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Income gaps, doctors, and ncd burden: correlating mortality, hospitalizations, and costs in Brazil

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Abstract

Introduction: Chronic Non-Communicable Diseases are a major public health problem in Brazil, with notable social and regional disparities.

Objective: examine the relationship between the number of doctors in the Unified Health System and the number of hospitalizations and mortality rates due to Non-Communicable Diseases, and how income inequality might influence such outcomes.

Methods: ecological study using secondary data from Brazil's public health system (2016-2018). Mortality rates were age-standardized based on WHO's population. All rates were standardized per 100,000 inhabitants, and costs were converted to US dollars. Linear regression was performed using backward elimination strategy.

Results: 2,423,251 deaths were recorded, with a total expenditure of US$3.2 billion. Both deaths and costs were higher in men. The Gini index was inversely correlated with total spending ($p < 0.05$) and hospital admissions for most Non-Communicable Diseases ($p < 0.001$), except for metabolic diseases. No correlation was found between the Gini index and mortality.

Conclusions: Non-Communicable Diseases accounted for over 2 million deaths in adults during 2016-2018, with a greater impact on men. A negative relationship between income inequality and Non-Communicable Diseases outcomes was found, but no significant association with the number of Unified Health System's doctors was identified.

Keywords: noncommunicable diseases, inequality, public health, public health expenditure, Brazil

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Authors summary

Why was this study done?
To address the public health impact of Chronic Non-Communicable Diseases (NCDs) in Brazil, particularly focusing on how factors like the availability of doctors in the Unified Health System (UHS) and income inequality might influence hospitalization and mortality rates for NCDs. Given the social and regional disparities in health outcomes, the study aimed to better understand how these variables might affect health expenditures and outcomes related to NCDs in Brazil.

What did the researchers do and find?
We performed an ecological study using secondary data from Brazil's public health system from 2016 to 2018. We analyzed mortality rates (age-standardized) and hospitalization rates for NCDs across regions, incorporating income inequality (Gini index) as a potential influencing factor. Through linear regression and a backward elimination strategy, we found that while income inequality inversely correlated with total spending on NCD hospitalizations, it was not correlated with NCD mortality. Additionally, no significant relationship was found between the number of UHS doctors and NCD outcomes, suggesting that other factors beyond physician availability and income inequality may be influencing NCD mortality.

What do these findings mean?
These findings highlight the profound impact of NCDs on public health in Brazil, emphasizing over 2 million deaths within three years and a significant economic burden. The inverse correlation between income inequality and hospital spending suggests that regions with higher inequality may see reduced spending on NCD-related hospitalizations, although this does not necessarily impact mortality rates. The lack of correlation with the number of UHS doctors suggests that increasing the medical workforce alone may not address NCD outcomes, indicating a need for multifaceted strategies to mitigate NCD burdens, particularly in populations with limited socioeconomic resources.

Highlights
Unlike previous studies, the present research uniquely explores the relationship between the availability of doctors in the Unified Health System and regional disparities in Chronic Non-Communicable Diseases mortality and hospitalization rates, revealing unexpected findings: no significant association was found between doctor availability and Non-Communicable Diseases' outcomes, and a surprising inverse relationship was observed between income inequality and Non-Communicable Diseases-related hospital costs. These findings suggest that factors beyond healthcare workforce numbers may play a critical role in addressing Non-Communicable Diseases' burdens, particularly in regions with socioeconomic challenges and inequalities.

INTRODUCTION

According to the World Health Organization, Chronic Non-Communicable Diseases (NCDs) are responsible for 71% of all deaths worldwide, mainly affecting low- and middle-income countries and posing a threat to public health[1,2].

In Brazil, the Ministry of Health estimates that 57.4 million people have NCDs – cardiovascular diseases, malignant neoplasms, chronic respiratory diseases, and diabetes mellitus –, which are responsible for 72% of deaths in the country[3]. However, its distribution and impact are not homogeneous across all social strata: vulnerable groups, such as the elderly and individuals with low income and lower educational levels tend to be the most affected[4].

Taking into account that more than 70% of the national population depends exclusively on the Unified Health System (UHS)[5], as well as the differences regarding the allocation of resources and health outcomes between the regions of Brazil, it is worth questioning the impact of the number of doctors working in the UHS on the number of hospitalizations and mortality rates due to NCDs in the country, along with the influence of income inequality in such outcomes.

Thus, the objective was to evaluate the relationship between the number of doctors in the Unified Health System and the number of hospitalizations and mortality rates due to NCDs, and how income inequality might influence these outcomes.

METHODS

Study design and data source

Ecological study with secondary data from the Information Technology Department of the Unified Health System and its subsystems. The number of doctors was obtained through the National Registry of Health Establishments in Brazil (CNES). Information regarding the number of deaths, hospital admissions and amounts spent was collected from the Mortality Information System and the Hospital Information System.

The resident population of each state was obtained through the Population Projection of Brazil and Federation Units, made available by the Brazilian Institute of Geography and Statistics (IBGE). The values referring to the Gini Index were collected from the Continuous National Household Sample Survey (PNAD) also available by IBGE.

Study variables

The study was composed of all deaths, hospitalizations and expenses recorded in Brazilian states in the population over 20 years of age between 2016 and 2018 for the following chapters of the 10th revision of the International Classification of Diseases (ICD10)[6]: II – Neoplasms; IV – Endocrine, nutritional and metabolic diseases; IX – Diseases of the Circulatory System; X – Diseases of the Respiratory System.

The number of doctors was obtained through CNES, the official information system of the Ministry of Health for recording information from all health establishments in Brazil[7]. To this end, only doctors linked to and working in the UHS were considered in the analysis. Since these data are available monthly, the annual average was considered.

The Gini Index was obtained through the Continuous PNAD, available on the IBGE website, for the Brazilian states and federal district between 2016 and 2018. All variables were collected for adults over 20 years old. The data recorded with "age unknown" were not collected and considered for the construction of the analysis in order to maintain both the internal and external validity of the study. The study period was defined with the aim of remaining uniform for all studied variables.

Data analysis

The mortality rate was calculated by dividing the total number of deaths by the resident population – by year, sex and age group – in a given state of the country and multiplied by 100,000 inhabitants. Afterwards, it was adjusted by the standard population of the World Health Organization (WHO) to enable its inter-regional comparison, as well as with that of other countries with different population structures[8].

To allow better comparison between data – considering different population density between each state –, a rate of hospitalizations per inhabitants was created, in which the absolute number of hospitalizations was divided by the corresponding population over 20 years of age. The same was done for the total amount spent on each disease studied, while for the amounts spent on hospital services, the absolute number of expenses was divided by the number of hospitalizations in the corresponding population. In a similar way, the ratio of doctors per population was created. All rates were adjusted per 100,000 inhabitants to allow better understanding and measurement of their effect, and their respective models are as follows:

hospitalization rate per inhabitant
$$\frac{\textit{(absolute number of hospitalizations)}}{\textit{(population older than 20 years of age)}} \times 100.000 \textit{ inhabitants}$$

rate of expenditure per inhabitant per illness
$$\frac{\textit{(absolute amount spent per illness)}}{\textit{(population older than 20 years of age affected by the disease)}} \times 100.000 \textit{ inhabitants}$$

rate of expenditure on hospital services
$$\frac{\textit{(absolute value spent per illness on hospital services)}}{\textit{(population older than 20 years of age hospitalized due to illness)}} \times 100.000 \textit{ inhabitants}$$

All expenses were converted to US dollars for international comparison[9]. For all variables studied, missing values were considered null for calculation purposes.

In order to describe the rates found by sex and age group for each ICD-10 chapter, descriptive statistics were used. To construct multivariable models, multiple regression using the stepwise forward selection strategy was used, in which mortality was the dependent variable. All variables in the model were quantitative with the exception of sex, which was assigned “1” for “male” and “0” for “female”. For each ICD-10 chapter analyzed, the physician rates of the specialists responsible for treating the respective diseases were used.

Similarly to our previous study, both the Percentage Change (PC) and the Annual Percentage Change (APC) were used as measures of trend in the present analysis. To calculate the PC, the initial value of a given rate is subtracted from its final value; the difference is then divided by the initial value and multiplied by 100 to express the variation in percentage terms10. For the APC, we utilized the slope coefficient *(β)*, obtained through linear regression, as described by Fay *et al.*, 2006[10,11].

The confidence level was 95%. The program used for tabulating and transforming data was Microsoft Excel® and the statistical program used was Stata® (Stata Corp., College Station, EUA) 12.0.

Ethical aspects

All data used in this project is secondary, made available through official Brazilian Government media. As they are of public and unrestricted access and use, there is no need for ethical assessment by the Research Ethics Committee in accordance with the terms of Resolution of the National Health Council (CNS) No. 510, of April 7, 2016[12].

RESULTS

Between 2016 and 2018 there were 2,423,251 deaths in adults over 20 years of age due to Chronic Non-Communicable Diseases (NCDs) in Brazil, with a slight predominance among men, who corresponded to 51% of total deaths. Among NCDs, diseases of the circulatory system reached first place with almost 50% of deaths, followed by malignant neoplasms with 656,696 deaths, respiratory diseases and, finally, endocrine-metabolic diseases. All NCDs showed a predominance of deaths in men, with the exception of endocrine-metabolic diseases. In the same period, the country spent US$3,198,354,081.93 on NCDs, with 52% of spending going to men (table 1).

Regarding variations over time, it is noted that, for cancer, there was an increase in the absolute number of deaths (APC 4.44; AAPC 2,501), but a reduction in mortality rates (APC -2.71; AAPC -2.51) for men, while there was an increase in both the absolute number of deaths (APC 7.92; AAPC 3.951) and mortality rates (APC 0.90; AAPC 0.59) for women. For the disease, there was an increase in spending and hospital admissions for both sexes both in absolute numbers and calculated rates. As for metabolic diseases, an increase in the absolute number of deaths was found (APC 6.32; AAPC 1,111.5), but reduced mortality rates in men (APC -1.36; AAPC -0.40). The same phenomenon was observed for deaths in women, for which there was a tendency for the absolute number to increase (APC 2.69; AAPC 562.5), but with a reduction in mortality rates (APC -4.76; AAPC -1.25). Overall, there was a trend towards an increase in spending, but a reduction in hospital admissions for both sexes. Regarding circulatory diseases, there was a reduction in the absolute number and mortality rates in men and women, with increased expenses and fewer hospitalizations. And, finally, for diseases of the respiratory system there was a tendency towards a fall/stability in hospitalizations, with a reduction in the absolute number and mortality rates in both sexes, but with an increase in absolute expenditure for men and women, at the same time in that there was a reduction in the spending rate for men (APC -2.31; AAPC -1,496.51) (table 1).

Table 1: Descriptive data for overall mortality and costs during 2016-2018 in Brazil *by 100.000 inhabitants **all costs were calculated in US$ dollars – thus, R$ 1,00 = US$ 0,1979 for conversion

				2016	2017	2018	APC	AAPC
Cancer	Deaths	Absolute number	Male	112,584	115,092	117,586	4.44	2,501
		Mortality rate	Male	185.12	182.61	180.10	-2.71	-2.51
		Absolute number	Female	99,733	104,066	107,635	7.92	3,951
		Mortality rate	Female	129.97	131.10	131.14	0.90	0.59
	Expenditure	Absolute Number	Male	133,501,210.26	137,908,426.38	144,867,419.64	8.51	5,683,105
		Cost Rate	Male	193,190.64	196,532.66	203,380.85	5.27	5,095.10
		Absolute Number	Female	161,976,982.51	170,946,753.97	177,522,049.94	9.60	7,772,534
		Cost Rate	Female	221,758.36	230,382.04	235,596.59	6.24	6,919.12
	Hospital Admission	Absolute Number	Male	289,859	301,419	314,549	8.52	11.07
		Hospital Admission Rate	Male	419.46	429.55	441.60	5.28	6.74
		Absolute Number	Female	419,049	433,496	455,920	8.80	15.68
		Hospital Admission Rate	Female	573.71	584.22	605.07	5.47	10.92
Metabolic Diseases	Deaths	Absolute number	Male	35,152	36,408	37,375	6.32	1,111.5
		Mortality rate	Male	58.52	58.46	57.72	-1.36	-0.40
		Absolute number	Female	41,895	42,280	43,020	2.69	562.5
		Mortality rate	Female	52.72	51.25	50.21	-4.76	-1.25
	Expenditure	Absolute Number	Male	13,868,217.28	14,402,487.67	14,911,172.52	7.52	521,477.6
		Cost Rate	Male	20,068.80	20,524.92	20,933.95	4.31	432.57
		Absolute Number	Female	22,231,819.33	24,015,139.35	25,894,341.54	16.47	1,831,261
		Cost Rate	Female	30,436.99	32,364.80	34,365.41	12.91	1,964.21
	Hospital Admission	Absolute Number	Male	97,191	96,201	96,804	-0.40	-2.37
		Hospital Admission Rate	Male	140.65	137.10	135.90	-3.37	-2.22
		Absolute Number	Female	111,003	110,285	111,403	0.36	-2.06
		Hospital Admission Rate	Female	151.97	148.63	147.85	-2.71	-1.79

continuation - Table 1: Descriptive data for overall mortality and costs during 2016-2018 in Brazil *by 100.000 inhabitants **all costs were calculated in US$ dollars – thus, R$ 1,00 = US$ 0,1979 for conversion

				2016	2017	2018	APC	AAPC
Circulatory Diseases	Deaths	Absolute number	Male	189,000	186,885	187,336	-0.88	-832
		Mortality rate	Male	315.14	300.57	290.27	-7.89	-12.44
		Absolute number	Female	170,990	170,167	168,727	-1.32	-1,131.5
		Mortality rate	Female	212.90	203.73	194.55	-8.62	-9.18
	Expenditure	Absolute Number	Male	304,358,779.18	316,389,428.66	326,807,417.58	7.38	11,200,000
		Cost Rate	Male	440,439.95	450,885.12	458,808.26	4.17	9,184.16
		Absolute Number	Female	226,138,798.79	234,494,893.83	241,501,528.82	6.79	7,681,365
		Cost Rate	Female	309,600.59	316,024.79	320,506.31	3.52	5,452.86
	Hospital Admission	Absolute Number	Male	560,836	565,021	575,105	2.54	-2.10
		Hospital Admission Rate	Male	811.59	805.21	807.40	-0.52	-4.79
		Absolute Number	Female	540,922	543,064	552,411	2.12	-3.72
		Hospital Admission Rate	Female	740.56	731.88	733.13	-1.00	-8.02
Respiratory Diseases	Deaths	Absolute number	Male	79,113	76,744	76,919	-2.77	-1,097
		Mortality rate	Male	134.77	126.56	121.76	-9.65	-6.51
		Absolute number	Female	74,790	75,253	74,501	-0.39	-144.5
		Mortality rate	Female	91.26	87.72	83.72	-8.27	-3.77
	Expenditure	Absolute Number	Male	89,418,032.28	89,321,181.85	90,037,460.78	0.69	309,714.2
		Cost Rate	Male	129,397.53	127,291.21	126,404.51	-2.31	-1,496.51
		Absolute Number	Female	77,724,582.73	79,877,883.03	80,238,074	3.23	1,256,746
		Cost Rate	Female	106,410.65	107,650.07	106,487.15	0.07	38.25
	Hospital Admission	Absolute Number	Male	339,101	340,724	338,485	-0.18	-7.76
		Hospital Admission Rate	Male	490.72	485.56	475.20	-3.16	-1.63
		Absolute Number	Female	330,639	340,206	334,731	1.24	-4.22
		Hospital Admission Rate	Female	452.67	458.49	444.23	-1.86	0.44

Regarding the multivariate models, it is noted that there is a negative correlation between the Gini index and the hospital admission rate for all NCDs (p value < 0.001), except for metabolic diseases for which there was a negative correlation with average monthly income (β = -0.14; CI95% -0.20 – -0.08; p value < 0,001). Still in this model, it is noted that the Gini index showed a negative correlation with the total amount spent on all NCDs (p value < 0.05) and, furthermore, there was a positive correlation between the average monthly income and the amount spent on circulatory and respiratory diseases (β = 622.98; CI95% 440.99 – 804.97; p value < 0,001; β = 80.38; CI95% 28.75 – 132.02; p value = 0.002, respectively) (table 2).

Table 2: Multivariate model for Hospital Admission rates and total value spent for each chapter of non-communicable diseases during 2016-2018 in Brazil

Hospital Admission Rates	Independent Variable	β	p value	95% CI	
Cancer	Gini Index	-1.635,90	< 0,001	-2.274,80	-997,01
Metabolic Diseases	Average Monthly Income*	-0,14	< 0,001	-0,20	-0,08
Circulatory Diseases	Gini Index	-2.411,41	< 0,001	-3.154,65	-1.668,17
	Average Monthly Income*	0,50	< 0,001	0,22	0,77
Respiratory Diseases	Gini Index	-1.740,28	< 0,001	-2.340,72	-1.139,84
Total Value Spent	**Independent Variable**	**β**	**p value**	**95% CI**	
Cancer	Gini Index	-475.725,10	0,002	-771.295,40	-180.154,80
Metabolic Diseases	Gini Index	-108.263,50	0,008	-187.653,50	-28.873,46
Circulatory Diseases	Gini Index	-1.824.058,00	< 0,001	-2.322.852,00	-1.325.263,00
	Average Monthly Income*	622,98	< 0,001	440,99	804,97
Respiratory Diseases	Gini Index	-518.254,20	< 0,001	-659.765,40	-376.724,90
	Average Monthly Income*	80,38	0,002	28,75	132,02

**all costs were calculated in US$ dollars – thus, R$ 1,00 = US$ 0,1979 for conversion.

However, except for respiratory diseases (β = 35.758; CI95% 30.255 – 41.561; p value < 0,001), there was no correlation between the Gini index and mortality from NCDs, which is why it was not included in the multivariate model. On the contrary, there was a divergent correlation between mortality from NCDs and average monthly income, with the latter being negatively associated with mortality from metabolic and circulatory diseases (β = -0.109; CI95% -0.140 – -0.078; p value < 0,001; β = -0.184; CI95% -0.250 – -0.118; p value < 0,001, respectively), and positively associated with cancer mortality (β = 0.056; CI95% 0.034 – 0.079; p value < 0,001). Furthermore, there is a positive correlation between mortality due to any NCD and sex, where, for statistical reasons, this variable was considered as binary, with “0” linked to the female sex and the number “1” to the male sex. (p value < 0.001). It is interesting to note that, for cancer, the only medical specialty measured associated with lower mortality was surgical oncology (β = -95.236; CI95% -163.616 – -26.856; p value 0.007), while for metabolic and circulatory diseases, several medical specialties were negatively associated with mortality (p < 0.05). Similarly, bronchoscopy was the only specialty negatively associated with mortality from respiratory diseases (β = -72.770; CI95% -99.073 – -46.467; p value < 0,001), for which a negative association was also noted over time (β = -5.132; CI95% -8.568 – -1.695; p value 0.004) (table 3).

DISCUSSION

When analyzing the behavior of NCDs in Brazil between 2016 and 2018, we found that: there was a predominance of deaths and expenses involving men; there was a negative association between the Gini index and the hospital admission rate and expenditure on NCDs; there was no correlation between the Gini index and mortality from NCDs, but there was a divergent correlation between this and the average monthly income depending on the disease analyzed.

To understand these results, some points must be taken into consideration. First, measuring inequality at an

Table 3: Multivariate model for mortality rates for each chapter of non-communicable diseases during 2016-2018 in Brazil

Cancer		**Adjusted R² = 0,777**		
	β	**p value**	**95% CI**	
Sex	43.737	< 0.001	38.975	48.498
Clinician	0.523	< 0.001	0.392	0.655
Oncology Surgeon	-95.236	0.007	-163.616	-26.856
Average Monthly Income**	0.056	< 0.001	0.034	0.079
Metabolic Diseases		**Adjusted R² = 0.624**		
	β	**p value**	**95% CI**	
Sex	14.329	< 0.001	9.772	18.885
General Surgeon	5.920	< 0.001	4.558	7.283
Clinician	0.411	< 0.001	0.267	0.556
Digestive System Surgeon	-38.645	< 0.001	-50.967	-26.323
Nutrologist	-56.331	< 0.001	-74.397	-38.265
Endoscopist	-24.936	0.001	-39.244	-10.629
Family Medicine	-0.438	0.047	-0.870	-0.006
Average Monthly Income**	-0.109	< 0.001	-0.140	-0.078
Circulatory Diseases		**Adjusted R² = 0.792**		
	β	**p value**	**95% CI**	
Sex	116.239	< 0.001	105.742	126.736
Vascular Surgeon	51.604	< 0.001	37.255	65.954
Family Medicine	2.460	< 0.001	1.447	3.473
Cardiologist	5.524	< 0.001	2.710	8.338
Cardio-Interventionist	-53.163	< 0.001	-80.351	-25.975
Nutrologist	-51.647	0.014	-92.612	-10.682
Average Monthly Income**	-0.184	< 0.001	-0.250	-0.118
Respiratory Diseases		**Adjusted R² = 0.557**		
	β	**p value**	**95% CI**	
Sex	35.758	< 0.001	30.255	41.261
Clinician	0.548	< 0.001	0.355	0.741
Gini Index	124.519	0.005	39.154	209.883
Bronchoscopist	-72.770	< 0.001	-99.073	-46.467
Time Period (2016-2018)	-5.132	0.004	-8.568	-1.695

*Mortality rates were calculated by 100.000 inhabitants; **all costs were calculated in US$ dollars – thus, R$ 1,00 = US$ 0,1979 for conversion.

individual and interpersonal level can prove to be extremely difficult. Brazil has large and historic income inequality that, despite falling across the country, persists among its regions[13,14]. Thus, although the UHS and the Family Health Strategy (FHS) play a crucial role in combating NCDs at national level, they also serve as a parameter for monitoring differences between macro-regional outcomes, since the UHS replicates inequalities between regions through the unequal distribution of its services[15].

In this sense, we found that average monthly income was negatively associated with mortality from NCDs, with the exception of cancer. Here, it is worth considering that, probably, in regions where there is a greater concentration of income, there is also the possibility of greater out-of-pocket expenses, complementing or even replacing the therapy offered by the UHS and, thus, reducing mortality rates[16]. Furthermore, it is known that there is an unequal distribution of high and medium complexity equipment, which remains concentrated in the country's richest centers[15]. In this context, there is evidence of regional influence on life expectancy and mortality from NCDs, as well as the different local availability of doctors [17-21]. Thus, adding the aforementioned, it can be hypothesized that the positive association found between average income and cancer mortality is precisely due to the increase in the number of diagnoses secondary to the greater arsenal of high complexity available in greater quantity in richer areas of the country, which does not necessarily translate into better treatments or results, but might be, sometimes, a waste of public resources[22].

Regarding the finding on the greater expenditure and number of deaths from NCDs in men, it must be taken into account that the burden of NCDs still remains greater in men around the world and, in Brazil, their mortality is, in general, higher[23,24]. Regarding expenses, it is possible to hypothesize that, since men tend to seek medical assistance later – compared to women –, their disease is at a more advanced stage and, therefore, requires more intensive treatment – which leads to higher costs. Another equally valid explanation could be attributed to individual data – such as age – or the number of deaths itself, which can distort real values, falsely increasing expenditure on men[25].

Furthermore, it is worth commenting on another findings probably reflecting a mathematical variation: for both cancer and endocrine-metabolic diseases, an increase in the absolute number of deaths was observed, but with a reduction in mortality rates –probably due to population increase, which, albeit small, led to the dilution of the number of cases[26]. Noteworthy, for endocrine-metabolic diseases, there was an increase in general expenses, but with a reduction in hospital admissions – which is consistent with the most recent data in the literature on admission rates for this group of diseases[27]. This finding, in addition to reinforcing the high cost associated with the management of these diseases[28], could, indirectly, indicate better outpatient management and, thus, contributes to the hypothesis that there was a correct allocation of public financial resources.

Finally, this article has limitations. First, like any ecological study, data extrapolation must be done with caution: its main purpose must be to generate hypotheses for a better global understanding of the Brazilian medical situation. Furthermore, it should be noted that the values described as "ignored" in the databases were not collected for any variable studied, which may underestimate the effect found. Still in this regard, the specific doctor/inhabitant rate may overestimate the real medical density, however it can be useful in certain cases – after all, there is no 100% accurate method of using the rate – this is another practical approach to better understand the current medical landscape.

CONCLUSION

Chronic non-communicable diseases represent a major burden on the Brazilian public health system, with more than 2 million deaths in adults during the period studied. There was a predominance of deaths and expenditure on men, as well as a negative association between the level of inequality and NCD outcomes in the country, with no specific relationship with the number of doctors working in the Public Health System.

Author Contributions

JHMS, LEWC, MAR, LCA, FLAF, LVAS, and LSP participated in the study design. LVAS, LSP, and JHMS participated in data gathering and statistical analysis. LEWC, MAR, LCA, JHMS, and LSP contributed to the initial writing and revision of the manuscript. All authors have read, critically revised and approved the final version of the manuscript.

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Conflicts of Interest

All authors declare that there are no competing interests to disclose.

Availability of supporting data

The datasets generated and/or analyzed during the current study are publicly available and may also be obtained from the corresponding author upon reasonable request.

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Resumo

Introdução: Doenças Crônicas Não Transmissíveis são um grande problema de saúde pública no Brasil, com notáveis disparidades sociais e regionais.

Objetivo: examinar a relação entre o número de médicos no Sistema Único de Saúde e o número de hospitalizações e taxas de mortalidade por Doenças Não Transmissíveis, e como a desigualdade de renda pode influenciar tais resultados.

Métodos: estudo ecológico usando dados secundários do sistema público de saúde do Brasil (2016-2018). As taxas de mortalidade foram padronizadas por idade com base na população da OMS. Todas as taxas foram padronizadas por 100.000 habitantes, e os custos foram convertidos para dólares americanos. A regressão linear foi realizada usando a estratégia de eliminação para trás.

Resultados: 2.423.251 mortes foram registradas, com um gasto total de US$ 3,2 bilhões. Tanto as mortes quanto os custos foram maiores em homens. O índice de Gini foi inversamente correlacionado com o gasto total ($p < 0,05$) e internações hospitalares para a maioria das Doenças Não Transmissíveis ($p < 0,001$), exceto para doenças metabólicas. Não foi encontrada correlação entre o índice de Gini e mortalidade.

Conclusões: As Doenças Não Transmissíveis foram responsáveis por mais de 2 milhões de mortes em adultos durante 2016-2018, com maior impacto nos homens. Foi encontrada uma relação negativa entre desigualdade de renda e desfechos de Doenças Não Transmissíveis, mas nenhuma associação significativa com o número de médicos do Sistema Único de Saúde foi identificada.

Palavras-chave: doenças não transmissíveis; desigualdade; saúde pública; gasto em saúde pública; Brasil