

C= concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The author declares no conflict of interest related to this study.

Ethical Consideration

This study does not require ethics committee approval as it uses only publicly available data from the Ministry of Health's Health Statistics Yearbook (2023) and does not involve the collection of data from human participants.

References

- Çalışkan Z. 2016. Analysis of public hospital unions' performance using the Pabon Lasso model. *J Soc Sec*, 8(1): 1-24.
- Dopeykar N, Meskarpour Amiri M. 2020. Evaluating the trend of efficiency at inpatient services by Pabon-Lasso model: A case study in a specialized hospital. *J Mil Med*, 22(9): 936-944.
- Goshtasebi A, Vahdaninia M, Gorgipour R, Samanpour A, Maftoon F, Farzadi F, Azizi F. 2009. Assessing hospital performance by the Pabon Lasso Model. *Iran J Public Health*, 38(2): 119-124.
- İşıkçelik F, Ağırbaş İ. 2023. Evaluation of general hospitals' bed utilization performance using the Pabon Lasso method. *J Mehmet Akif Ersoy Univ Fac Econ Admin Sci*, 10(1): 277-294.
- Kalhor R, Ramandi FD, Refiei S, Tabatabaee SS, Azman M, Kalhor L. 2016. Performance analysis of hospitals affiliated to Mashhad University of medical sciences using the Pabon Lasso model: A six-year-trend study. *Biotech Health Sci*, 3(4): 19-24.
- Kalhor R, Salehi A, Keshavarz A, Bastani P, Orojloo P. 2014. Assessing hospital performance in Iran using the Pabon Lasso model. *Glob J Health Sci*, 9(2): 77-82.
- Kaplan R, Norton D. 2001. Transforming the balanced scorecard from performance measurement to strategic

- management: Part I. Account Horiz, 15(1): 87-104.
- Khalilabad TH, Asl AN, Raeissi P, Shali M, Niknam N. 2020. Assessment of clinical and paraclinical departments of military hospitals based on the Pabon Lasso Model. J Educ Health Promot, 9(1): 25-29.
- Mehrtak M, Yusefzadeh H, Jaafari-pooyan E. 2014. Pabon Lasso and data envelopment analysis: A complementary approach to hospital performance measurement. Glob J Health Sci, 6(4): 107-116.
- Mohammadkarim B, Jamil S, Pejman H, Seyyed MH, Mostafa N. 2011. Combining multiple indicators to assess hospital performance in Iran using the Pabon Lasso model. Australas Med J, 4(4): 175-179.
- Moradi G, Pirooz B, Safari H, Nasab Ne, Bolbanabad AM, Yari A. 2017. Assessment of the efficiency of hospitals before and after the implementation of health sector evolution plan in Iran based on Pabon Lasso model. Iran J Public Health, 46(3): 389-395.
- Pabon Lasso H. 1986. Evaluating hospital performance through simultaneous application of several indicators. Bull Pan Am Health Organ, 20(4): 63-68.
- Republic of Türkiye Ministry of Health. 2003. Health Transformation Program. Ministry of Health Publications, Ankara, Türkiye, pp: 112.
- Republic of Türkiye Ministry of Health. 2023. Health Statistics Yearbook 2023. Ministry of Health Publications, Ankara, Türkiye, pp: 198.
- Shaqura II, Gholami M, Sari AA. 2021. Evaluation of performance at Palestinian public hospitals using Pabón Lasso model. Int J Health Plann Manage, 36(3): 896-910.
- Taşkaya S. 2020. Determining the efficiency of training and research hospitals in Türkiye using Pabon Lasso and data envelopment analysis. Hacettepe J Health Adm, 23(2): 247-260.
- Yiğit P, Kumru S. 2016. Analysis of hospital efficiency in Türkiye using the Pabon Lasso method. 10th Congress on Health and Hospital Administration, December 11-14, Ankara, Türkiye, pp: 59-64.
- Younsi M. 2014. Performance of Tunisian public hospitals: A comparative assessment using Pabón Lasso model. Int J Hosp Res, 3(4): 159-166.