

Home mortality during the COVID-19 pandemic

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Abstract

The study investigated home mortality during the SARS-CoV-2 pandemic in Santa Catarina, using secondary data from the Mobile Emergency Care Service characterizing deaths reported by the teams. Analysis of the data, accessed via the state government's Transparency Portal, uncovered a rise in deaths attended to by emergency teams in the area. It also highlighted an average increase of 2.16 per 100,000 residents in the mortality rate attributable to non-specific cardiovascular diseases between 2019 and 2022, distinguishing Santa Catarina from the rest of Brazil. This contrast could be linked to inadequate management of risk factors and comorbidities during the pandemic. The findings underscore the need for preventive measures to alleviate adverse impacts on home mortality and enhance healthcare services, particularly concerning equity in the allocation of limited resources amid the pandemic.

Keywords: Mortality. Cardiovascular diseases. Pandemics. COVID-19. Equity.

Resumo

Mortalidade em domicílio durante pandemia de covid-19

O estudo investigou a mortalidade em domicílio durante a pandemia de SARS-CoV-2 em Santa Catarina, utilizando dados secundários do Serviço de Atendimento Móvel de Urgência caracterizando óbitos notificados pelas equipes. A análise dos dados, acessados no Portal da Transparência do governo estadual, revelou aumento nos óbitos atendidos pelas equipes de urgência na região. Destacou-se também incremento médio de 2,16/100 mil habitantes na taxa de mortalidade por doenças cardiovasculares inespecíficas entre 2019 e 2022, diferenciando Santa Catarina do restante do Brasil. Essa disparidade pode estar associada à falta de controle dos fatores de risco e comorbidades durante a pandemia. Os achados ressaltam a necessidade de medidas preventivas para mitigar os efeitos adversos sobre a mortalidade domiciliar e melhorar os serviços de saúde, especialmente em relação à equidade na distribuição de recursos escassos durante a pandemia.

Palavras-chave: Mortalidade. Doenças cardiovasculares. Pandemias. Covid-19. Equidade.

Resumen

Muerte en el hogar durante la pandemia de COVID-19

El estudio investigó la muerte en el hogar durante la pandemia por SARS-CoV-2 en el estado de Santa Catarina, en Brasil, utilizando datos secundarios del Servicio de Atención Móvil de Urgencia que caracterizan las defunciones notificadas por los equipos. El análisis de los datos, a los que se tuvo acceso por medio del Portal de la Transparencia del gobierno estatal, puso de manifiesto un aumento en las muertes atendidas por los equipos de urgencia en la región. También se resaltó un incremento medio de 2,16/100.000 habitantes en la tasa de mortalidad por enfermedades cardiovasculares inespecíficas entre el 2019 y el 2022, lo que diferencia a Santa Catarina del resto de Brasil. Esta disparidad puede estar asociada a la falta de control de los factores de riesgo y comorbilidades durante la pandemia. Los hallazgos resaltan la necesidad de adoptar medidas preventivas para mitigar los efectos adversos sobre la muerte en el hogar y mejorar los servicios de salud, en especial con respecto a la equidad en la distribución de recursos escasos durante la pandemia.

Palabras clave: Mortalidad. Enfermedades cardiovasculares. Pandemias. COVID-19. Equidad.

The authors declare no conflict of interest.

In times of humanitarian crisis, one can observe the behavior and reactions of individuals, particularly of those in positions of authority wielding the power and responsibility to guide, propose solutions, and ensure the implementation of actions for the society they are serving at that moment. Exceptional circumstances, often fraught with tension and concern, call for decisive measures to ensure the well-being and both physical and emotional safety of the affected populations.

The SARS-CoV-2 (COVID-19) pandemic introduced an unprecedented reality that demanded serenity, discipline, strategy, respect, and, above all, solidarity. Numerous reports documented the rapid and lethal progression of the pandemic across different parts of the globe, notably in Italy¹, Sweden², and Brazil^{3,4}.

In Brazil, with the primary goal of preserving life, as mandated by the Federal Constitution⁵, authorities implemented health measures and directives that, coupled with extensive media coverage, instilled feelings of fear and resignation among the people. In such a milieu, it is natural for human behavior to undergo significant shifts. Studies released by various medical organizations indicated a substantial decline in the number of clinical and surgical procedures during the COVID-19 pandemic, with a portion of this decrease attributed to patients' avoidance of looking for assistance in hospital settings due to contamination fear^{6,7}.

A survey conducted by the Federal Council of Medicine (CFM) underscores a troubling reality regarding the infrastructure of intensive care unit (ICU) beds in Brazil, revealing a landscape of inadequate funding and inequitable resource distribution⁸. Despite a notable surge in the number of ICU beds during the COVID-19 pandemic, the predominant allocation of these resources for the exclusive treatment of coronavirus patients has laid bare the vulnerability of the healthcare system in meeting other demands^{8,9}. In Santa Catarina, the population largely adhered to the safety measures recommended by national and local health authorities, yet the state grappled with significant challenges in the face of a considerable number of cases and fatalities¹⁰.

Thus, within the COVID-19 pandemic context, the significance of the bioethical principle of justice was underscored, particularly concerning the equitable distribution of scarce resources and the provision of healthcare. The inadequate control of risk factors and comorbidities imposed by the pandemic may have contributed to notable disparities in home mortality rates compared to other regions of Brazil.

Finally, medical literature will demonstrate a marked increase in home mortality as the COVID-19 pandemic unfolded¹¹. This phenomenon resulted from various factors, including mobility restrictions, apprehension about contagion in hospital settings, and healthcare systems overload. In many instances, individuals with different comorbidities or severe symptoms of the disease opted to remain at home, where access to specialized medical care was limited.

Additionally, some refrained from seeking medical attention due to concerns about hospital strain or difficulties accessing healthcare services^{3,4}. This study aimed to scrutinize the rise in home mortality during the COVID-19 pandemic in Santa Catarina between 2019 and 2022, as well as to comprehend its underlying causes.

Method

Empirical research area

Santa Catarina, situated in the southern region of Brazil, spans 95,730.921 km² in area. According to data from the Brazilian Institute of Geography and Statistics (IBGE)¹², the state's demographic density stands at 79.49 inhabitants per km², spread across 295 municipalities. The estimated population in 2022 was 7,609,601, with the majority residing in urban areas (84%) and experiencing a population growth rate of 1.4% annually.

The State Department of Health notes profound and transformative shifts in Santa Catarina's population health profile throughout the 20th century, notably a remarkable increase of approximately 30 years in life expectancy, leading to significant demographic and public health advancements. Moreover, social indicators position

Santa Catarina as the sixth wealthiest state in the federation, boasting a diversified and industrialized economy. In 2020, the state's gross domestic product (GDP) was estimated at R\$349.3 million, constituting 4.6% of Brazil's GDP¹³.

According to the 2022 Synthesis of Social Indicators from IBGE¹⁴, in 2021, the percentage of people living in extreme poverty in Santa Catarina was 2.1%, with a GDP *per capita* of R\$48,159.24, and a 0.792 Human Development Index (HDI), securing the state's position as the third highest-ranked among Brazilian states. However, regional disparities persist, with the regions of Planalto Norte and Serra Catarinense hosting municipalities with the lowest HDI. Out of the 295 municipalities in the state, 50 have an HDI below the state average, underscoring the importance of factors like life expectancy at birth in determining HDI rankings¹³.

Databases and statistical analysis

Information was solicited from the company tasked with overseeing the Mobile Emergency Care Service (SAMU) in Santa Catarina, OZZ Saúde Eireli, a legal entity registered with the Regional Council of Medicine of the State of Santa Catarina (CRM-SC) under registration PJ 6,029. The company's technical manager provided a spreadsheet with data on treated cases, encompassing details such as the location of death, epidemiological information, gender, age group, occurrence date/time, type and reason for the occurrence, description, municipality, destination unit, and region.

Data sourced from the Civil Registry Transparency Portal, maintained by the National Association of Natural Persons Registrars (Arpen Brasil)¹⁵, were also utilized. This online platform, accessible to the public, serves to furnish citizens with statistics on births, marriages, deaths, and other relevant information. Users can investigate data such as federative unit (unidade federativa, UF), city, period, skin color, and place of death. Concerning data linked to COVID-19 mortality, the portal continuously updates the count of death records.

This initiative by civil registry offices in Brazil underscores their dedication to transparency with society, in adherence to Ordinance 57/2020 issued by the National Council of Justice (CNJ)¹⁶. This regulation also incorporated the COVID-19 pandemic into the National Observatory on Environmental, Economic, and Social Issues of High Complexity and Great Impact and Repercussion, established jointly by the CNJ and the National Council of the Public Ministry (CNMP).

Data retrieved from the Civil Registry Transparency Portal were utilized to compute both general and specific mortality rates, considering the absolute number of deaths relative to the populations of Brazil and Santa Catarina across various components, including COVID-19, respiratory failure, pneumonia, sepsis, severe acute respiratory syndrome (SARS), stroke, heart attack, non-specific cardiovascular diseases, undetermined causes, and other causes. The analysis encompassed each year of interest, along with an evaluation of the trend in the pattern of deaths over the period, accounting for the location of care and its distribution in both absolute and relative terms from 2019 to 2022.

Results

Between January 2019 and December 2022, Brazil recorded a total of 5,430,806 deaths, with 19.4% (1,054,194) occurring at home. In the same period, Santa Catarina accounted for 3.4% (185,040) of the national total, with 17.9% (33,094) of deaths occurring at home. The average mortality rate in the country was 125.03 per 100,000 inhabitants, while in the state of Santa Catarina, it stood at 111.9 per 100,000 inhabitants. (See Table 1).

Table 2 presents household mortality rates by specific component. Between 2019 and 2022, a slight rise in the incidence of strokes and heart attacks in Brazil can be observed, with rates climbing from 6.1 to 7.9 and from 14.8 to 16.4, respectively. Meanwhile, in the state of Santa Catarina, these rates fluctuated from 6.3 to 7.3 and 13 to 14.8 per 100,000 inhabitants.

Table 1. Absolute, relative number and mortality rate at home between 2019 and 2022 in Brazil and Santa Catarina

Year	Santa Catarina/Brazil					
	n/N	%	Rate (100,000)	n/N	(% thousand)	Rate (100)
2019	219,264/1,154,875	19.0	104.3	6,720/39,157	17.2	93.7
2020	274,972/1,349,478	20.4	129.8	8,226/43,363	19.0	113.4
2021	284,575/1,596,650	17.8	133.4	9,275/55,820	16.6	126.3
2022	275,383/1,329,803	20.7	132.5	8,873/46700	19.0	114.3

Table 2. Absolute number and home mortality rate between 2019 and 2022 in Brazil and Santa Catarina

	Brazil		Santa Catarina	
	n	Rate (100,000)	n	Rate (100,000)
COVID-19				
2019				
2020	4781	2.2	126	1.7
2021	8425	3.9	345	4.7
2022	2599	1.2	117	1.5
Respiratory failure				
2019	13908	6.6	337	4.7
2020	14770	7.0	386	5.3
2021	13420	6.3	431	5.9
2022	14660	7.0	414	5.3
Pneumonia				
2019	13435	6.4	306	4.3
2020	10436	5.0	317	4.4
2021	9297	4.4	342	4.7
2022	13220	6.4	400	5.2
Sepsis				
2019	4195	2.0	68	0.9
2020	5603	2.6	96	1.3
2021	5123	2.4	113	1.5
2022	5482	2.6	107	1.4
SARS				
2019	143	0.1	2	0.0
2020	1049	0.5	4	0.1
2021	575	0.3	14	0.2
2022	628	0.3	6	0.1
Stroke				
2019	12912	6.1	451	6.3
2020	16576	7.8	522	7.2
2021	16857	7.9	623	8.5
2022	16330	7.9	567	7.3

continues...

Table 2. Continuation

	Brazil		Santa Catarina	
	n	Rate (100,000)	n	Rate (100,000)
Heart attack				
2019	31074	14.8	935	13.0
2020	32758	15.5	1005	13.9
2021	33464	15.7	1164	15.9
2022	34098	16.4	1145	14.8
Nonspecific cardiovascular diseases				
2019	18270	8.7	774	10.8
2020	31470	14.9	1106	15.2
2021	35790	16.8	1222	16.7
2022	34551	16.6	1355	17.5
Undetermined causes				
2019	3585	1.7	132	1.8
2020	5027	2.4	129	1.8
2021	5657	2.7	125	1.7
2022	4894	2.4	139	1.8
Other causes				
2019	121741	57.9	3715	51.9
2020	152502	72.0	4535	62.5
2021	155967	73.1	4896	66.7
2022	148921	71.7	4623	59.6

SARS: severe acute respiratory syndrome; stroke: cerebrovascular accident

In Santa Catarina, there was a noteworthy surge in non-specific cardiovascular mortality, skyrocketing by 62% from 10.8 per 100,000 inhabitants in 2019 to 15.2 in 2020, further increasing to 16.7 in 2021, and peaking at 17.5 in 2022. Each year witnessed an average rise of 2.16 per 100,000 inhabitants, resulting in a 0.87 R² value (Table 2).

Over the period from January 2019 to December 2022, SAMU recorded 8,603 consultations in Santa Catarina, with 37.8% of cases lacking complete information on complications. Notably, deaths occurring at the site of care displayed variation, such that, among the 2,275 records accumulated in the period, 626 (27.5%) occurred in 2018; 786 (34.5%) in 2019; and 863 (37.9%) in 2020, with $p < 0.001$ (Table 3).

Table 3. Relative absolute number of services provided by SAMU in Santa Catarina between 2018 and 2020

	2018	2019	2020	Total			
	n	%	n	%	n	%	
Unreported incident	1248	38.3	905	27.8	1103	33.9	3256
Death confirmed upon arrival at the location	626	27.5	786	34.5	863	37.9	2275
Death at the location/during care	409	25.6	508	31.8	678	42.5	1595
Death during transport	24	30.8	25	32.1	29	37.2	78
Other*	388	27.7	416	29.7	595	42.5	1399
Total	2695	31.3	2640	30.7	3268	38.0	8603

*Death without specific details, without incidents or other complications ($p < 0.001$)

Discussion

From the data analysis, it became evident that mortality from non-specific cardiovascular causes observed at the site of death exhibited distinct patterns in Santa Catarina compared to the rest of Brazil. Additionally, analysis of the SAMU system data revealed that 37.8% of cases were labeled as “without complications,” indicating a deficiency in report preparation. This impediment jeopardizes efforts to pinpoint the underlying causes leading to such outcomes and poses challenges in devising effective strategies for resolution or mitigation. Another notable issue is the classification of data under “non-specific causes,” which further complicates objective analysis and conclusive insights, thus hindering the formulation of effective intervention strategies.

In the period analyzed, 5,430,806 deaths were recorded in Brazil. This crucial information should serve as a guiding beacon for health authorities, especially in addressing recurring, acute, and chronic illnesses, particularly those pertaining to the cardiovascular system. Such efforts aim to preempt the onset and progression of these ailments, thereby alleviating the populace’s suffering.

Cardiovascular diseases and their associated risk factors have been linked to heightened susceptibility to adverse outcomes from COVID-19, including severe disease manifestations and increased mortality rates¹⁷⁻²⁰. In Brazil, in addition to the observations in Santa Catarina, Brant and collaborators²¹ concluded that the care for cardiovascular diseases was disrupted, leading to a shift in deaths from hospitals to homes. The authors suggest that hospital care was postponed, especially in the group of older adults, the most socially vulnerable.

The protection of human life, in its broadest sense, encompasses a range of interconnected aspects aimed at ensuring the well-being and dignity of all individuals. This includes promoting public health measures to prevent illness and injury, ensuring equitable access to quality healthcare, promoting food and nutrition security, provisioning adequate housing and basic sanitation, and protecting human rights while promoting social justice.

Furthermore, it involves respecting individual and collective rights, preserving the environment, and promoting peace and social stability. At its core, safeguarding human life necessitates an ongoing commitment to building more just, inclusive, and resilient societies, where everyone can live with dignity and prosperity.

In this regard, Article 196 of the 1988 Federal Constitution of Brazil acknowledges health as a right of all citizens and a duty of the State, guaranteed through social and economic policies aimed at reducing the risk of disease and ensuring universal and equal access to actions and services for their promotion, protection, and recovery⁵. Articles 197-200 complement Article 196, although given the complexity and variability of human beings, there is a need to adapt the approach to health and public policies, especially in times of crisis. Monitoring the publications of entities responsible for providing care to the population substantiates the perception of the implementation of numerous regulations (resolutions, ordinances, laws, etc.).

The *Universal Declaration of Human Rights* (UDHR), proclaimed by the General Assembly of the United Nations²² in 1948, emerged in response to the recognition of atrocities and genocides committed against minorities during the Second World War, serving as a guiding framework for societal attitudes and governmental actions aimed at protecting the rights of citizens. The UDHR acknowledges that all individuals possess inherent rights to dignity, equality before the law, and freedom of expression, irrespective of their beliefs, race, gender, age, or nationality^{23,24}.

In 1979, Beauchamp and Childress²⁵ introduced the four foundational bioethical principles of beneficence, non-maleficence, autonomy, and justice. The principle of beneficence underscores the ethical imperative to maximize benefit and minimize harm, necessitating that healthcare practitioners possess both conviction and technical expertise to ensure actions are beneficial to patients (meant to do good).

Non-maleficence, closely intertwined with beneficence, prohibits the intentional infliction of harm, emphasizing that medical interventions should cause the least possible harm or risk to patients’ health, as universally epitomized by the Hippocratic aphorism “*primum non nocere*” (firstly,

do no harm), whose purpose is to reduce the adverse or undesirable effects of diagnostic and therapeutic actions on humans.

These precepts must be foremost in the minds of public health decision-makers, who confront a plethora of intricate challenges with far-reaching consequences for individuals' lives. These challenges entail the delicate balance between public health imperatives and economic, social, and political considerations, alongside navigating uncertainty and rapidly evolving health conditions. Decisions regarding resource allocation, health policies, and intervention strategies wield direct influence over access to healthcare, the quality of services rendered, and the health outcomes of populations.

Moreover, decision-makers grapple with effectively communicating complex public health information to the general populace, ensuring comprehension, adherence, and confidence in the adopted measures. The ramifications of these decisions can profoundly impact not only physical health but also individuals' emotional, social, and economic well-being. Hence, the principle of health justice becomes of paramount importance, guiding decisions to ensure equitable resource distribution and that the needs of the most vulnerable populations are met.

However, it is essential to acknowledge the limitations of this study, stemming from the neglect of chronic disease care. Consequently, it is inconclusive whether treatment hindrances stemmed from access barriers to care facilities, unavailability due to lockdown mandates, or public apprehension about seeking medical assistance in healthcare units. To make matters worse, the incomplete filling out of SAMU data sheets, which omit information regarding the location of death, poses challenges in accurately capturing the true number of cases treated. Additional limitations

include the high level of contamination and the emergence of a vaccine to combat the virus, factors that were not examined or included in this study.

Final considerations

In times of crisis, leaders are tasked with the immense responsibility of guiding and implementing solutions to safeguard society's well-being. The COVID-19 pandemic has underscored the critical need for serenity, discipline, and solidarity in confronting this formidable and deadly reality, as evidenced in countries like Italy, Sweden, and Brazil. This research underscores the significance of equity in bioethics concerning the distribution of limited resources and the delivery of healthcare services. The lack of effective control over risk factors and comorbidities during the pandemic may have contributed to disparities in home mortality rates, setting Santa Catarina apart from other regions of Brazil.

Mortality and morbidity rates from chronic diseases surged above the national average, suggesting that patients may have discontinued treatment or management of their conditions. Although incomplete, the data provided by SAMU still reveals a notable increase in deaths at home, during care, and while en route to hospital care. This evidence indicates a potential adverse impact of directives advising against seeking medical assistance or suspending treatment for preexisting illnesses, potentially exacerbating the progression of chronic disease symptoms and leading to an uptick in complications and fatalities.

The rise in home mortality during the pandemic underscores the critical need to fortify health systems, enhance equitable access to home healthcare, and ensure the availability of adequate resources to address future public health crises.

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Received: 12.14.2023

Revised: 4.10.2024

Approved: 4.15.2024