

Published: February 29, 2024

Citation: ROSSI, S., et al., 2024. Assessment of the progression of public investment in cataract surgery in Brazil. Medical Research Archives, [online] 12(2). <https://doi.org/10.18103/mra.v12i2.5113>

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DOI:

<https://doi.org/10.18103/mra.v12i2.5113>

ISSN: 2375-1924

## RESEARCH ARTICLE

# Assessment of the progression of public investment in cataract surgery in Brazil

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## ABSTRACT

**Aim:** This study aimed to evaluate the progression of public investments in cataract surgery in Brazil and its correlation with the growth of the elderly population and the gross domestic product (GDP) between 2010 and 2021.

**Methods:** This descriptive, retrospective study analyzed data from public databases recording surgical procedures and the amounts invested per surgery to treat senile cataracts, performed per year and by region by the Unified Health System in 2010 and 2021.

**Results:** The number of cataract surgeries performed by Brazil's public health system increased by 79.77%, from 356,088 in 2010 to 640,408 in 2021, while the population aged >60 years increased by 50.08%. The increase in the number of surgeries resulted from greater public investments in the area (an increase of 26.61% in corrected values), which was consistent with the increase in the GDP during the period (30.88% in corrected values).

**Conclusions:** The progression of public investments in cataract surgery from 2010 to 2021 was similar to the increase in GDP of Brazil. Moreover, the increase in the number of surgeries performed by the public health system offset the increase and aging of the population and also reduced the proportion of accumulated cases of cataract-related blindness. However, the improvement was not homogeneous, demonstrating the need to adopt public policies based on regional epidemiological evidence.

**Keywords:** Cataract surgery; Preventing blindness; Phacoemulsification; Extracapsular cataract extraction; Epidemiology; Public health service.

## Introduction

Cataract is one of the major causes of blindness in Brazil as well as globally, and its surgery is highly cost-effective for treatment and visual rehabilitation<sup>1-3</sup>.

Cataract is considered the second most common cause of moderate and severe visual impairment, accounting for 33% and 48% of global visual impairment, respectively.<sup>4,8</sup> World Health Organization estimates suggest that this number will increase to 40 million in 2025 with the growing population and increasing life expectancy<sup>3,9</sup>.

Age and other risk factors including diabetes mellitus, ocular trauma, intraocular inflammation, intraocular neoplasia, congenital abnormalities, sun exposure, corticosteroid use, malnutrition, dehydration, smoking, and alcoholism are identified as various causes of cataract<sup>10</sup>.

In Brazil, more than 2 million people have cataracts, and the majority of them are over 60 years old<sup>11-13</sup>.

The Brazilian public health system is responsible for approximately 75% of cataract surgeries<sup>14,15</sup>. With the increase in life expectancy of the Brazilian population, patterns of government investment in the treatment of cataract-related blindness must be assessed to guide public policies using scientific evidence.

This study aimed to evaluate the progression of public investments in cataract surgery in Brazil and its correlation with the increase in the elderly population and the gross domestic product (GDP) between 2010 and 2021.

## Methods

This descriptive retrospective study analyzed databases including DATASUS, Ministry of Health, Brazilian Institute of Geography and Statistics (IBGE), and National Health Fund Portal (FNS; <https://portalfns.saude.gov.br/about-o-fns/>). Public Health System (SUS) cataract procedures performed between 2010 and 2021 in either hospitals or outpatient clinics, including extracapsular cataract extraction (ECCE) and phacoemulsification with or without intraocular lens (IOL) implantation, were analyzed. Data from 2010 and 2021 were derived from the system using the codes 405050097 and 405050100 for ECCE and 405050119 and 405050372 for phacoemulsification.

The number of procedures and costs were analyzed according to year and region. The number of procedures performed in the SUS was obtained by accessing the link <http://datasus.saude.gov.br/informacoes-de-saude/tabnet>, a public domain tabulator. Data relating to outpatient production (SIA/SUS) and/or hospital production (SIH/SUS) (by state, municipality, frequency, values, and periods) was collected on December 8, 2022 and reviewed on April 10, 2023<sup>16-23</sup>.

Population data was estimated based on the 2010 census, since the 2022 census had not yet been released. GDP data was collected from the website of the Brazilian Institute of Geography and Statistics<sup>16-18</sup>.

The National Health Fund (FNS; <https://portalfns.saude.gov.br/sobre-o-fns/>) provided values applied in the Public Health System by the Ministry of Health in Brazil and its regions<sup>23</sup>.

Monetary values were adjusted for inflation using the Broad National Consumer Price Index (IPCA) published by IBGE. The values referring to 2010 were adjusted considering the IPCA inflation rate from 2010 to 2021 using 2021 as the base year. The 2021 values were not adjusted because they were considered the baseline for this comparison (source of IPCA data:

<https://www.ibge.gov.br/estatisticas/economicas/precos-e-custos/9256-indice-nacional-de-precos-ao-consumidor-amplo.html?=&t=destaques>).

system in Brazil and its regions in 2010 and 2021. The number of surgeries performed increased by 79.77%, from 356,088 in 2010 to 640,408 in 2021. The largest increase occurred in the northern region (138.02%) and the smallest in the central-west region (25.50%).

## Results

Table 1 summarizes the number of cataract surgeries performed by the public health

**Table 1.** Number of cataract surgeries performed by the public health system in 2010 and 2021 in Brazil and by regions.

Year	Brazil	Region				
		Southeast	Northeast	South	Midwest	North
2010	356,088	123,091	144,141	40,366	21,745	26,745
2021	640,408	267,860	186,549	95,027	27,293	63,679
Progress (%)	79.77%	117.63%	29.40%	135.34%	25.51%	138.02%

The growth of the population aged >60 years in Brazil and by region is shown in Table 2.

**Table 2.** Growth of the population aged >60 years in Brazil and by regions

Year	Brazil	Region				
		Southeast	Northeast	South	Midwest	North
2010	20.87 million	9.65 million	5.53 million	3.33 million	1.45 million	1.09 million
2021	31.33 million	14.84 million	7.48 million	5.43 million	2.44 million	1.72 million
Progress (%)	50.08%	53.42%	35.2%	63.1%	68.2%	57.8%

Table 3 lists the amounts invested by the government in cataract surgeries and their correlation with the increase in GDP during the study period.

**Table 3.** Amount invested in cataract surgeries and the gross domestic product (GDP) in Brazil in 2010 and 2021, in absolute figures and adjusted for inflation in the period.

Year	Amount invested in cataract surgery	Amount invested in cataract surgeries (corrected by IPCA-base year 2021)	GDP	GDP (corrected by IPCA-base year 2021)
2010	R\$ 210,258,054.03	R\$ 387,498,993.37	R\$3.7 trillion	R\$6.8 trillion
2021	R\$ 490,603,477.57	R\$ 490,603,477.57	R\$ 8.9 trillion	R\$ 8.9 trillion
<b>Progression (%)</b>	133.43%	26.61%	140.54%	30.88%

Table 4 presents the amounts invested by the government in cataract surgeries in different regions of the country.

**Table 4.** Amount invested in cataract surgeries by the public health system in Brazil in 2010 and 2021, overall and by region. Unadjusted and adjusted for inflation during the study period.

Region	Unadjusted for inflation*			Adjusted for inflation*		
	2010	2021	Percentage of investment variation	2010	2021	Percentage of investment variation
<b>Southeast</b>	R\$ 71.068.899,65	R\$ 204.248.902,10	187,50%	R\$ 130.977.751,13	R\$ 204.248.902,10	55,94%
<b>Northeast</b>	R\$ 87.286.747,90	R\$ 143.763.660,58	64,63%	R\$ 160.866.736,36	R\$ 143.763.660,58	-10,63%
<b>South</b>	R\$ 24.151.444,88	R\$ 73.241.888,80	203,00%	R\$ 44.510.354,78	R\$ 73.241.888,80	64,55%
<b>Midwest</b>	R\$ 11.958.746,40	R\$ 21.031.744,33	75,89%	R\$ 22.039.594,22	R\$ 21.031.744,33	-4,57%
<b>North</b>	R\$ 15.792.215,20	R\$ 48.317.281,76	205,80%	R\$ 29.104.556,88	R\$ 48.317.281,76	66,01%

\*Correction based on the Broad National Consumer Price Index: IPCA-IBGE, based on 2021

## Discussion

In Brazil, >2 million people are affected by cataracts and depend upon public policies for access to surgery<sup>1,24,25</sup>.

This study revealed that the number of cataract surgeries performed by Brazil's public health system increased by 79.77%, from 356,088 in 2010 to 640,408 in 2021 (Table 1). The population aged >60 years, comprising of individuals predominantly affected by cataracts, increased by 50.08% (Table 2). The increase in the number of surgeries resulted from greater public investments in the area (a real increase of 26.61%), similar to the increase in gross domestic product (GDP) in that period, which was 30.88% in values adjusted for inflation (Table 3).

In public health, especially the cataract surgery programs, the number of surgeries performed is directly proportional to the funds available to pay for the procedures<sup>26,27</sup>.

Thus, the progression of public investments in cataract surgeries in Brazil from 2010 to 2021, similar to the rate of GDP growth, led to an increase in the number of surgeries. This not only compensated for population growth and aging but also reduced the proportion of accumulated cases of cataract-related blindness and patients who could not undergo surgery because of access difficulties<sup>26,28,29</sup>.

Regarding the distribution of financial resources across the different regions of the country (Table 4), a real decrease in investment in cataract surgeries was found in the northeast and central-west regions, when the values were adjusted for inflation in that period, probably failing to compensate for the newly emerged cases in that period.

The health system actions in Brazil is driven by Health Department System and funds are directed toward areas with greater demand for elective surgeries. Each state establishes priority surgeries according to the local reality.

Although the status of cataract-related blindness in Brazil has improved over time, this improvement is not homogeneous, demonstrating the need to adopt public policies based on regional epidemiological evidence.

## Conclusions

In Brazil, the progression of public investments in cataract surgeries from 2010 to 2021 was similar to the increase in GDP. Moreover, the increase in the number of surgeries performed by the public health system not only offset the increase and aging of the population but also reduced the proportion of accumulated cases of cataract-related blindness. However, the improvement was not homogeneous, demonstrating the need to adopt public policies based on regional epidemiological evidence.

### **Conflict of Interest:**

The authors have no conflicts of interest to declare.

### **Acknowledgements**

None

### **Funding:**

This study received no specific financial support.

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