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Relationship between hospitalizations due to ambulatory care sensitive conditions and economic indicators

Relação entre internações por condições sensíveis à atenção primária e indicadores econômicos

Relación entre hospitalizaciones por condiciones sensibles a la atención ambulatoria e indicadores económicos

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ABSTRACT

Objective: to analyze the distribution and relationship between the coefficients corresponding to Ambulatory Care Sensitive Conditions (ACSCs) associated with Chronic Non-Communicable Diseases (CNCDs) and municipal and *per capita* Gross Domestic Products (GDPs) in the state of São Paulo between 2016 and 2022. **Method:** an ecological study based on secondary data about CNCD-related HACSCs collected in DATASUS. Global Moran indices were used to evaluate spatial auto-correlations and changes in the monthly coefficients, waiving appraisal by any Research Ethics Committee. The data were analyzed following the "joinpoint" regression model. **Results:** a positive spatial correlation was verified in relation to the HACSC coefficient and *per capita* GDP in 2016, 2021 and 2022, in addition to the formation of High-High clusters in the Campinas, Marília, São Paulo, Bauru and Sorocaba regions. **Conclusion:** socioeconomic inequalities were evidenced in the territories, impairing fair access to Primary Health Care.
Descriptors: Ambulatory Care Sensitive Conditions; Chronic Disease; Hospitalization; Socioeconomic Factors; Health Inequities.

RESUMO

Objetivo: analisar a distribuição e relação entre os coeficientes de Internações por Condições Sensíveis à Atenção Primária (ICSAP) associadas às Doenças Crônicas Não Transmissíveis (DCNT) e o Produto Interno Bruto (PIB) municipal e per capita no estado de São Paulo entre os anos de 2016 e 2022. **Método:** estudo ecológico a partir de dados secundários de ICSAP relacionadas às DCNT coletados no DATASUS. Utilizou-se os índices de Moran global para avaliar autocorrelações espaciais; mudanças nos coeficientes mensais, com dispensa de apreciação pelo Comitê de Ética em Pesquisa. Dados analisados por meio do modelo de regressão *joinpoint*. **Resultados:** verificou-se uma correlação espacial positiva em relação ao coeficiente ICSAP e o PIB per capita nos anos de 2016, 2021 e 2022, e formação de clusters alto-alto nas regiões de Campinas, Marília, São Paulo, Bauru e Sorocaba. **Conclusão:** evidenciou-se desigualdades socioeconômicas nos territórios, comprometendo o acesso equitativo à Atenção Primária.
Descritores: Condições Sensíveis à Atenção Primária; Doença Crônica; Hospitalização; Fatores Socioeconômicos; Desigualdades de Saúde.

RESUMEN

Objetivo: analizar la distribución y relación entre los coeficientes de Hospitalizaciones por Condiciones Sensibles a la Atención Ambulatoria (HCSAA) asociadas a Enfermedades Crónicas No Transmisibles (ECNT) y el Producto Bruto Interno (PBI) municipal y *per capita* en el Estado de São Paulo entre 2016 y 2022. **Método:** estudio ecológico basado en datos secundarios sobre HCSAA relacionadas con ECNT recopilados de DATASUS. Se utilizaron los índices de Moran global para evaluar las autocorrelaciones espaciales; los cambios en los coeficientes mensuales se realizaron sin revisión por parte del Comité de Ética en Investigación. Los datos se analizaron utilizando el modelo de regresión *joinpoint*. **Resultados:** se encontró una correlación espacial positiva entre el coeficiente de HCSAA y el PBI *per capita* en los años 2016, 2021 y 2022, y se formaron clústeres de tipo "alto-alto" en las regiones de Campinas, Marília, São Paulo, Bauru y Sorocaba. **Conclusión:** se evidenciaron desigualdades socioeconómicas en los territorios, lo que compromete el acceso equitativo a la Atención Primaria.
Descriptores: Condiciones Sensibles a la Atención Ambulatoria; Enfermedad Crónica; Hospitalización; Factores Socioeconómicos; Inequidades en Salud.

INTRODUCTION

Hospitalizations due to Ambulatory Care Sensitive Conditions (HACSCs) are considered avoidable hospitalizations caused by health conditions that may have been solved in Primary Health Care Services (PHC), in order to prevent outcomes that would require tertiary-level health care[1].

The indicators of these hospitalizations suggest that PHC services may be facing difficulties to ensure effective assistance. Such obstacles can be associated with the coverage-demand ratio in that care level[2,3] or with non-integration across the Health Care Network services, which can lead to care fragmentation[4,5].

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The Brazilian List of Ambulatory Sensitive Hospitalizations is structured into groups of reasons for the hospitalizations and diagnoses such as immunization-preventable diseases and sensitive conditions, infectious gastroenteritis cases and complications, anemia, nutritional deficiencies, ear/nose/throat infections, bacterial pneumonias, asthma, pulmonary diseases, angina, Systemic Arterial Hypertension (SAH), Diabetes *Mellitus* (DM), and kidney and urinary tract infections[6].

In this context, Chronic Non-Communicable Diseases (CNCDs) stand out among HACSCs, influenced by the social and individual factors related to life habits and with the possibility of persisting throughout life, resulting in disabilities, reduced productivity and need for hospitalizations[7,8].

SAH and DM stand out among the main CNCDs due to their magnitude and potential to trigger other diseases and complications[9]. Before the COVID-19 pandemic, CNCDs were responsible for 41 million deaths a year, which represents 71% of all cases at the global level, with cardiovascular diseases accounting for most of them: a mean of 17.9 million a year[10].

The number of HACSCs, especially those related to CNCDs, cannot be solely associated with the effectiveness of PHC services but also with socioeconomic indicators, as the assistance provided is grounded on the users' adherence to pharmacological and non-pharmacological treatments, which are strongly related to income and schooling[8,11].

CNCDs present different geographical distributions, disproportionately affecting the poorer and more vulnerable population segments, thus evidencing social ailments and further accentuating social inequality[12]. Nevertheless, gaps remain in the literature as for the relationship between the geographical distribution of HACSCs and economic indicators such as *per capita* and municipal GDPs.

Thus, the objective of this study was to analyze the distribution and relationship between the coefficients corresponding to Ambulatory Care Sensitive Conditions (ACSCs) associated with Chronic Non-Communicable Diseases (CNCDs) and municipal and *per capita* Gross Domestic Products (GDPs) in the state of São Paulo between 2016 and 2022.

METHOD

This is an ecological study based on secondary data corresponding to CNCD-related HACSCs and economic indicators in the state of São Paulo during the 2016-2022 period. Such period was defined because it includes consistent time series following the consolidation of the Brazilian List of HACSCs, implemented in 2008. The timeframe selected encompasses both the pre-pandemic scenario and the subsequent years, allowing recording changes related to the COVID-19 health emergency.

The cases analyzed were those of HACSCs in people with CNCDs, with no age restrictions and living in the state of São Paulo, referring to the 2016-2022 period and with ICD-10 HACSC codes included in the Brazilian List of Ambulatory Care Sensitive Conditions. In turn, the hospitalizations excluded were those of patients coming from other states, as the *per capita* and municipal GDP data did not meet the research criteria, precluding correlations.

The data referring to the reasons for the hospitalizations, their nature and ZIP codes corresponding to the municipalities of residence found in the Hospitalization Authorization Forms (HAFs) were collected in the Hospital Information System (*Sistema de Informações Hospitalares*, SIH), available in the official DATASUS website[13] in the form of microdata, and exported to Excel. In addition, the sociodemographic data about *per capita* and municipal GDPs were collected from the estimated population living in Brazil and its Federation Units available in the official websites managed by the Brazilian Institute of Geography and Statistics[14] and by the State System for Data Analysis Foundation[15].

The division into Administrative Regions (AR) from the state of São Paulo[16] was used for the analyses performed in this study, namely: Araçatuba, Barretos, Bauru, Campinas, Central, Franca, Itapeva, Marília, Presidente Prudente, Registro, Santos, Ribeirão Preto, São José do Rio Preto, São José dos Campos, São Paulo and Sorocaba. Choice of this division is justified by the fact that the economic indicators are consolidated by ARs, which allowed performing robust spatial analysis that could be compared across regions with different profiles.

Univariate and bivariate global Moran indices were calculated to evaluate the spatial auto-correlations corresponding to the variables of interest. The Moran index is a test yielding an index which provides a single value as a spatial association measure for an entire dataset and whose null hypothesis is spatial independence, with a value of zero in this case. Positive values (between 0 and +1) indicate direct correlations, whereas negative ones (between 0 and –1) signal inverse correlations[17,18].

After estimating the global indices, the bivariate local Moran indices were calculated. In addition to that, it was possible to verify that clusters were formed. Thus, the presence of spatial groupings (clusters) was evaluated based on the spatial association indicators and by building boxmaps related to the analysis of the dependent variables and each of the independent variables. The GeoDa® software (version 1.20.0.10) was used to calculate the indices; in turn, QGIS® (version 3.26.0) was employed to prepare the maps and the frequency distributions.

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Any and all changes in the monthly coefficients were analyzed using a "joinpoint" regression model. Based on a Poisson regression analysis, the positions for the change points and regression coefficients were estimated; as for the ideal number of joinpoints, it was selected through a Monte Carlo permutation test considering a maximum of 5 points due to the excessive convergence time. In order to ease interpretation, the Monthly Percentage Changes (MPCs) for each line segment were calculated, with their corresponding 95% confidence intervals. A 5% significance level was adopted for all the analyses. The data were analyzed in the Joinpoint Regression software (version 4.9.1.0).

For being a research study conducted with secondary public domain data, appraisal by any Committee of Ethics in Research with Human Beings was waived.

RESULTS

A total of 16,705,572 SUS hospitalizations in the state of São Paulo were recorded during the period analyzed; 1,273,838 of them were due to ACSCs, representing a mean of 7.6% of all the hospitalizations recorded. In the period analyzed, 2016 stands out with the highest proportion of HACSCs in relation to all hospitalizations (8.2%). Table 1 presents the results corresponding to the univariate and bivariate auto-correlation analyses for the HACSC coefficient.

Table 1: Univariate and bivariate spatial auto-correlation analysis corresponding to the coefficient for CNCD-related HACSCs per 100 hospitalizations and GDP and *per capita* GDP in the state of São Paulo during the 2016-2022 period. São Paulo, Brazil, 2022.

			HACSC rate X GDP		HACSC rate X *Per capita* GDP	
Year	**GMI-uni[a]**	**p-value**	**GMI-bi[b]**	**p-value**	**GMI-bi**	**p-value**
2016	0.070	<0.001	0.006	0.266	0.023	0.008
2017	0.066	<0.001	0.013	0.060	0.013	0.084
2018	0.063	<0.001	0.005	0.293	0.015	0.068
2019	0.071	<0.001	0.008	0.166	0.001	0.451
2020	0.085	<0.001	0.01	0.109	0.004	0.324
2021	0.073	<0.001	0.008	0.172	0.015	0.042
2022	0.119	<0.001	0.018	0.018	0.028	0.004

Notes: [a]GMI-uni: Univariate Global Moran Index; [b]GMI-bi: Bivariate Global Moran Index.

In the univariate analysis, a mild spatial correlation was verified in relation to the CNCD-related HACSCs in all the years analyzed; in other words, the correlation values generated by the Global Moran Index (IMG) pointed to a direct and mild correlation for being positive values and close to zero, respectively, indicating that the spatial distribution of the hospitalization is not at random.

In turn, when the bivariate analysis was performed, a mild positive spatial correlation stood out among municipalities with higher coefficients for CNCD-related HACSCs and higher GDPs in 2022. A mild positive spatial correlation was also verified in relation to the HACSC coefficient and *per capita* GDP in 2016, 2021 and 2022; in other words, municipalities with higher coefficients for CNCD-related HACSCs presented higher *per capita* GD values.

The results show concentration of High-High clusters, that is to say, municipalities and surrounding districts presenting high coefficients for HACSCs and GDPs in the Campinas, Marília, São Paulo and Sorocaba ARs. During the period analyzed, it was observed that the High-High clusters in the Campinas AR were more persistent; in turn, the Sorocaba AR recorded reduced formation of High-High clusters in 2018 and 2019, followed by reappearance of such formation in 2020 (Figure 1).

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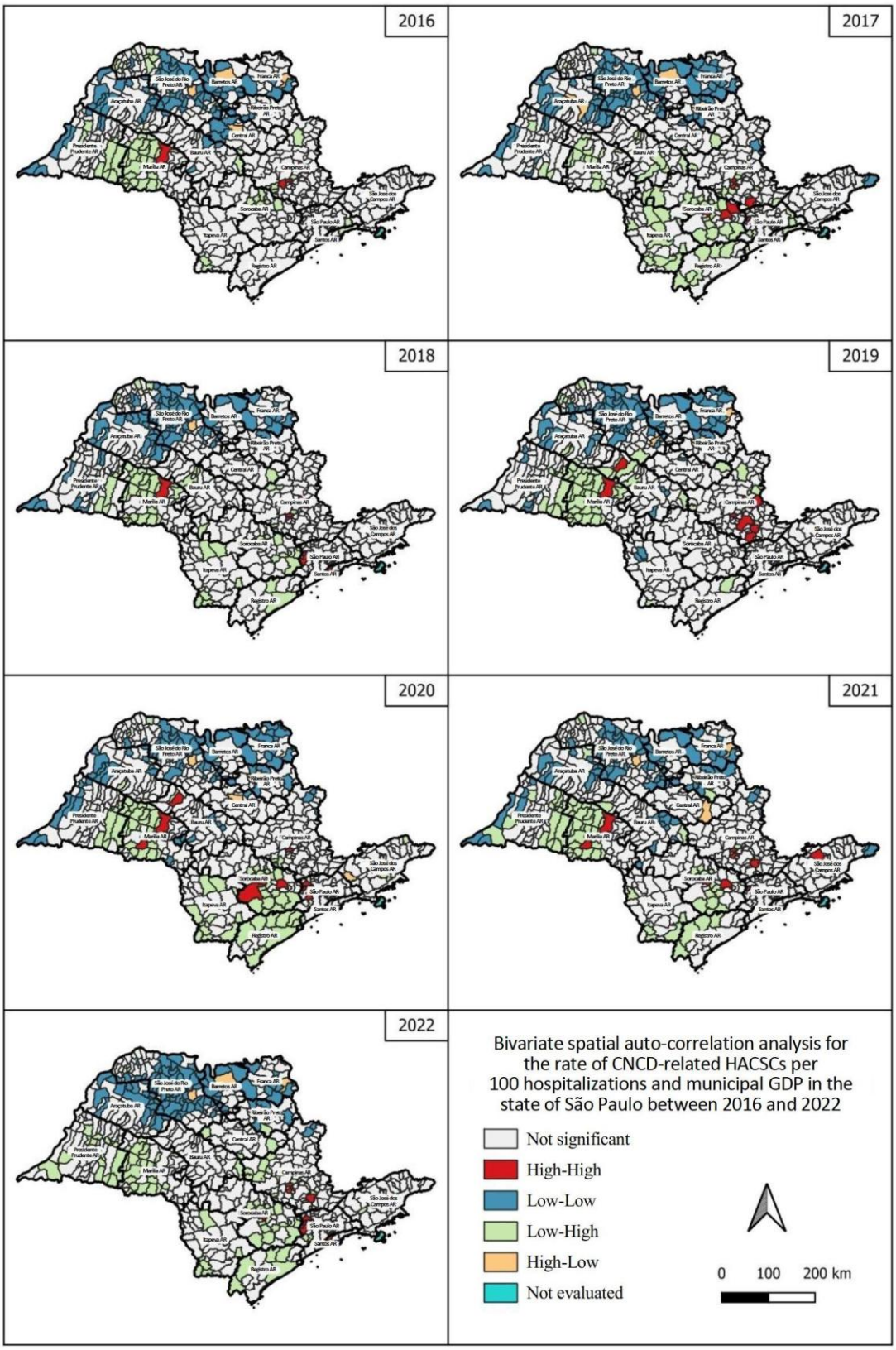

Figure 1: Bivariate spatial auto-correlation analysis for the rate of CNCD-related HACSCs per 100 hospitalizations with municipal GDP in the state of São Paulo between 2016 and 2022. São Paulo, Brazil, 2022.

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The Low-Low clusters indicated regions with low HACSC coefficients and lower GDPs in part of the municipalities and neighboring districts, being more frequent in the São José do Rio Preto, Central, Barretos, Franca and Presidente Prudente ARs.

Figure 2 presents the results of the analysis following the bivariate local Moran index in relation to the rate of CNCD-related HACSCs and municipal *per capita* GDP.

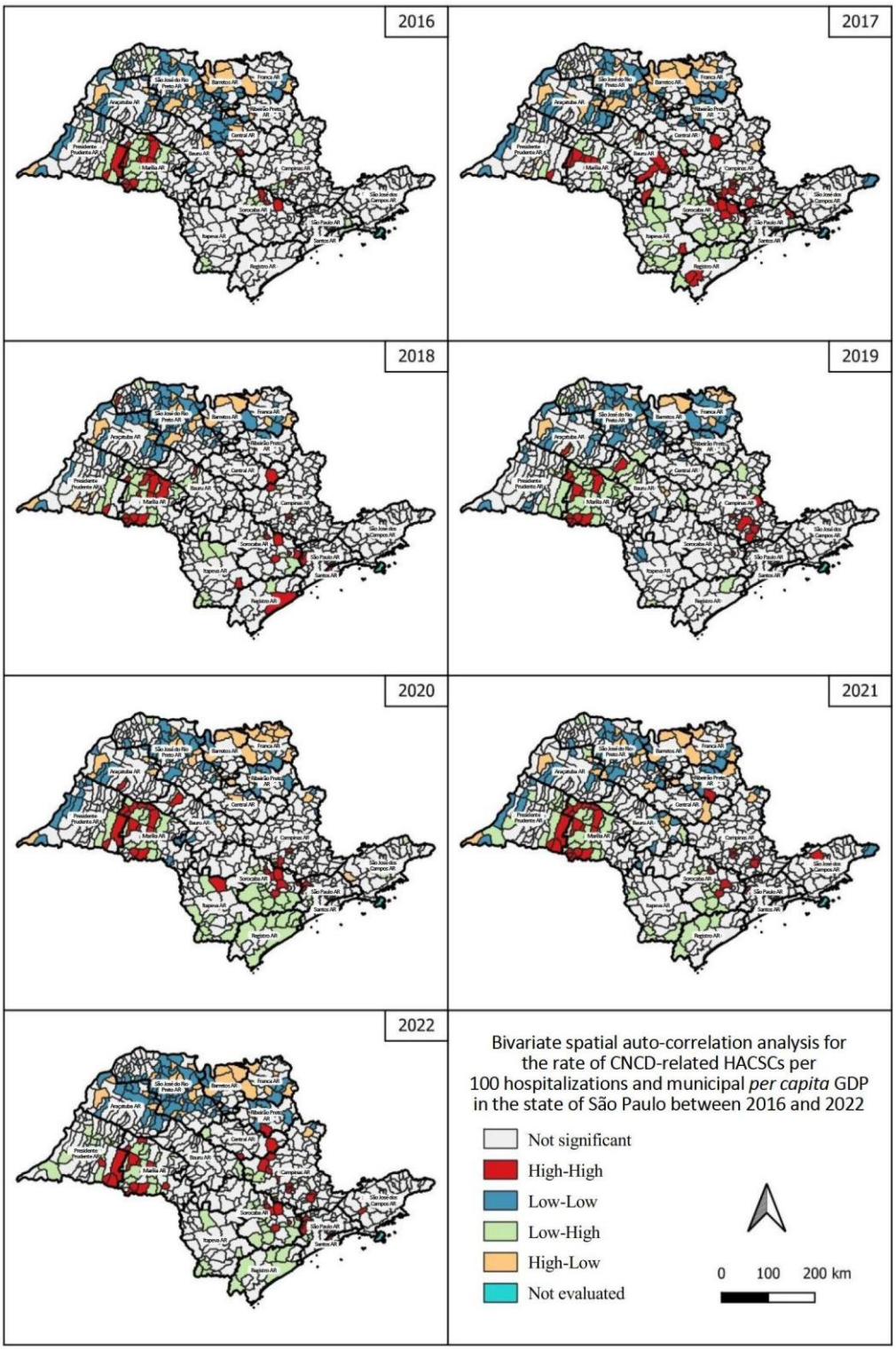

Figure 2: Bivariate spatial auto-correlation analysis for the rate of CNCD-related HACSCs per 100 hospitalizations with municipal *per capita* GDP in the state of São Paulo between 2016 and 2022. São Paulo, Brazil, 2022.

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It was shown that High-High clusters were formed in municipalities from the Campinas, Marília and Sorocaba ARs in all the years analyzed. The Ribeirão Preto and Central ARs also presented High-High clusters during specific periods of time.

As for the Low-Low clusters, the São José do Rio Preto, Franca and Araçatuba ARs stand out, maintaining this pattern in all the years analyzed, thus indicating a trend of low coefficients for CNCD-related HACSCs and lower *per capita* GDPs in part of their territories.

DISCUSSION

Based on the analysis of the results, it was possible to verify that there is a correlation between CNCD-related HACSCs and the "Municipal GDP" and "*Per capita* GDP" variables. In relation to municipal GDPs, a correlation was only detected in two of the seven years analyzed. However, the spatial analysis revealed persistence of High-High clusters in certain regions, indicating that the high coefficient for CNCD-related HACSCs in those places can be associated with municipalities presenting high *per capita* GDP levels. These findings suggest that economic conditions can exert an influence on the distribution of CNCD-related HACSCs and underscore the importance of considering such disparities when formulating health-targeted public policies. Alterations in the profile corresponding to the distribution of CNCD-related HACSCs such as the one recorded in the Sorocaba AR between 2018 and 2019 deserve an in-depth analysis to determine if these changes in the spatial pattern can be associated to variations in the economic pattern, to health service dynamics or to other specific factors both related to health and to socioeconomic conditions in the AR.

It can be seen that the municipal GDPs were only associated with the HACSC coefficients in 2022, concentrating High-High clusters in the Campinas, Marília, São Paulo and Sorocaba ARs. This one-off relationship can reflect specific characteristics of the period, including late effects of the COVID-19 pandemic on the care network and changes in local health funding, which may have increased the number of hospitalizations recorded. In turn, the *per capita* GDPs presented a correlation in 2016, 2021 and 2022, indicating better time stability in this indicator to record inequalities in the incidence of HACSCs. This difference suggests that, for reflecting the aggregate economic value, municipal GDPs can mask poverty pockets and intra-urban heterogeneities, whereas *per capita* GDPs are closer to the population mean income conditions, representing a more sensitive indicator of those inequalities[19].

The correlation between GDP and the coefficients for CNCD-related HACSCs is complex, as richer municipalities tend to possess better hospital infrastructures; however, the increase in the number of beds can paradoxically make these coefficients rise. In addition to having more hospital beds and specialized equipment available, richer municipalities usually have more robust information systems, which can enhance detection and recording of avoidable hospitalizations. Nevertheless, these municipalities frequently adopt a hospital-centered care approach and a scarcely resolute traditional PHC model, which can lead to higher hospitalization rates, even in the case of HACSCs. Consequently, PHC services in these places can be undervalued and not included in the local health strategy as the preferred gateway and coordinating area of the system, with direct repercussions on the indicators[20].

In turn, poorer areas with fewer human and material resources in PHC and more access difficulties can present under-reporting or barriers that delay the search for care services, resulting in late hospitalizations. On the other hand, it is worth noting that these municipalities sometimes direct their financial resources to strengthen PHC (especially the Family Health Strategy, FHS) as the main gateway, which can result in more resolute PHC services and in lower rates of avoidable hospitalizations[20]. Nevertheless, it is crucial to note that these are general trends subject to variation and that such characteristics emerge as potential confounding factors for the analysis.

Heterogeneity in municipal funding, variations in management and FHS quality and specific local initiatives are elements that can explain part of the regional differences observed. However, an analysis of a seven-year historical time series as the one performed in this study allows mitigating the influence of one-off fluctuations and recording the evolution trend for these hospitalizations, offering a more robust view about the relationship between economic variables and HACSCs, even when these confounding factors are present.

A study about the Minas Gerais health macro-regions revealed that a one-bed increase per 1,000 inhabitants implied a mean 2.8% increase in the HACSC coefficient[21]. In addition to that, expanding PHC coverage does not necessarily reduce the number of HACSCs, as access to health and quality of the services provided in this care level are also factors to be taken into consideration[22].

It is noticed that, despite having an economically strong industrial complex, the Santos AR also presents deep socioeconomic vulnerability, which can be related to higher demand for Public Health services and, consequently, to a higher HACSC coefficient[23]. Given the financial hardships, the socially vulnerable population is restricted to SUS care services and faces greater difficulties purchasing medications and adapting to healthy lifestyles[24].

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In the Registro AR and when compared to richer ARs, FHS coverage may have contributed to minimizing the effect exerted by socioeconomic vulnerability on the HACSC coefficient, indicating that PHC strengthening is essential to control and reduce HACSCs. Thus, the existence of well-structured PHC services is associated with better health outcomes and with lower overload in emergency and in-hospital services[25,26].

Other Brazilian regions, such as the state of Rio de Janeiro, presented larger reductions in the number of HACSCs, associated with greater FHS coverage and with better health follow-ups[27]. In the Brazilian Amazon, a reduction in the number of HACSCs and of hospital costs was identified, concomitant to increased FHS coverage[28]. In Canada, follow-ups in charge of Family Health physicians resulted in lesser use of emergency services and in lower hospitalization rates[29,30]. In South Korea, the increase in the number of Primary Health Care physicians was associated with lower mortality rates[31].

In another Brazilian study it was verified that the presence of physicians from the *Mais Médicos* (More Physicians) program exerted an impact on reducing the number of hospitalizations due to cardiovascular conditions; however, this reduction was observed 4 years after these physicians had started their activities[3]. All this evidence suggests the importance of PHC and of medium- and long-term policies. In addition to that, it is necessary to consider the expanded coverage and the improved quality of the services provided. PHC efficacy is directly connected with the ability to reach more vulnerable populations and maintain health follow-ups.

It is worth noting that HACSC frequency can be related to the quality assessment of PHC services and not only to coverage itself, as Brazilian municipalities with lower quality in these services recorded more HACSCs than better assessed towns in that sense[32]. Therefore, the FHS coverage analysis alone may not be conclusive to understanding HACSCs, with a need for a scrutiny targeted at the specific characteristics inherent to PHC structuring, such as resoluteness, timely access and work process organization[33]. It is also necessary to assess the individual characteristics of health management in the municipalities, as it is usual in several towns for people to wait extended periods of time to schedule appointments with specialty physicians, which can aggravate their health conditions and lead to urgency hospitalizations, resulting in challenges related to bed regulation in the Unified Health System (*Sistema Único de Saúde*, SUS)[34,35].

In another setting (the capital city of Rio de Janeiro), a correlation was verified among regions of the city with deeper social vulnerability and higher coefficients regarding hospitalizations due to DM[36]. It is noted that unequal wealth distribution can lead to disparities in accessing health services, especially in peripheral areas and regions presenting deeper social vulnerability[11]. Associations can be verified between higher HACSC coefficients and illiteracy and low schooling, situations that are more frequent among the most vulnerable population segments[36,37].

A relationship was verified between *per capita* GDP and the HACSC coefficients in 3 of the 7 years analyzed, indicating that cities with higher *per capita* GDPs also presented higher coefficients for CNCD-related HACSCs. These increased HACSC coefficients along with higher *per capita* GDPs can be related not only to better health infrastructures that ease detecting and recording these hospitalizations but also to socioeconomic inequalities, exerting an impact on the health-disease process in more vulnerable individuals[38].

It is important to note that the São José do Rio Preto, Franca and Araçatuba ARs (which presented Low-Low clusters) stand out for showing lower vulnerability indices. The Araçatuba region is characterized by low inequality in income distribution and low proportions of districts with extremely high vulnerability[23]. Therefore, these regions may reflect more efficient PHC performance in preventing and controlling CNCDs, contributing to a lower incidence of HACSCs. However, even in regions considered economically favored, the existence of territories in municipalities with good economic performance but concentrating population groups in social vulnerability situations cannot be disregarded[39,40].

These intra-urban and intra-regional inequalities represent a significant challenge in the fight against CNCDs. People living in poverty are more exposed to risk factors, such as precarious housing and lack of access to drinkable water and sewage systems. In addition to that, many workers cannot miss work to access health services for CNCD prevention, follow-up and continuous treatments[41,42]. Therefore, the existence of Low-Low clusters should not be interpreted in a simplistic way as absence of problems associated with CNCD-related HACSCs, as high GDPs do not necessarily eliminate the incidence of poverty pockets in economically developed municipalities.

Based on the cluster formation analysis in the ARs from the state of São Paulo, inferences can be made about the impacts exerted by the heterogeneity of the state population living conditions on the coefficient for CNCD-related HACSCs in different towns. Consistent predominance of Low-Low clusters was observed in the North region of the state during the period analyzed; in turn, the High-High clusters presented larger variations. These differences show the impact of the economic and social diversity inherent to HACSCs across the ARs, as disparities of a socioeconomic nature and in access to health can be observed even within the municipalities. In the capital city of the state, the peripheral area presents worse socioeconomic indicators and in access to health when compared to the central region[43]. The social

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inequalities and dynamics inherent to a given territory are not always taken into consideration when planning health policies and actions[23]. The findings reinforce the need for public policies that consider socioeconomic diversity and the resoluteness ability of the primary and in-hospital care network. Fair resource allocation strategies, PHC coverage and quality improvements, expanding the integration across care levels and systematically monitoring spatial indicators can reduce regional disparities and optimize CNCD management, contributing to reducing the number of HACSCs.

Densely-populated urban areas face deeper challenges in terms of providing PHC services to the entire population, which can result in high HACSC coefficients. More densely populated regions such as São Paulo and Campinas are among the ones with the highest hospitalization coefficients, reflecting both their population size and the Public Health challenges associated with the large care demand. Population density can result in additional challenges for local health systems, such as increased demand for health services, need for robust health infrastructures and sufficient human resources to meet the population needs, which can affect the quality of the health assistance provided to the users[44,45]. Thus, despite high GDPs and Human Development Indices, richer and densely populated regions like São Paulo and Campinas do not necessarily present better HACSC results.

It is worth noting that the formation of High-High clusters can also be related to how health professionals are distributed within the AR, to the PHC service capacity and to adequate access to Public Health services. Altogether, these factors can contribute to the disparities detected among the coefficients for CNCD-related HACSCs, as social inequality and vulnerability are critical factors that affect access to health services and their quality in low income population groups[8,21].

In turn, people with higher purchase powers can generally access health and preventive care services with more ease, which should theoretically reduce the number of HACSCs. However, the high wealth concentration in certain municipalities can mask social inequalities, as the population may face significant barriers in accessing good-quality health care in peripheral areas and less favored regions of these cities, resulting in higher HACSC coefficients. In addition to that, an increase in demand and pressure on the Public Health system was verified during the health emergency phase imposed by the COVID-19 pandemic in 2020 and 2021, intensifying those inequalities[46,47].

Various social factors are also associated with difficulties accessing health services, such as feminism, age between 60 and 69 years old, black race/skin color and illiteracy[44]. In Nordic countries, factors such as male gender, lower incomes and lower schooling levels were related to higher incidence of HACSCs[48]. Individuals earning lower incomes tend to face less favorable living and working conditions that can aggravate CNCDs and limit effective access to preventive and outpatient care. As in the case of the aforementioned study, patients with avoidable hospitalizations in Canada tended to live in disadvantaged neighborhoods and to earn lower family incomes, presenting twice the chances of undergoing avoidable hospitalizations when compared to people earning higher incomes[49].

Overcoming health inequalities depends on the system's ability to recognize and act on these social determinants, even in economically privileged contexts. Even in municipalities with higher GDPs and better hospital infrastructures, poverty pockets remain that concentrate population groups in precarious living conditions and with limited access to preventive care, which contributes to perpetuating high HACSC coefficients. The COVID-19 pandemic worsened this scenario, evidencing the weakness of the public system against the high demand and deepening already existing disparities. Even so, it is necessary to analyze internal inequalities in municipalities and regions, promoting public policies that identify and intervene in vulnerable territories with health promotion, disease prevention and PHC qualification actions.

Study limitations

The following stands out among the limitations of this study: having depended on the quality of the secondary data collected for the analysis, especially in SIH/DATASUS, which only gather data from hospitalizations in SUS-accredited providers. In addition to that, it was not possible to directly control variables such as FHS coverage, number of hospital beds or intensity of the municipal health policies, wBhich can interfere both in HACSC incidence and recording, thus representing potential confounding factors. Nevertheless, the results of this study are robust and show consistent spatial correlation patterns and unequal distribution of CNCD-related HACSCs in the state of São Paulo, offering relevant aids to plan and direct public policies targeted at equality in access to health. By integrating a spatial analysis with health and economy data, this innovating approach evidenced the effect exerted by socioeconomic inequalities on PHC performance, even in regions marked by high economic development.

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CONCLUSION

The results of this study evidenced that CNCDs still persist in the HACSCs in the state of São Paulo from 2016 to 2022, as well as a positive spatial correlation between the HACSC coefficients and municipal GDP in 2022, indicating that municipalities with lower HACSC coefficients presented higher GDPs, in addition to a positive correlation between the HACSC coefficients and *per capita* GDPs in 2016, 2021 and 2022. In addition, they underscore the importance of Public Health policies targeted at the prevention, early diagnosis and adequate management of CNCD-related HACSCs, especially in contexts marked by economic inequalities. Continuous PHC improvement is essential to reduce the number of HACSCs and to promote health among the population, addressing both the economic and social aspects that exert an influence on Public Health.

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Use of artificial intelligence tools

Authors declare that no artificial intelligence tools were used in the composition of the manuscript "*Relationship between hospitalizations due to ambulatory care sensitive conditions and economic indicators*".