

# Hospitalizations due to malnutrition and their consequences: Risk profile and hospitalization costs

## Internações por desnutrição e suas consequências: Perfil de risco e gastos com internações

## Hospitalizaciones por desnutrición y sus consecuencias: Perfil de riesgo y gastos en hospitalizaciones

Kelien Canova Berlatto<sup>1</sup>, Lucas Mateus Both<sup>2</sup>, Álvaro César Cattani<sup>3</sup>

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1. Centro Universitário de Pato Branco. Pato Branco, Paraná, Brasil.

<https://orcid.org/0009-0007-9479-2852>

2. Centro Universitário de Pato Branco. Pato Branco, Paraná, Brasil.

<https://orcid.org/0009-0007-9932-3211>

3. Centro Universitário de Pato Branco. Pato Branco, Paraná, Brasil.

<https://orcid.org/0000-0002-2918-6828>

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### RESUMO

**Objetivo:** A desnutrição hospitalar é uma condição associada com o aumento do tempo de internação, desfechos negativos e aumento dos gastos com saúde. Este estudo caracteriza-se por ser ecológico, com o objetivo de investigar as internações por desnutrição em todos os estados federativos do Brasil entre 2014 e 2024, a partir dos dados secundários disponibilizados pelo DATASUS. Os parâmetros avaliados foram: número de internações, duração, taxa de mortalidade e custos, aplicado as variáveis faixa etária, raça/cor e gênero. Os resultados encontrados indicam aumento no número de internações de lactentes e idosos, com os custos aumentando de acordo com a faixa etária. Indígenas e amarelos demonstram taxas e despesas mais altas. Estados como PB, AL, RS, BA, MG e ES tiveram mais internações, e SP e RJ se destacaram pelos custos. A análise conclui que a desnutrição afeta de maneira desigual diversas regiões e grupos populacionais, atingindo especialmente os extremos etários. Destaca-se a importância de implementar políticas de prevenção e intervenção precoce, mesmo diante das limitações impostas pelo uso de dados secundários e pela falta de informações clínicas detalhadas.

**Palavras-chave:** Desnutrição; Hospitalização; Custos de Cuidados de Saúde.

### ABSTRACT

**Objective:** Hospital malnutrition is a condition associated with increased length of hospital stay, negative outcomes, and increased healthcare costs. This ecological study aimed to investigate hospitalizations due to malnutrition in all Brazilian states between 2014 and 2024, based on secondary data provided by DATASUS. The parameters evaluated were: number of hospitalizations, duration, mortality rate, and costs, applying the variables age group, race/color, and gender. The results indicate an increase in the number of hospitalizations of infants and the elderly, with costs increasing according to age group. Indigenous and Asian people show higher rates and expenses. States such as Paraíba, Alagoas, Rio Grande do Sul, Bahia, Minas Gerais, and Espírito Santo had the most hospitalizations, and São Paulo and Rio de Janeiro stood out for their costs. The analysis concludes that malnutrition affects different regions and population groups unequally, especially at the extremes of age. The importance of implementing prevention and early intervention policies is highlighted, even given the limitations imposed by the use of secondary data and the lack of detailed clinical information.

**Keywords:** Malnutrition; Hospitalization; Health Care Costs

### RESUMEN

**Objetivo:** La desnutrición hospitalaria es una condición asociada con una mayor duración de la estancia hospitalaria, resultados negativos y mayores costos de atención médica. Este estudio ecológico tuvo como objetivo investigar las hospitalizaciones por desnutrición en todos los estados brasileños entre 2014 y 2024, con base en datos secundarios proporcionados por DATASUS. Los parámetros evaluados fueron: número de hospitalizaciones, duración, tasa de mortalidad y costos, aplicando las variables grupo de edad, raza/color y género. Los resultados indican un aumento en el número de hospitalizaciones de bebés y ancianos, con costos que aumentan según el grupo de edad. Las personas indígenas y asiáticas muestran tasas y gastos más altos. Estados como Paraíba, Alagoas, Rio Grande do Sul, Bahía, Minas Gerais y Espírito Santo tuvieron la mayor cantidad de hospitalizaciones, y São Paulo y Río de Janeiro se destacaron por sus costos. El análisis concluye que la desnutrición afecta a diferentes regiones y grupos poblacionales de manera desigual, especialmente en los extremos de edad. Se destaca la importancia de implementar políticas de prevención e intervención temprana, aún considerando las limitaciones que impone el uso de datos secundarios y la falta de información clínica detallada.

**Descriptores:** Desnutrición; Hospitalización; Costos de atención médica

ORIGINAL

## Introduction

Hospital malnutrition is a frequent condition that contributes significantly to prolonged hospital stays, increased morbidity and mortality, and higher healthcare costs. Patients admitted due to malnutrition are more likely to face clinical complications, such as infections, slow wound healing, and functional impairment, which directly impact the quality of healthcare.<sup>1,2</sup> Risk factors include advanced age, chronic comorbidities, gastrointestinal diseases, reduced food intake, and prolonged periods of catabolism. In addition to clinical consequences, hospital admissions for malnutrition entail high costs for health systems, resulting from the extension of the hospitalization period, demand for intensive care, and specialized nutritional interventions.<sup>2,3,4</sup>

In Brazil, although there is data on hospital malnutrition in general, specific information on the epidemiological profile and the costs related to hospitalizations due to malnutrition is still scarce.<sup>5</sup> This highlights the need for more research to support prevention strategies, nutritional management, and public policies focused on reducing potentially avoidable hospitalizations.

## Method

This research has an ecological character and aimed to determine characteristics associated with higher numbers of hospitalizations, longer hospital stay, higher mortality rates, and higher costs related to hospitalizations classified in the SUS Hospital Morbidity System (SIH/SUS) under the diagnoses of "Malnutrition" and "Sequelae of malnutrition and other nutritional deficiencies."

Data referring to the total number of hospitalizations, average length of stay, mortality rate, and average cost per hospitalization, according to the variables Federative Unit (FU) of residence, age group, color/race, and sex, were obtained from the TabNet platform, made available by DATASUS. Records referring to the period from 2014 to 2024 were included.

For the calculation of the incidence of hospitalizations and the cost per 100,000 inhabitants, population information was obtained from demographic surveys conducted by the IBGE in the years 2010 and 2022. For the intermediate years, the populations were estimated by linear interpolation. The data for each variable were compared to the data for the national territory using the Chi-square test, in order to evaluate whether the distribution occurred randomly or presented a pattern, with the presence of a pattern being considered significant when  $p < 0.05$ . To identify whether the pattern corresponded to an increase or decrease, the difference between the national average of each indicator and the average observed in each specific characteristic was calculated, resulting in the calculation of the Variation between Means (VBM).

## Results

**Table 1** - Variation between Means (VBM) and statistical significance of hospitalizations, length of stay, mortality rate, and costs due to malnutrition in Brazil.

Characteristic	Variables						
	Hospitalizations		Length of Stay		Mortality Rate		Cost
	VBM	P	VBM	P	VBM	P	
FU							
RO	1,02	0,00	-1,7	0,87	-1,7	0,278	8866

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AC	-8,36	0,00	2,24	0,21	0,51	0,278	5606
AM	-9,57	0,00	1,81	0,56	-3,1	0,434	4640
RR	-2,03	0,00	6,91	0,00	-4,9	0,001	13264
PA	-1,99	0,93	-1,2	0,97	-7,5	0,000	11343
AP	-10,99	0,00	0,71	0,48	0,21	0,007	2672
TO	-6,86	0,00	0,10	0,97	2,81	0,060	5793
MA	-4,76	0,00	2,71	0,27	-7,4	0,000	21924
PI	-3,54	0,23	0,04	1,00	-5,0	0,002	7071
CE	-10,87	0,00	1,61	0,86	2,01	0,056	4141
RN	0,76	0,58	-0,6	0,99	-3,1	0,167	11849
PB	4,94	0,00	6,21	0,00	5,81	0,000	18255
PE	-6,19	0,00	1,71	0,00	-2,3	0,471	7178
AL	2,23	0,02	0,11	0,99	-1,5	0,492	12558
SE	-6,22	0,00	5,91	0,00	-0,1	0,039	20705
BA	16,81	0,00	-0,9	0,99	-2,5	0,800	23887
MG	18,39	0,00	-1,3	0,98	-1,7	0,928	22102
ES	10,96	0,00	-0,0	1,00	-2,6	0,360	19289
RJ	-4,41	0,10	3,11	0,13	13,5	0,000	7903
SP	-7,70	0,00	0,41	1,00	6,34	0,000	6286
PR	1,31	0,99	-1,9	0,84	-2,4	0,850	11664
SC	1,20	0,89	0,01	1,00	-1,2	0,963	11493
RS	5,54	0,01	0,21	1,00	4,01	0,156	16523
MS	-2,74	0,78	1,31	0,29	-0,7	0,886	12719
MT	-2,22	0,91	-0,9	0,99	-2,5	0,389	10353
GO	-5,09	0,00	-1,0	0,97	-3,7	0,133	9088
DF	-9,80	0,00	5,41	0,00	-2,6	0,000	7969
<b>Age Group</b>							
Less than 1 y	96,07	0,00	5,41	0,00	-11,2	0,000	259314
1 to 4 year	-3,95	0,16	1,81	0,88	-12,0	0,000	10258
5 to 9 year	-12,26	0,00	1,01	0,99	-12,4	0,000	2910
10 to 14 year	-13,24	0,00	2,21	0,54	-11,9	0,000	2457
15 to 19 year	-13,00	0,00	-0,3	1,00	-11,4	0,000	2258

20 to 24 years	-13,04	0,00	-1,2	0,99	-9,8	0,000	1817
25 to 29 years	-12,61	0,00	-0,9	0,99	-8,7	0,000	2013
30 to 34 years	-11,21	0,00	-0,4	1,00	-7,5	0,000	2768
35 to 39 years	-9,51	0,00	-0,8	0,99	-6,4	0,000	3719
40 to 44 years	64,51	0,00	-0,4	1,00	-4,6	0,052	4772
45 to 49 years	95,94	0,00	-0,3	1,00	-2,8	0,746	6585
50 to 54 years	134,06	0,00	-0,1	1,00	-0,8	1,000	8575
55 to 59 years	176,74	0,00	-0,1	1,00	1,00	0,999	11264
60 to 64 years	239,26	0,00	-0,2	1,00	2,90	0,677	15418
65 to 69 years	334,33	0,00	-0,5	1,00	3,70	0,240	20634
70 to 74 years	490,42	0,00	-0,8	1,00	4,00	0,168	29807
75 to 79 years	809,85	0,00	-1,1	0,99	4,80	0,036	46734
80 years and over	1737,60	0,00	-1,4	0,96	8,20	0,000	94560
<b>Race/color</b>							
White	-4,63	0,12	-0,5	1,00	1,70	0,990	7853
Black	-7,67	0,00	0,50	1,00	2,50	0,853	5988
Brown	-2,18	0,74	0,00	1,00	-1,1	1,000	10432
Yellow	34,43	0,00	-0,5	0,99	-1,5	0,868	37484
Indigenous	10,64	0,00	2,40	0,07	-6,9	0,000	17399
<b>Sex</b>							
Male	2,22	0,97	0,00	1,00	0,30	1,000	13419
Female	-2,10	0,98	-0,0	1,00	-0,4	1,000	10823

LEGEND: RO, Rondônia; AC, Acre; AM, Amazonas; RR, Roraima; PA, Pará; AP, Amapá; TO, Tocantins; MA, Maranhão; PI, Piauí; CE, Ceará; RN, Rio Grande do Norte; PB, Paraíba; PE, Pernambuco; AL, Alagoas; SE, Sergipe; BA, Bahia; MG, Minas Gerais; ES, Espírito Santo; RJ, Rio de Janeiro; SP, São Paulo; PR, Paraná; SC, Santa Catarina; RS, Rio Grande do Sul; MS, Mato Grosso do Sul; MT, Mato Grosso; GO, Goiás; DF, Distrito Federal.

**Source:** Authors, 2025.

Differences were identified that are statistically significant in various analyzed variables. Regarding the **Federative Units**, a significant increase in hospitalizations was found in PB, AL, RS, BA, MG, and ES, and a significant reduction in RO, AC, AM, RR, AP, TO, MA, CE, PE, SE, SP, GO, and DF. The average length of stay was higher in RR, PB, SE, and DF. The mortality rate showed a significant reduction in RR, PA, MA, PI, CE, PE, SE, and DF, and an increase in AP, RJ, and SP. The cost of hospitalizations was significantly higher in several states, notably SE, BA, MG, ES, RS, MS, MT, and DF.

In the analysis by **age group**, a higher number of hospitalizations was observed in children under 1 year old and in all groups from 40 years old and up, especially among the elderly,

and a reduction between 5 and 39 years old. The average length of stay was higher only in children under 1 year old. The mortality rate was significantly reduced in children and young people up to 39 years old, and increased in individuals aged 75 years or older. Furthermore, hospital costs showed a progressive increase with advancing age, reaching the highest values among the elderly aged 80 years or older.

In relation to **race/color**, there was a significant increase in hospitalizations among self-declared yellow and indigenous individuals, and a reduction among black individuals. The mortality rate was lower among indigenous individuals, while costs were higher in this group, as well as among yellow individuals. For the variable **sex**, no statistically significant differences were observed.

## Discussion

This study examined the economic and epidemiological profile of hospitalizations due to malnutrition in Brazil, highlighting important variations between states, ages, racial groups, and sexes. The results show that states such as SP, RJ, MG, and BA had the highest absolute number of hospitalizations and high costs, reflecting both the larger population and the complexity of care in urban centers with high population density. Previous research indicates that hospital malnutrition is linked to a prolonged length of stay, a higher risk of complications, and increased healthcare costs, mainly in areas with a greater number of referral hospitals.<sup>1,2</sup>

The analysis by **age group** indicates that infants had higher hospitalization rates (VBM=96.07;  $p < 0.001$ ) and negative associated costs. This suggests a great demand for early support and the need for more comprehensive interventions. Infants are more susceptible to malnutrition due to the immaturity of the immune system, consequently having a greater propensity for infectious diseases,<sup>6</sup> elements that may justify the high hospitalization rate and related expenses. Older adults ( $\geq 60$  years) showed an increase in expenses as they age, which indicates that, even if the frequency of hospitalizations may be lower, the individual financial impact tends to be greater due to comorbidities and prolonged care.<sup>7</sup>

In relation to **race/color**, yellow and indigenous individuals presented considerable differences in hospitalizations and expenses, evidencing ethnic-racial disparities in access to food and health services.<sup>3</sup> No significant differences were noted in terms of hospitalizations, length of stay, mortality, or costs when analyzed by sex. Regarding the **length of stay** and **mortality rate**, only some states, such as RR and PB, presented variations with statistical relevance. This indicates that factors such as clinical protocols, resource availability, and early nutritional intervention may influence these results.<sup>8</sup>

## Final Considerations

In the "tupaniqum" country (Brazil), statistics indicate that hospitalizations due to malnutrition vary unevenly in relation to regions, age groups, and ethnic-racial groups. Children under one year old and the elderly are the most affected, which leads to changes in the morbidity and mortality rate, length of stay, and expenses. Among the limitations of the research are the use of secondary data, which may lead to an underestimation of malnutrition cases, and the lack of detailed information on comorbidities, clinical severity, and nutritional interventions performed. These factors make it difficult to analyze the elements that directly affect the results.

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**Correspondent author**

Kelien Canova Berlatto  
Avenida Brasil, 746, apto 906, Centro, CEP:  
85501-057.  
Pato Branco Paraná, Brasil,  
kelien\_berlatto@hotmail.com