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Impact of corporate governance practices (RN 518/22) on the solvency of mid-sized health insurance providers in Brazil

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Abstract

In January 2019, ANS published NR 443/2019, replaced by Normative Resolution 518/2022, which established corporate governance practices with an emphasis on internal controls and risk management to improve the solvency of health insurance companies. The aim of the research was to assess whether the regulation contributes to improving the solvency of health insurance companies. Documentary research was used as a methodological tool, analyzing accounting information extracted from the ANS database for the period from 2014 to 2022. The methodology was quantitative, employing statistical analysis in three stages: the first consisted of descriptive analysis using the main measures of position and dispersion of consolidated financial results; the second, application of the nonparametric Mann-Whitney test individually and for all health insurance companies; and the third stage involved cluster analysis using the K-Means method for both types of health insurance companies, with and without a positive result after regulation was issued. The study was applied to 38 medium-sized health insurance companies, which were obliged to report the practices described in the regulation to the ANS for the base date of December 31st, 2020. The study found that the resolution influenced improving solvency in general for all 38 operators analyzed, as well as improving economic and financial indicators. More specifically, it observed a positive relationship in the solvency of 15 of the 38 operators analyzed, around 40% of the sample. The study's contribution indicates that corporate governance practices contribute to the solvency and financial performance of health insurance companies.

Keywords: health plan operators, corporate governance, solvency, internal controls, risk management

1 INTRODUCTION

Private health insurance and plans in Brazil began to be regulated by Law 9,656/1998, with the creation of the National Supplementary Health Agency (*Agência Nacional de Saúde Suplementar* – ANS) in 2000, which became the regulatory body of the sector. In 2022, Brazil had 933 health plan operators, serving more than 50 million medical care beneficiaries, representing approximately 25% of the population. This sector generated over R$ 238 billion in revenue, playing a crucial role in alleviating the

deficiencies of the Unified Health System (*Sistema Único de Saúde* – SUS).

The ANS identified the need to improve corporate governance among operators after the liquidation of 119 of them between 2012 and 2018, revealing serious management and internal control issues. In response, the agency issued ANS Normative Resolution 443/2019, later replaced by NR 518/2022, which establishes minimum governance practices and requires medium- and large-sized operators to annually submit an Agreed-Upon Procedures Report audited by independent auditors, starting in 2023. This model adopts a "comply or explain" approach, requiring justifications in cases of non-compliance.

NR 518/2022 defines minimum and advanced corporate governance practices that operators must follow, including the clear definition of roles and responsibilities, the promotion of ethical conduct, and transparency in financial statements. These practices aim to ensure effective and responsible management by establishing robust internal control structures, regulatory compliance, and process effectiveness. This includes addressing recommendations on controls, economic and financial analysis, and continuous operational monitoring.

The resolution also sets guidelines for identifying, assessing, and managing risks related to underwriting, credit, market, legal, and operational activities that may, even indirectly, impact the solvency of organizations. Together, these elements aim to strengthen the management of operators, increasing the reliability and sustainability of the supplementary health sector in Brazil.

In this context, the following research question arises: how has NR 518/2022 impacted the solvency of supplementary health plan operators in Brazil? The objective of this study is to verify whether NR 518/2022 has impacted the solvency and financial outcomes of Brazil's supplementary health plan operators.

Previous studies, such as Guimarães and Alves (2009), addressed insolvency prediction models for health plan operators, and Silva et al. (2014) calculated solvency margin sufficiency and compared it with risk-based capital calculations in the insurance market. However, the present study offers a different perspective, as it aims to analyze the impact of the Normative Resolution on corporate governance practices and their effect on the solvency of health plan operators. The social perspective also justifies the study, considering the societal and stakeholder concerns about solvency in the supplementary health sector.

Furthermore, it aims to stimulate future research by consolidating governance practices in this sector. Although the study focuses on health plan operators, its implications extend to the entire supplementary health sector, which includes hospitals, clinics, laboratories, credentialed health professionals, and others. This sector is a complex and multifaceted segment that moves billions in resources and directly impacts millions of people in Brazil.

2 THEORETICAL FRAMEWORK

2.1 Structure of normative resolution 518/22

ANS Normative Resolution 518/22 establishes guidelines for the governance of health plan operators, detailing governance practices, risk management, and internal controls. The guidelines are organized into annexes, which include minimum and advanced practices for health plan operators and benefit administrators, economic-financial indicators, and Agreed-Upon Procedures (AUP) for compliance verification.

NR 518/22 detailed the practices, structures, and verification methods in its annexes:

Table 1

Annexes of NR 518/22 – ANS

ANNEXES	**Description**	**Governance Requirements**
ANNEX I	Minimum practices related to risk management and internal controls for health plan operators.	Handling of recommendations on internal controls and risk management; Economic-financial analysis and monitoring; Risk management practices: underwriting, credit, market, legal, and operational.
ANNEX II (a)	Minimum practices related to risk management and internal controls specifically for benefit administrators.	Handling of recommendations on internal controls and risk management; Economic-financial analysis and monitoring; Risk management practices: credit, market, legal, and operational.
ANNEX III (b)	Advanced practices and governance structure, risk management, and internal audit to be verified for operators with proprietary risk-based capital models.	Advanced practices and structures include: Governance (roles, responsibilities, ethical conduct, and financial statements); Internal controls and risk management; Internal audit.
ANNEXES	**Description**	**Economic-Financial Indicators**
ANNEX IV	Economic-Financial Indicators	List of minimum indicators for monitoring the economic-financial situation of the operator and benefit administrator.
ANNEXES	**Description**	**Agreed-Upon Procedures (AUP)**
ANNEX V	Agreed-Upon Procedures – Health Plan Operators	Agreed-Upon Procedures to be performed to verify compliance with the requirements set out in Annex I.
ANNEX VI (a)	Agreed-Upon Procedures – Benefit Administrators	Agreed-Upon Procedures to be performed to verify compliance with the requirements set out in Annex II.
ANNEX VII (b)	Agreed-Upon Procedures (Health Plan Operators with Advanced Corporate Governance practices and proprietary risk-based capital models).	Agreed-Upon Procedures to verify compliance with the requirements set out in Annex III (advanced practices and structure of governance, risk management, and internal audit for operators with proprietary risk-based capital models).

Note: Source: Adapted from NR 518/22 – ANS.

(a) Refers to Benefit Administrators (which are not the subject of this study). (b) Refers to the proprietary risk-based capital model, which is not yet in effect, as it is pending regulation. However, according to ANS, the advanced practices and governance, risk management, and audit structures (outlined in Annex III and verified through the AUP Report in Annex VII, both from NR 518/22) are fundamental elements that guide good governance practices, which should be pursued by all operators.

Operators with more than 20,000 beneficiaries must annually submit an AUP report prepared by an independent auditor, based on data from the previous fiscal year, while submission is optional for those with fewer than 20,000 beneficiaries. The first submission occurred in 2023, referring to the year 2022, in accordance with ANS NR 518/2022 (Agência Nacional de Saúde Suplementar [ANS], 2022).

The resolution also addresses advanced practices for operators with a proprietary risk-based capital model, still pending regulation. The regulation allows for the possibility of reducing regulatory capital factors for operators that demonstrate compliance with the minimum corporate governance requirements through the AUP report certified by an independent auditor. Consequently, the operator would have more capital available for investment, thereby increasing its competitiveness (ANS, 2022).

2.2 Relationship tionship between corporate governance pratices, internal controls, and risk management in the solvency of health plan operators

Together, these practices help ensure the solvency of health plan operators by providing a solid foundation for decision-making, improving operational efficiency, and protecting against financial and reputational risks. This results in greater trust from beneficiaries, promoting stability and sustainable growth of the sector.

Several authors have associated improvements in economic-financial indicators with corporate governance. Freire et al. (2020), as a result of their research, revealed a direct association between the autonomy of corporate governance and financial performance, considering variables such as solvency and operational activity.

Rezaee et al. (2018) analyzed a sample of 4,455 Chinese companies during the fiscal years from 2012 to 2014 and concluded that companies with a higher financial corporate governance index and more efficient internal control exhibited higher earnings response coefficients.

Correia et al. (2011) developed the Governance Quality Index (*Índice da Qualidade de Governança* – IQG) with the purpose of assessing the excellence of corporate governance in Brazil, using effectiveness criteria in its construction. This index is aimed at publicly traded companies. Investors perceive companies with good governance as less risky, thereby increasing the likelihood of recovering their investments, according to the research's conclusion. Therefore, the quality of governance closely influences stock values.

2.3 Supplementary health sector and solvency

Although the terms "liquidity" and "solvency" are often treated as synonyms, liquidity refers to a company's ability to meet its short-term obligations, while solvency relates to the company's capacity to meet both short- and long-term financial commitments, ensuring the continuity of its operations over the long term, and thus its permanence.

According to Costa (2011), in finance, solvency refers to the condition of a debtor whose assets exceed liabilities, indicating their ability to meet obligations using resources that comprise their equity. From an economic standpoint, a company is considered solvent when it can meet its immediate obligations and also presents a sound equity position and profit outlook that ensures its future continuity.

Health plan operators act as intermediaries between healthcare service providers and consumers, negotiating better conditions for their beneficiaries and ensuring the quality of services. The solvency of these operators is fundamental to the sustainability of the supplementary health sector. The market is characterized by "market failures" due to informational asymmetry among agents (Conselho Administrativo de Defesa Econômica [CADE], 2021).

The implementation of financial guarantees to ensure economic-financial balance and mitigate the risks of insolvency among health plan operators began with the enactment of RDC Resolution No. 77, dated July 17, 2001 (now repealed by other resolutions). The regulation addressed compliance with "Guarantor Assets," "Minimum Own Resources," and the establishment of "Technical Provisions." Ans (2022) affirms that "Within the framework of prudential regulation, equity guarantees are included – that is, capital rules that ensure the operator maintains sufficient equity to absorb fluctuations in the risks associated with health plan operations, thereby avoiding insolvency" (ANS, 2022).

Thus, "the solvency regulation of ANS is based on a three-pillar model: provisions (liabilities), guarantor assets (assets), and solvency margin (equity), which is fundamentally concerned with maintaining the financial health of the operators' balance sheets" (Federação Nacional de Saúde Suplementar [FENASAÚDE], 2018).

Guarantor assets, as defined by Normative Resolution 521, 2022, are:

> Real estate, shares, bonds, or securities that are owned by the operator or the maintainer of a self-managed entity, its direct or indirect controlling party, or a legal entity controlled, directly or indirectly, by the operator or its direct or indirect controlling party, must secure the technical provisions and meet the criteria for acceptance, registration, linkage, custody, movement, and diversification.

Technical provisions are amounts recorded under the liabilities of the operator that represent expected obligations arising from health plan operations. These provisions are regulated by NR 574, issued in February 2023.

The "Minimum Own Resources" or "Regulatory Capital" represent the limit of Adjusted Net Equity based on economic effects, which must be observed by health plan operators (*Operadoras de Planos de Saúde* – OPS), according to the criteria of Base Capital and Solvency Margin, as regulated by ANS NR No. 526 of April 29, 2022, which remained in effect until December 31, 2022.

The Solvency Margin was established by ANS NR 160 of July 3, 2007, and came into effect in January 2008. Its full implementation was set over ten years (1/120 per month), reaching 100% by December 31, 2017. The calculation of the solvency margin, as per Article 5 of ANS NR No. 526 of April 29, 2022, is as follows:

> The solvency margin must be calculated monthly and corresponds to the greater of the following values:
>
> a) 0.20 times the sum over the past twelve months of 100% of premiums in the pre-established price modality, and 50% of premiums in the post-established price modality; or
> b) 0.33 times the annual average over the past thirty-six months of the sum of 100% of claims in the pre-established price modality and 50% of claims in the post-established price modality.

The solvency margin can be defined as follows:

> To mitigate the potential negative effects of unexpected fluctuations, rules are established for capital formation (in addition to the adjusted minimum equity requirements). The required capital must be sufficient to offset the various risks that may adversely affect the results of the operators. In the supplementary health sector, the Solvency Margin is established for this purpose (ANS, 2017).

The calculation of Adjusted Net Equity (*Patrimônio Líquido Ajustado* – PLA), according to Article 9 of ANS NR No. 526 of April 29, 2022, must be based on the values recorded as net equity, adjusted by the following economic effects:

> I – deduction of direct or indirect holdings in other health plan operators and in financial, insurance, reinsurance, and open or closed private pension entities subject to the supervision of other federal sectoral economic regulatory bodies;
> II – deduction of tax credits arising from income tax losses and negative bases of social contribution;
> III – deduction of deferred expenses;
> IV – deduction of prepaid expenses;
> V – deduction of intangible non-current assets; and
> VI – deduction of goodwill from direct or indirect holdings not covered under item I of this article.

Operators must maintain, at all times, adjusted net equity equal to or greater than the regulatory capital, as established in ANS NR No. 526 of April 29, 2022.

> Article 11. The regulatory capital to be observed by operators until December 2022 shall be the greater of the following:
>
> I – the Base Capital calculated in accordance with Section I of Chapter II; or
> II – the Solvency Margin calculated in accordance with Section II of Chapter II.

The expression "Minimum Own Resources" was updated by the regulatory body to "Regulatory Capital" (*Capital Regulatório* – CR) and is governed by NR 569, issued in 2022, which came into effect in 2023 and revoked NR No. 526/2022. As of January 1, 2023, the "Regulatory Capital" must be observed as the minimum limit of Adjusted Net Equity, which must always correspond to the greater amount between the Base Capital and the Risk-Based Capital (ANS NR 569/2022).

3 METHODOLOGY

In developing the object of investigation in this research, a quantitative approach was employed. Documentary research was used as the methodological tool, enabling the collection and analysis of information related to accounting data and other information published in the ANS database.

Plan solvency was calculated using the "Solvency Margin Sufficiency," which corresponds to the solvency margin determined in comparison to the adjusted net equity at the end of each year. This criterion was in effect from January 1, 2008, to December 31, 2022, and therefore encompasses the entire analysis period.

To be considered sufficient under the solvency margin criterion, the adjusted net equity must be greater than the calculated solvency margin. During the period in which the solvency margin was in effect, ANS allowed for staggered implementation and the freezing of total requirements in certain periods. However, this study did not take such exceptions into account, considering 100% (one hundred percent) of the solvency margin requirement at all times in the calculation. It was also assumed that the solvency margin value was greater than the base capital throughout the analysis period.

Other economic-financial indicators were also analyzed, such as net revenue, profitability, current liquidity, and the number of beneficiaries during the period.

Table 2 presents the description of the variables used in the study:

Table 2

Description of Variables

Variable	Description	Formula
$Solvency\ Margin\ Sufficiency_{i,t}$	Solvency Margin Sufficiency for plan i in year t, measured as the ratio between Adjusted Net Equity in year t and the Solvency Margin in year t	$\frac{Adjusted\ Net\ Equity_{i,t}}{Solvency\ Margin_{i,t}}$ = above 1: sufficient, below 1: insufficient
$Net\ Revenue_{i,t}$	Net revenue of plan i in year t	$Net\ Revenue_{i,t}$
$Profitability_{i,t}$	Profitability of plan i in year t, measured by the Net Margin percentage, i.e., the ratio of Net Income to Net Revenue	$\frac{Net\ Income_{i,t}}{Net\ Revenue_{i,t}} * 100$
$Current\ Liquidity_{i,t}$	Current liquidity for plan i in year t, measured as the ratio between Current Assets and Current Liabilities	$\frac{Current\ Assets_{i,t}}{Current\ Liabilities_{i,t}}$
$Beneficiaries_{i,t}$	Number of beneficiaries for plan i in year t	Beneficiaries in Medical Care Plans + Beneficiaries in Dental-Only Plans, by operator

Note: Source: Created by the author (2024).

The evolution of solvency and financial indicators of these entities was evaluated based on information made available by ANS. The accounting data analyzed refer to the period from December 31, 2014, to December 31, 2022.

The study focused on 62 medium-sized group medicine operators. These operators, having more than 20,000 beneficiaries as of December 31, 2022, were required by ANS to submit the AUP report verifying compliance with the minimum corporate governance practices, issued by an independent auditor, to ANS by May 31, 2023, for the fiscal year 2022. From this group, 16 entities were excluded from the sample due to their legal nature as foundations or associations, as they follow different tax regulations and are not profit-oriented, as verified by consulting their CNPJ (National Register of Legal Entities). Additionally, 7 operators were excluded because their registration with ANS occurred after 2014, the beginning year of the analysis. One operator established in 2014 was also excluded, as it had no beneficiaries that year.

The research did not include large-scale operators (with more than 100,000 beneficiaries), based on the assumption that such entities tend to have better corporate governance and solvency practices due to their greater capacity for market retention and competitiveness. With larger beneficiary portfolios, they also have greater capacity to dilute the risks arising from the inherent uncertainty of the activity. Table 3 summarizes the steps of the process and the number of operators:

Table 3

Sampling process carried out in research

Process steps	Number of Operators
Medical-Hospital Operators as of Dec. 31, 2022	**692**
(–) Small-Sized Medical-Hospital Operators	(384)
(–) Large-Sized Medical-Hospital Operators	(88)
(=) Medium-Sized Medical-Hospital Operators	**220**
(–) Self-Management, Medical Cooperatives, Philanthropic Entities, and Health Insurance Companies	(158)
(=) Medium-Sized Medical-Hospital Operators – Group Medicine	**62**
(–) Foundations and Associations	(16)
(–) Operators established after 2014	(7)
(–) Operator established in 2014 but with no beneficiaries that year	(1)
(=) Total Medium-Sized Medical-Hospital Operators – Group Medicine – in the Sample	**38**

Note: Source: Created by the author (2024).

The study focused on 38 medium-sized Group Medicine Operators structured as *Sociedade Empresária Limitada* (Limited Liability Business Company), *Sociedade Simples Limitada* (Limited Liability Simple Partnership), or *Sociedade Anônima de Capital Fechado* (Privately Held Corporation). The sample size represents 17.27% of all medium-sized operators and includes 1,895,039 health plan beneficiaries, which accounts for 63.85% of the total population of beneficiaries covered by medium-sized Group Medicine Operators as of December 31, 2022.

Information was analyzed from the accounting data of these companies, accessed through the ANS database, for the fiscal years ending on December 31, 2014, to December 31, 2018 (before the issuance of the regulation), and from December 31, 2019, to December 31, 2022 (after the regulation came into effect), as shown in the following timeline.

Table 4

Analysis timeline

Analyzed Years		
Before the Existence of NR 518/22	**After the Existence of NR 518/22**	
2014 to 2018	**2019 to 2021**	**2022**
Before the Issuance of the Regulation	Transition Phase	Mandatory Compliance with Corporate Governance Practices

Note: Source: Created by the author (2024).

During the analyses, the expression “after the existence of NR 518/22” was used, even though this normative resolution was officially published in 2022. However, its existence was considered from 2019 onward, as it replaced/revoked NR 443/19, which was published in 2019.

The statistical analysis was conducted in three (3) stages. The first stage involved descriptive analysis using the main measures of central tendency and dispersion for the consolidated financial results of the 38 selected operators.

In the second stage, the non-parametric Mann-Whitney test was applied both individually and across all operators to verify whether there was a positive relationship in the solvency margin sufficiency after the issuance of NR 443/2019, which was later replaced by NR 518/22, taking effect from fiscal year 2019. A significance level of 5% (p-value ≤ 0.05) was established for the analysis. The non-parametric test is hypothesis-based and uses statistical concepts to determine whether to reject a null hypothesis. In this context, the null hypothesis is: "NR 518/22 had no impact on the solvency of health plan operators."

After applying the non-parametric test, descriptive analysis was carried out on the financial data and number of beneficiaries for the groups of operators that did or did not show a positive relationship in solvency margin sufficiency following the issuance of NR 443/2019, later replaced by NR 518/22.

The third stage involved cluster analysis using the K-Means method for the two types of operators (those with and without a positive relationship after the issuance of NR 443/2019, replaced by NR 518/22). This resulted in three (3) groups for the operators with a positive relationship and two (2) groups for those without, based on the behavior of financial data and number of beneficiaries. After applying the cluster analysis, it was possible to understand the financial characteristics of the operators through the descriptive results of their respective groups.

It is worth noting that the position measure used for analyzing financial data and the number of beneficiaries was the median, due to the small number of observations (from 2014 to 2022). This choice helps avoid large deviations and potential misinterpretations. Supporting this choice is the use of the median as a comparative measure in the non-parametric Mann-Whitney test, as stated by Siegel (1981).

4 RESULTS

The statistical summary presented in Table 5 below refers to the comparison of solvency margin sufficiency, financial indicators, and the number of beneficiaries before (2014 to 2018) and after (2019 to 2022) the existence of the normative resolution.

Table 5

Consolidated Descriptive Analysis

Indicators	Regulation	1st Quartile	Median	3rd Quartile	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.45	0.54	0.72	0.42	78.80%
	After	0.68	0.79	1.28	0.62	78.70%
Net Revenue	**Before**	R$ 45,679,542	R$ 68,080,031	R$ 133,706,426	R$ 62,669,265	92.10%
	After	R$ 65,710,285	R$ 113,374,896	R$ 219,847,673	R$ 112,636,700	99.30%
Profitability	**Before**	0.70	2.28	5.37	4.19	183.70%
	After	-0.63	1.61	5.16	6.04	375.00%
Current Liquidity	**Before**	1.05	1.27	1.52	0.48	37.50%
	After	1.16	1.54	1.91	0.74	47.60%
Number of Beneficiaries	**Before**	23,246	36,192	58,162	28,385	78.40%
	After	25,776	41,951	64,100	23,957	57.10%

Note: Source: Created by the author (2024).

Through the Consolidated Descriptive Analysis, it is possible to observe that at least 75% of the operators were below solvency margin sufficiency (i.e., below 1) before the existence of NR

518/22, whereas after the regulation came into effect, at least 25% of the operators already showed solvency margin sufficiency. The variation in the solvency margin sufficiency index also increased, with higher median values, indicating an influence of the normative resolution on the operators analyzed. Additionally, there was a significant increase in Net Revenue, as well as in Current Liquidity and the number of Beneficiaries, when comparing median values from the periods before and after the resolution came into effect.

The non-parametric Mann-Whitney test was applied to compare the medians of solvency margin sufficiency between the periods before (2014 to 2018) and after (2019 to 2022) the existence of the normative resolution. This non-parametric test is hypothesis-based, and the Mann-Whitney model is one of the most commonly used for independent samples of different sizes that do not follow a normal distribution. The test employs statistical reasoning to determine whether to reject a null hypothesis. In this context, the null hypothesis is: *"NR 518/22 had no impact on the solvency of health plan operators."*

To assess whether NR 518/22 had a positive effect on the solvency margin sufficiency of operators, a significance level of 5% (p-value ≤ 0.05) was established. This means that if the p-value exceeds 5%, the null hypothesis is not rejected, indicating that there was no significant change in solvency before and after NR 518/22. If the p-value is below 5%, the null hypothesis is rejected, and solvency is assumed to have improved.

Table 6 presents the results of the non-parametric Mann-Whitney test applied individually for each operator.

Table 6

Non-Parametric Mann-Whitney Test – Individual by Operator

Operator Code	Operator	Median Before NR 518	Median After NR 518	P-value
301728	Prontomed Planos de Saúde Ltda.*	1.29	2.09	0.02
326861	Promédica – Proteção Médica a Empresas S.A.*	0.42	0.76	0.02
360244	Plano de Saúde Ana Costa Ltda.*	0.28	1.56	0.02
366561	Bensaúde Plano de Assistência Médica Hospitalar Ltda.*	1.10	1.68	0.02
385255	Unihosp Saúde Ltda.*	0.58	0.77	0.02
392391	Hospital Marechal Cândido Rondon S/A.*	0.55	0.82	0.02
412538	Unihosp Serviços de Saúde Ltda.*	0.33	1.64	0.02
414930	Saúde Santa Tereza Ltda.*	0.45	0.67	0.02
416495	Matão Clínicas & AMHMA Saúde Ltda.*	0.66	0.84	0.02
327417	Autoclínicas Assistência Médica e Hospitalar Ltda.*	0.58	0.72	0.04
372609	Nossa Saúde – Operadora de Planos Privados de Assistência à Saúde Ltda.*	0.52	0.86	0.04
414131	RN Metropolitan Ltda.*	0.61	1.60	0.04
414581	União Médica Planos de Saúde S/A.*	0.07	0.77	0.04
415693	Policlin Saúde S/A.*	0.50	0.77	0.04
418170	Quallity Pro Saúde Plano de Assistência Médica Ltda.*	-0.21	0.78	0.04
325236	Assistência Médica São Miguel Ltda.	0.55	0.85	0.07
344362	São Lucas Saúde S/A.	0.57	1.15	0.07
394734	Ameplan Assistência Médica Planejada Ltda.	0.56	0.87	0.07
403962	São Francisco Assistência Médica Ltda.	0.05	0.61	0.07
303739	Sermed Saúde Ltda.	0.52	0.72	0.11
318477	Operadora Unicentral de Planos de Saúde Ltda.	0.49	0.98	0.18

Operator Code	Operator	Median Before NR 518	Median After NR 518	P-value
320510	Ativia Serviços de Saúde S/A.	0.47	0.24	0.18
343463	Plamed Plano de Assistência Médica Ltda.	0.47	0.28	0.18
352586	Sistemas e Planos de Saúde Ltda.	0.42	0.77	0.18
414492	Life Empresarial Saúde Ltda.	1.83	1.62	0.18
415774	Caberj Integral Saúde S.A.	1.03	1.14	0.18
416398	Hospitais e Clínicas do Piauí S/S Ltda.	1.48	1.87	0.23
315265	Paraná Assistência Médica Ltda.	0.72	0.42	0.27
346870	Porto Alegre Clínicas Ltda	0.43	-1.54	0.27
413330	Amep Freguesia Operadora de Plano de Saúde Ltda.	0.64	0.82	0.27
415111	Biovida Saúde Ltda.	0.45	-0.04	0.27
335614	Samedil Serviços de Atendimento Médico S/A.	0.96	1.19	0.39
395480	Esmale Assistência Internacional de Saúde Ltda.	0.65	0.77	0.39
412759	Terramar Administradora de Plano de Saúde Ltda.	0.57	0.49	0.39
328537	Med-Tour Administradora de Benefícios e Empreendimentos Ltda.	0.98	0.92	0.71
416738	Oeste Saúde Assistência à Saúde Suplementar S/A.	1.76	2.29	0.71
363766	Casa de Saúde São Bernardo Ltda.	0.75	0.74	0.90
414352	HBC Saúde Ltda.	0.77	0.77	1.00

Note: * significance level of 5% (p-value ≤ 0.05). Source: Created by the author (2024).

Of the total 38 (thirty-eight) operators analyzed using the non-parametric Mann-Whitney test, a positive relationship was observed, considering the established significance level (p-value ≤ 0.05), in the Solvency Margin Sufficiency after the implementation of NR 518/22 in 15 (fifteen) operators, which represents approximately 40% of the selected sample. This impact was not directly evaluated, as it would require inference about the corporate governance practices of each individual company. Nevertheless, the results confirm an influence on the solvency margin sufficiency of the analyzed operators.

In 23 (twenty-three) operators, the existence of the regulation did not show a positive relationship within the established significance level, as their p-values were above the 5% threshold (p-value > 0.05) for Solvency Margin Sufficiency.

Finally, Table 7 presents the non-parametric Mann-Whitney test results for all operators in a consolidated manner:

Table 7

Non-Parametric Mann-Whitney Test – Consolidated for All Operators

Operator	Median Before NR 518	Median After NR 518	P-value
All operators	0.54	0.79	0.002

Note: Source: Created by the author (2024).

According to the non-parametric Mann-Whitney test – consolidated for all operators, the table shows a p-value = 0.002, that is, 0.2% < 5%. Therefore, the null hypothesis can be rejected, meaning that the implementation of NR 518/22 had an impact on the overall improvement of solvency margin sufficiency (considering all 38 operators).

To better understand the financial behavior and the number of beneficiaries after NR 518/22 among the operators, a descriptive analysis was conducted for the two resulting groups.

Table 8

Descriptive Analysis According to the Existence of a Positive Relationship with NR 518/22 – 15 Operators

Indicators	Regulation	1st Quartile	Median	3rd Quartile	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.36	0.51	0.55	0.37	72.30%
	After	0.72	0.83	1.56	0.48	44.70%
Net Revenue	**Before**	R$ 47,916,953	R$ 78,533,646	R$ 136,957,485	R$ 65,908,326	64.90%
	After	R$ 82,997,854	R$ 139,277,645	R$ 218,513,267	R$ 99,979,581	63.50%
Profitability	**Before**	0.72	1.99	6.54	4.23	143.10%
	After	0.93	2.89	5.10	4.21	136.80%
Current Liquidity	**Before**	0.95	1.28	1.78	0.64	43.00%
	After	1.54	1.70	2.33	0.83	41.80%
Number of Beneficiaries	**Before**	23,557	38,714	53,479	23,216	54.50%
	After	37,821	45,929	58,736	20,218	40.80%

Note: Source: Created by the author (2024).

In the descriptive analysis based on the existence of a positive relationship with NR 518/22 for the 15 (fifteen) operators, a significant increase is observed in the median values of solvency margin sufficiency, net revenue, and current liquidity, along with an increase in profitability. All these improvements were also accompanied by a notable rise in the median number of beneficiaries.

Table 9

Descriptive Analysis Without a Positive Relationship with NR 518/22 – 23 Operators

Indicators	Regulation	1st Quartile	Median	3rd Quartile	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.45	0.60	0.95	0.44	62.50%
	After	0.39	0.77	1.14	0.68	85.90%
Net Revenue	**Before**	R$ 39,389,312	R$ 58,804,950	R$ 112,038,224	R$ 61,250,707	70.60%
	After	R$ 58,254,608	R$ 89,499,152	R$ 223,850,892	R$ 121,967,489	86.00%
Profitability	**Before**	0.50	2.30	5.32	4.25	130.00%
	After	-1.61	1.00	5.33	6.96	616.60%
Current Liquidity	**Before**	1.05	1.25	1.45	0.32	24.80%
	After	1.12	1.35	1.82	0.60	40.50%
Number of Beneficiaries	**Before**	22,314	33,437	59,991	31,770	70.30%
	After	22,913	31,665	64,581	26,419	58.20%

Note: Source: Created by the author (2024).

The table presenting the descriptive analysis without a positive relationship with NR 518/22 for the 23 (twenty-three) operators shows that, although there was a median increase in solvency margin sufficiency, it was not sufficient to confirm a positive relationship after the regulation came into effect, given the greater variation observed among these companies over the period of enforcement. Financial results fluctuated, showing improved median performance in net revenue and current liquidity; however, profitability saw a significant decline, accompanied by a reduction in the number of beneficiaries.

The K-Means clustering method was applied to more precisely segment behavioral patterns. Three (3) groups were created for operators with a positive relationship with NR 518/22 in terms of solvency margin sufficiency, and two (2) groups for those without such a relationship. This method is capable of segmenting companies into homogeneous groups based on financial performance (Hair *et al.*, 2009). Performance levels were categorized as high, moderate, and low, and the results were presented using descriptive analysis with key measures of central tendency and dispersion.

As a result of the test, 15 (fifteen) companies were divided into 3 (three) groups, corresponding to levels of impact after the implementation of NR 518/22 on solvency margin sufficiency, representing high, moderate, and low financial performance: 6 (six) companies in group "1," 2 (two) in group "2," and 7 (seven) in group "3." Tables 10, 11, and 12 present the statistical calculations.

Table 10

Statistical summary for operators, total of 6 companies (group 1), with a positive relationship after the regulation came into effect, showing higher financial performance

Indicators	Regulation	Median	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.53	0.28	46.20%
	After	1.19	0.47	38.90%
Net Revenue	**Before**	R$ 124,474,639	R$ 26,550,637	22.10%
	After	R$ 162,521,653	R$ 38,482,475	21.90%
Profitability	**Before**	2.32	3.03	98.70%
	After	4.20	3.04	68.30%
Current Liquidity	**Before**	1.28	0.84	51.30%
	After	1.69	1.22	56.50%
Number of Beneficiaries	**Before**	46,994	8,559	17.70%
	After	48,910	14,165	27.00%

Note: Source: Created by the author (2024).

According to Table 10, a positive relationship is observed, with the best performance in financial results, particularly regarding solvency margin sufficiency, which more than doubled compared to the period prior to the regulation. This was accompanied by a significant increase in net revenue along with improvements in current liquidity.

Table 11

Statistical summary for operators, total of 2 companies (group 2), with a positive relationship after the regulation came into effect, showing moderate financial performance

Indicators	Regulation	Median	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.52	0.05	10.00%
	After	1.16	0.57	4.50%
Net Revenue	**Before**	R$ 230,901,792	R$ 4,045,694	1.80%
	After	R$ 354,860,930	R$ 92,375,927	26.00%
Profitability	**Before**	5.20	6.44	123.80%
	After	2.86	3.17	110.90%
Current Liquidity	**Before**	1.30	0.50	38.80%
	After	2.33	0.01	0.30%
Number of Beneficiaries	**Before**	86,951	22,404	25.80%
	After	87,109	7,609	8.70%

Note: Source: Created by the author (2024).

According to the results presented in Table 11, there was an improvement in financial performance, though more moderate. The median value of solvency margin more than doubled compared to the period prior to the regulation, which was mainly reflected in current liquidity, despite a decrease in median Profitability and a non-significant increase in the number of beneficiaries.

Table 12

Statistical summary for operators, total of 7 companies (group 3), with a positive relationship after the regulation came into effect, showing lower financial performance

Indicators	Regulation	Median	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.47	0.48	113.40%
	After	0.78	0.51	54.20%
Net Revenue	**Before**	R$ 47,916,953	R$ 18,064,100	37.30%
	After	R$ 82,997,854	R$ 35,853,793	42.00%
Profitability	**Before**	1.97	5.00	224.40%
	After	2.79	5.35	272.70%
Current Liquidity	**Before**	1.28	0.54	37.90%
	After	1.65	0.50	28.40%
Number of Beneficiaries	**Before**	23,557	8,250	32.90%
	After	38,812	9,747	26.80%

Note: Source: Created by the author (2024).

According to Table 12, the companies listed in the third group experienced a statistical increase; however, it was not sufficient in terms of solvency when using the median as the measure of central tendency. There was significant growth in the number of beneficiaries, and although net revenue, current liquidity, and profitability also increased, these improvements were not enough to

ensure satisfactory solvency margin sufficiency (greater than 1) for at least 50% of the companies analyzed, even with the positive effect following the implementation of NR 518/22.

When analyzing those operators that did not show a positive result from NR 518/22, considering the established significance level, two groups were formed, one with better and the other with lower financial performance, comprising 7 (seven) companies in group "1" and 16 (sixteen) companies in group "2," totaling 23 (twenty-three) companies. Tables 13 and 14 present the statistical calculations.

Table 13

Statistical summary for operators, total of 7 companies (group 1), without a positive relationship after the regulation came into effect, showing better financial performance

Indicators	Regulation	Median	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.57	0.44	66.90%
	After	0.73	0.74	62.30%
Net Revenue	**Before**	R$ 49,234,653	R$ 22,739,523	43.10%
	After	R$ 66,050,907	R$ 32,583,138	42.60%
Profitability	**Before**	1.35	4.79	174.10%
	After	0.59	6.57	-5663.10%
Current Liquidity	**Before**	1.15	0.36	28.90%
	After	1.34	0.5	36.10%
Number of Beneficiaries	**Before**	24,865	18,252	56.90%
	After	27,195	17,352	53.70%

Note: Source: Created by the author (2024).

Table 13 presents the operators with the best financial performance among those that did not show a positive result in solvency margin sufficiency, considering the established significance level. Although there was an increase in the number of beneficiaries accompanied by net revenue growth, it was not possible to maintain profitability, which impacted the solvency margin sufficiency.

Table 14

Statistical summary for operators, total of 16 companies (group 2), without a positive relationship after the regulation came into effect, showing lower financial performance

Indicators	Regulation	Median	Standard Deviation	Coef. of Variation
Solvency Margin Sufficiency	**Before**	0.64	0.46	56.20%
	After	0.86	0.52	54.00%
Net Revenue	**Before**	R$ 176,135,314	R$ 48,167,508	29.30%
	After	R$ 249,581,551	R$ 119,799,813	41.10%
Profitability	**Before**	3.13	2.54	57.20%
	After	1.50	7.50	188.80%
Current Liquidity	**Before**	1.42	0.19	14.10%
	After	1.35	0.79	47.00%
Number of Beneficiaries	**Before**	85,403	36,946	49.20%
	After	75,599	17,659	23.50%

Note: Source: Created by the author (2024).

Finally, Table 14 represents the lowest financial performance among the operators that did not show a positive relationship with NR 518/22. The operators in this group experienced a decrease in the number of beneficiaries, an increase in net revenue, and a reduction in both current liquidity and profitability.

4.1 Data Discussion

Several factors affect the solvency of health plan operators. According to Stock et al. (2006), one of the main challenges for an operator is the difficulty of forecasting its costs. Andrade and Maia (2009) point out that the supplementary health sector has particularities, such as various failures stemming from uncertainty regarding the timing and volume of service usage; this asymmetry negatively affects economic efficiency.

The study conducted by Freire et al. (2020) revealed a direct association between corporate governance and financial performance, considering variables such as solvency and operational activity. Rezaee et al. (2018) found that companies with a higher corporate governance index and more efficient internal controls present higher earnings response coefficients.

This research observed an improvement in the median values of solvency, net revenue, and current liquidity of the analyzed operators, as well as the impact of the enforcement of NR 518/22 on solvency margin sufficiency, according to the statistical significance level. These findings corroborate the association between corporate governance and financial performance and, more specifically, demonstrate a positive relationship in solvency, accompanied by improvements in financial indicators in 15 (fifteen) of the 38 (thirty-eight) operators analyzed, approximately 40% of the sample, since the issuance of NR 443/2019, which was replaced by NR 518/22.

For the remaining 23 (twenty-three) operators, although there was a slight improvement in the median solvency margin sufficiency, it was not statistically possible to confirm the impact of the regulation, as the solvency variation for this group exceeded the established significance level.

It is important to note that the COVID-19 pandemic had a significant impact on health plans in recent years. In 2020, measures adopted to contain the spread of the virus, such as social isolation and the suspension of elective surgeries and procedures, led to historic drops in consultations, exams, therapies, and surgeries. This scenario resulted in record profits for the sector, with increased revenue, growth in the number of beneficiaries, and a sharp reduction in medical expenses. In 2021 and 2022, however, costs rose due to the treatment of COVID-19 patients and the resumption of elective procedures that had been postponed since the beginning of the pandemic, negatively affecting the results of health plans. These situations directly impacted the operational outcomes and, consequently, the solvency of health plan operators during this period.

FINAL CONSIDERATIONS

This study aimed to evaluate the solvency of medium-sized group medicine health plan operators, covering the period before the issuance of the Normative Resolution, during the transitional phase when the verification of the described practices was not yet mandatory, and in 2022, under the mandatory enforcement of corporate governance practices that were to be reported to ANS at the beginning of 2023 by medium- and large-sized health plan operators. The study also sought to understand the regulatory environment and determine whether the Normative Resolution contributed to improving the solvency of health plan operators.

The study noted improvements in the median solvency, net revenue, and current liquidity for the group of operators analyzed. Furthermore, it confirmed the impact of NR 518/22 on the general improvement of solvency margin sufficiency (covering all 38 operators), based on the established statistical significance level, supporting the positive association between corporate governance practices and financial performance.

More specifically, a positive relationship in solvency was observed, accompanied by improved financial indicators in 15 (fifteen) of the 38 (thirty-eight) operators analyzed, representing approximately 40% of the sample since the issuance of NR 443/2019, which was replaced by NR 518/22.

For the remaining 23 (twenty-three) operators, although there was a slight improvement in the median solvency margin sufficiency, the impact of the regulation could not be statistically

confirmed, as the solvency variation for this group exceeded the established significance threshold. The study also noted that, despite the improvement when comparing the periods before and after NR 518/22, around 68% (sixty-eight percent) of the sample operators were still below the solvency margin sufficiency threshold in 2022.

This research contributes to the understanding that corporate governance practices, internal controls, and risk management may have a positive relationship with organizational solvency. From a managerial perspective, it highlights the importance of governance management, internal controls, and risk management as essential pillars for the supplementary health sector. These practices strengthen operator management, safeguard the interests of beneficiaries and healthcare service providers, and, consequently, ensure the solvency of health plan operators.

One limitation of the method is the lack of publicly available information on the extent to which these entities comply with the minimum corporate governance practices required by NR 518/22. This assessment would be possible through verification of the first AUP report under NR 518/22, certified by an independent auditor, which was to be submitted to ANS by May 31, 2023, for the year 2022. However, this information is not publicly accessible. Access to these reports would allow for inference on whether entities that fully complied with the minimum governance practices performed better in the solvency evaluation than those that did not.

Another limitation is the heterogeneity of the sample group. Although classified as medium-sized group medicine operators, the companies differ in size, structure, and operational models. A further limitation is related to the COVID-19 pandemic, whose effects were not controlled for in the analyzed sample. The sector was significantly impacted by the pandemic's outcomes.

This study aims to encourage future research linking solvency and corporate governance practices following the consolidation of these practices among health plan operators. Future studies are recommended to replicate this research for other groups of operators, including large-scale health plan operators. Future research could also explore qualitative aspects of corporate governance through interviews or case studies, aiming to gain deeper insights into perceived changes in organizational culture, decision-making processes, and the effectiveness of governance practices resulting from the adoption of regulation.

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