

# Impact of economic recession on the indicator intra-hospital mortality rate in Tocantins

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**Abstract— Introduction:** Brazil's recent economic downturn has led the country to the largest and longest drop in GDP in current history, in addition to the rapid growth of the unemployment rate. In these moments there is an increase in demand for public services when it comes to public health. **Objective:** In this sense, the study analyzes whether the increasing unemployment rate as a consequence of contraction in the Brazilian economy influences the increase in the mortality rate and the average stay of hospitalization in public hospitals in the state of Tocantins. **Material and Method:** This is a retrospective documentary study with data from patients admitted to public hospitals in the Tocantins between the period 2012 and 2018 correlating in a quali-quantitative manner with the national unemployment rate, intra-hospital mortality rate and the average length of stay of hospitalization in the same time. **Conclusion:** It is estimated that the present study has a

significant contribution in clarifying how the economic activity of the country is in connection with health indicators. The results of the present study showed that Tocantins' health indicators changed according to the change in the national unemployment rate generated by the slowdown in the economy.

**Index Terms—** Economic recession; Public health; Mortality.

## I. INTRODUCTION

Hospital mortality and hospitalization are indicators of improving resources for improving and quality of health services in hospitals, as proposed by Ernest Codman [1].

Brazil's recent economic recession has led the country to the largest and longest fall in GDP (Gross Domestic Product) in its current history, in addition to the rapid growth in the unemployment rate [2]. Among some of the causes of the decline in the Brazilian economy are inflation, unemployment, corruption, and the lack of effective fiscal adjustment measures [3]. In these times of economic crisis, there is a limitation in the availability of resources, and an increase in the demand for public services when it comes to public health [4].

According to Antunes [5] in 2008, Europe began a period of crisis, reflecting the rise of health indicators in some countries of the continent. Therefore, it is necessary to analyze whether the recession in the Brazilian economy influences the in-hospital mortality rate indicator in the Tocantins. And how the economic fluctuation experienced between 2012 and 2018 influenced the hospital quality indicator.

According to the Department of Informatics of the Unified Health System (DATASUS) [6], when analyzing the indicators of the three largest municipalities (Palmas, Araguaína and Gurupi) it is clear that the mortality rate during 2012 to 2018 varied, but with a high rate in 2016, reaching 4.64%. Same period, according to data from the Brazilian Institute of Geography and Statistics (IBGE) in which the country experienced the second consecutive year of economic recession.

Therefore, this study aimed to correlate the unemployment rate generated by the economic recession with the mortality rate and length of stay in the hospitalization of patients in public hospitals in the State of Tocantins, in the period from 2012 to 2018.

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## II. BRAZILIAN ECONOMIC RECESSION

Also known as the crisis of capitalism, the economic crisis is considered as one of the phases of the economic cycle, along with overproduction, recession, and depression, associated with GDP decline [7]. It refers to a period of scarcity, a large reduction in the level of production, and a decrease in the income of the population, which does not buy beyond what is necessary, impacting the consumption of products and services [8].

Started in 2015 and extended until 2016, Brazil experienced one of the biggest economic crises today. The recent economic recession was caused by political, ethical, and economic factors, and a worrying situation emerged in the Brazilian population [9].

It is seen that changes in the cycle of the economy have a link with the changes in the health levels of the population. In particular, it has great effects on both physical and mental health of the community, due to being associated with a reduction in protective factors and increased health risk factors. Life circumstances are influenced by the crisis – the conditions in which the human being is born, grow, live and work, the structuring factors of this condition, such as money, resources and the organization of power, being social determinants influenced by changes in the economy that generates an imbalance [5].

According to BIGS, the Brazilian economy was negative with 3.8% in 2015 and 3.6% in 2016, a drop not seen since the years 1930 and 1931, leaving only in subsequent years [9]. According to the National Confederation of Industry (NCI) [10], the deepening of the economic crisis led to the loss of the standard of living of a significant part of the Brazilian population, resulting in the exchange of private services for public services and 34% no longer have health insurance.

## III. HEALTH INDICATORS

To achieve quality in any area of health, it is necessary that structure of all its practices and processes. The control of the quality of health care is based on indicators used as instruments for its evaluation [11]. Indicators refer to measures used to portray an existing situation, analyze changes or trends for some time, and to assess, in terms of quality and quantity, the health conducts carried out by the [12].

The use of specific indicators contributes to the monitoring of the quality of health care, in the identification of opportunities to seek means of improvement, allows the implementation of measures, as well as to monitor their evolution over the years and applied to assist in quality management [13] [14].

In relation, effectiveness, effectiveness, efficiency, optimization, acceptability, legitimacy, and equity became known as the "seven pillars" encompassed by Donabedian. These concepts helped to better understand health quality [15].

## IV. CRISIS AND HEALTH

Economic crises are enough for the decline of people's health, by raising poverty and modifying other social

determinants of health, austerity policies reinforce this process by reducing social protection and reducing health resources. However, recent studies have already shown worsening in the health indicators of Brazilians, where the reduction in investments in health reflects in policies of promotion, prevention, and care [16] [17].

There is evidence related to unemployment and health at all levels of social science analysis, from national population rates to individual psychophysiological responses to stress. At the population level of analysis, the increase in the unemployment rate indicates recession and/or structural economic decline [18]. Counterparty, recessions are the periods in which layoffs present themselves with high rates, raising the number of unemployed in the economy, and reducing the probability of finding a new job [19].

Crises cause changes in income distribution and the health of populations. Thus the per capita product of the countries and their distribution defines their level of health [5]. Currently, there is a lot of evidence on the repercussions of economic crises, obtained from studies on past crises and how they have affected countries and peoples. Given this in times of economic crisis, there is an increase in the unemployment rate, where evidence is found that reports worsening of the health status of unemployed people [20].

Periods of the economic crisis are accompanied by increased mortality in the general population in less affluent countries compared to periods before or after the crisis, among the causes are cardiovascular diseases, respiratory infections, liver disease, traffic accidents, suicide mortality and homicide [21].

Patients in long periods of hospitalization are more exposed to risks such as depression, falls, the decline in physical fitness, deep vein thrombosis (DVT), and hospital infections [22]. Regarding hospital infection, Reis [23] in his study analyzed two groups of patients, one with cases of infections acquired in the ICU (Intensive Care Unit) and another group, without cases of infections acquired in the ICU, comparing variables such as permanence and mortality, the results confirm that patients without cases of infection were mostly discharged, while those who had an infection, most of them died, increasing the mortality rate of the group.

## V. MATERIALS AND METHODS

This is a retrospective documentary study using the official data of the Government of the State of Tocantins DATASUS, with information on mortality rate, the average length of stay of hospitalization, of patients hospitalized in the main public hospitals of the State of the Tocantins, located in the municipality of Palmas, Araguaína and Gurupi.

The period analyzed comprises the years between 2012 and 2018. Correlated in a quali-quantitative way with data from the Brazilian Institute of Geography and Statistics (BIGS) and the National Confederation of Industry (NCI) about the unemployment rate at the national level generated by the variation in GDP, in the same period.

The inclusion criteria adopted were data from patients admitted to public hospitals in the state of Tocantins from 2012 to 2018. And excluded patients with incomplete or

undefined data.

The present study dispenses with the approval of the Research Ethics Committee, due to the public government data, made available by the Department of Informatics of the SUS (DATASUS) and the Ministry of Health.

After data collection and selection of quality and financial indicators to compose the sample, univariate statistics were used to perform a descriptive analysis of indicators and variations during the analyzed period, with presentation of values minimum, maximum, average and standard deviation. Pearson's correlation was used to verify the relationship between financial indicators and quality indicators. To identify the significance level of each variable, the Student's T-test was used, and the percentage was established in all cases of 5% (P

national unemployment rate has, among the years analyzed, a higher rate of 12.73% and a lower rate of 6.83%. For annual GDP, the maximum was 3.00%, and a minimum of -3.80%.

For the quality variables referring to the State of Tocantins, Table 1 – Absolute values of financial indicators and quality

Variables	Minimum	Maximum	Average	Standard Deviation
Unemployment Rate	6,83	12,73	9,47	2,59
GDP	-3,8	3	0,02	2,66
Mortality Rate	3,87	4,64	4,23	0,26
Average length of stay of hospitalization	5,1	6,5	5,77	0,57

GDP: gross domestic product.

Figure 1, with data extracted from NCI and BIGS - there is a variation in the country's GDP and unemployment rate between 2012 and 2018. In 2015 and 2016, GDP was negative with -3.8% and -3.6%, respectively. And in 2017 and 2018, the GDP was stagnant at 1.1%. However, as of 2015, the unemployment rate had the highest values of 12.73% in 2017, with a slight reduction in 2018 (Figure 1). The increase in the proportion of unemployed people is a reflection of the economic crisis that began in 2015, which was reflected in the following years.

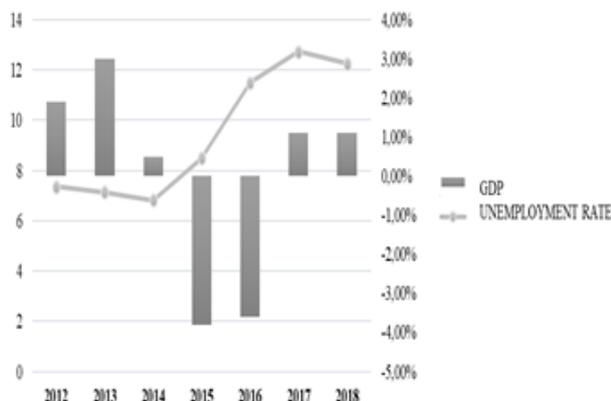


Figure 1 – Evolution of GDP and Brazilian unemployment rate between 2012 and 2018.

≤ 0.05).

Data tabulation, correlation, significance test, and graphs were performed from the tab in Microsoft Excel® 2010 and with the IBM SPSS Statistics 22 © 2013 Program.

## VI. RESULTS AND DISCUSSIONS

At this stage, the data collected from the four indicators are exposed, of which two are qualitative and two financial, as can be seen in Table 1, which presents the descriptive analysis of the variables with the minimum, maximum, mean, and standard deviation values. For the financial variables, the

the mortality rate presented a maximum value of 4.64% and a minimum of 3.87%. On the other hand, the mean length of stay of hospitalization presented a maximum verified value of 6.50 days and a minimum of 5.10 days. According to table 1. indicators in the period 2012 to 2018.

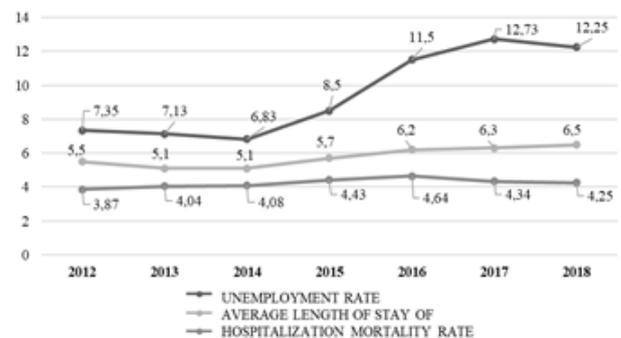


Figure 2 showed that in the first three years of the sample analyzed, there was a reduction in the unemployment rate. However, as of 2015, the unemployment rate showed higher values and a slight reduction in 2018 as a reflection of the economic crisis that began in 2015, which reflected in the following years. Therefore, it is possible to observe that as well as the unemployment rate from 2015 onwards, the average length of stay of hospitalization increased, and the mortality rate varied on the scale of 4% with the highest rate in 2016, and with a slight reduction in the following years.

Figure 2 – Evolution of the Mortality Rate, Average Length of Stay of Hospitalization, and Unemployment Rate between 2012 - 2018.

Table 2 shows Pearson's correlation between financial and quality indicators.

The results of the present study show that the health indicators, mortality rate, and length of stay of hospitalization in the Tocantins changed according to the change in financial indicators generated by the contraction phase of the economic cycle.

Table 2 – Correlation between financial indicators (GDP and Unemployment Rate) and quality indicators.

Unemployment Rate	Mortality Rate	The average length of stay	GDP
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Unemployment Rate	1	0,654 0,111	0,964** 0,000	-0,225 0,627
Mortality Rate	0,654 0,111	1	0,624 0,134	0,820* 0,024
Average length of stay	0,964** 0,000	0,624 0,134	1	-0,300 0,513
GDP	-0,225 0,627	-0,820* 0,024	-0,300 0,513	1

GDP: gross domestic product.

Regarding GDP, a negative correlation with the unemployment rate, the average cost per hospitalization, and the mortality rate among the years analyzed are notorious. That is, when GDP shows less variation, there is an increase in the national unemployment rate, an induction in the increase in the cost of hospitalization of patients in the hospital environment, and a tendency to increase the quantity of the mortality rate (Table 2).

Regarding the unemployment rate, there was a positive and significant correlation with the mortality rate of 0,654 and mean length of stay of 0,964, showing that as a factor of the economic recession, the increase in the unemployment rate generates an increase in the length of stay of patients'

hospitalization and the in-hospital mortality rate (Table 2).

This fact was also observed in the study by [16] and [17] where evidence was found that the economic recession generates significant impacts on health indicators. This finding was also found by [18] and [20] in their study where they show that the high unemployment rate comes as a reflection of the economic crisis and individuals who are unemployed during this period are more likely to present worsening in their health status compared to those who remain with their job opening.

Complementing with the study by [21], in periods of economic crisis, there is an increase in the mortality rate mainly in less developed countries, among the main causes are cardiovascular diseases, respiratory infections, and liver diseases.

In Table 3, the student's t-test showed significance to measure sample quality, with a  $p < 0.05$  level. Except for GDP, the other variables were significant, showing that the sample is relevant in the description of the results since p-values close to zero show lower probabilities of error.

Table 3 – Significance level of financial indicators and quality indicators.

Variables	T	Df	Sig (2 Ends)	Average difference	95% Difference Confidence Interval	
					Bottom	Top
GDP	0,28	6	0,978	0,028	-2,437	2,495
Unemployment Rate	9,661	6	0	9,47	7,071	11,868
Mortality Rate	42,945	6	0	4,235	3,994	4,477
Average length of hospital stay	26,62	6	0	5,771	5,241	6,302

## VII. CONCLUSION

The scenarios presented during the years analyzed, regarding the relationship between health and economic development, show the impact generated by the negative performance of Brazil's gross domestic product on health indicators in the State of Tocantins. With the results of this study it is notorious that the objective of this study was achieved, where it portrays that financial indicators, GDP, and unemployment significantly influence the increase in the mortality rate and the length of stay of patients. Thus, reaching the problem of the research attested that the Brazilian economic fluctuation experienced between the years 2012 to 2018 influenced the indicators of in-hospital quality of the State of Tocantins.

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