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TEMPORAL TRENDS AND SPATIAL ANALYSIS OF ELDER ABUSE CASES IN THE STATE OF PIAUÍ

TENDÊNCIAS TEMPORAIS E ANÁLISE ESPACIAL DOS CASOS DE VIOLÊNCIA AO IDOSO NO ESTADO DO PIAUÍ

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ABSTRACT

Introduction: The World Health Organization defines violence as the intentional use of force or power, threatened or actual, against oneself, another person, or against a group or community. **Objective:** To analyze the epidemiological profile of violence against older adults in the state of Piauí. **Methodology:** This was an ecological, quantitative study using data from the Notifiable Diseases Information System for Piauí between 2010 and 2022. The reported cases were tabulated, and spatial analyses were conducted. **Results:** Most victims were male (n=740; 54.9%), of mixed race (n=782; 69.6%), and had low educational attainment (n=237; 46.8%). The predominant age group was 60 to 69 years (n=686; 58.4%), and most were married (n=534; 52.2%). Physical violence was the most common type (n=1022; 57.9%). Most incidents occurred in the victim's residence (n=819; 75.6%), and the primary perpetrators were their children (n=216; 23.6%). Regarding spatial analysis, the highest rates of violence were identified in seven health regions. The primary cluster, which includes the regions of Entre Rios and Carnaubais, showed a 1.93-fold higher risk of violence. **Conclusion:** Violence against older adults impacts their lives, primarily through physical and psychological aggression. Therefore, the formulation of effective policies is crucial to address this public health issue.

Keywords: Violence; Elder abuse; Public Health Surveillance.

RESUMO

Introdução: *A Organização Mundial da Saúde define violência como o uso intencional de força ou poder, seja por ameaça ou ação, contra si mesmo, outra pessoa, grupo ou comunidade.* ***Objetivo:*** *Analisar o perfil epidemiológico dos casos de violência contra os idosos no estado do Piauí.* **Metodologia:** *Trata-se de um estudo ecológico com abordagem quantitativa, realizado utilizando a plataforma do Departamento de Informação e Informática do Sistema Único de Saúde e o Sistema de Informação de Agravos de Notificação. Os dados dos casos notificados foram tabulados e espaciais foram avaliados pela base pública, as notificações ocorreram entre 2010 e 2022 no Piauí.* ***Resultados:*** *A maioria das vítimas era do sexo masculino (n=740; 54,9%), de cor parda (n=782; 69,6%),*

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possuindo baixa escolaridade (n=237; 46,8%). A faixa etária predominante foi de 60 a 69 anos (n=686; 58,4%). As vítimas estavam casadas (n=534; 52,2%). A violência física foi a mais comum (n=1022; 57,9%). A maioria dos casos ocorreu na residência da vítima (n=819; 75,6%), os principais agressores eram seus filhos (n=216; 23,6%). Em relação à análise espacial, as maiores taxas de violência foram identificadas em sete regiões de saúde. O cluster primário, que inclui as regiões de Entre Rios e Carnaubais, apresenta um risco 1,93 vezes maior de casos de violência. ***Conclusão:*** *A violência contra os idosos afeta a vida das vítimas principalmente por sofrerem violência física e psicológica. Diante disso, a formulação de políticas de enfrentamento é crucial no combate do agravo.*

Palavras-chave: *Violência; Abuso de idosos; Vigilância em Saúde Pública.*

INTRODUCTION

The World Health Organization (WHO) defines violence as the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation (WHO, 2002).

According to WHO statistics on violence against older adults, 1 in 6 people aged 60 or older experience some form of abuse in community settings each year. This issue is compounded by a global demographic transition, with the population of older adults projected to increase from 900 million in 2015 to 2 billion by 2050 (WHO, 2023).

The impacts of violence can be immediate, latent, or long-term, requiring attention due to the diverse forms of violence that affect all life stages, including children, adolescents, women, men, and older adults (Dahlberg & Krug, 2006). One factor contributing to this vulnerability is that older people may become more dependent on others for basic activities of daily living, financial support, or psychological well-being. This dependency, especially in those with cognitive deficits or natural age-related limitations, can lower their ability to defend themselves and create opportunities for perpetrators (Chaimovich *et al*., 2013).

Furthermore, the increased prevalence of violence against older adults within the family environment may be related to various structural changes in society that consequently affect family relationships. These changes include divorces and new unions, national and international migration, women's entry into the workforce, decreased birth and mortality rates, and accelerated industrialization and urbanization (Elsner, Pavan, & Guedes, 2007).

In this context, the Brazilian population has continued its aging trend, gaining 4.8 million older adults since 2012 and exceeding 30.2 million in 2017 (IBGE, 2018). Comparing this to Brazil's past, a significant increase in life expectancy is evident; during the 20th century, life expectancy at birth did not exceed 40 years, and less than a quarter of the population reached the age of 60. Consequently, as the number of older adults grows, so does the number of cases of neglect and abuse against them (Chaimowicz *et al*., 2013).

According to Brazil's Statute of the Elderly (2003), an older person is defined as anyone aged 60 or over. Their rights are guaranteed by the State, which must promote the preservation of their physical, mental, and social health in conditions of dignity and freedom. Article 19 of the Statute mandates that all cases of violence against an older person must be reported to the competent authorities (Brazil, 2003).

In Brazil, between 2011 and 2019, data from the Institute of Applied Economic Research (IPEA) revealed a progressive increase in neglect and abandonment, occurring most frequently in individuals over 80 years old (73% of registered cases) (IPEA, 2021). Meanwhile, in the Northeast region from 2012 to 2019, 18,357 cases of violence against older adults were registered, with physical violence being the most prevalent type at 28% of cases (Lima, Palmeira, & De Macedo, 2021).

Certain signs also warrant investigation, such as frequent injuries, a neglected appearance, malnutrition, aggressive or apathetic behavior, withdrawal, isolation, and deep sadness or depression (Fernandes & Assis, 1999). In this context, the role of health professionals is crucial in the prevention, diagnosis, treatment, and care of older adults in situations of violence (Brazil, 2016).

Given the data presented, it is clear that violence against older adults is an intersectoral problem affecting victims' health and their psychological and social well-being. It is necessary to study the situation of these cases to investigate the magnitude of the issue and to support the creation of public policies aimed at better confronting violence in the state of Piauí. Therefore, the objective of this study is to analyze the epidemiological profile of violence against older adults in the state of Piauí.

METHODOLOGY

This was a cross-sectional, retrospective, quantitative study conducted using data from the Information System for Notifiable Diseases (SINAN), obtained via the platform of the Department of Informatics of the Brazilian Unified Health System (DATASUS).

The study was set in the state of Piauí, located in the Northeast region of Brazil and comprising 224 municipalities. According to the last official census (2010), the state had a population of 3,118,360, with an estimate of 3,289,290 for 2021 (IBGE, 2021). The state's health system is organized into 11 health regions: Planície Litorânea, Cocais, Entre Rios, Carnaubais, Vale do Sambito, Vale do Canindé, Vale do Rio Guaribas, Vale dos Rios Piauí e Itaueiras, Tabuleiros do Alto Parnaíba, Serra da Capivara, and Chapada das Mangabeiras, respectively represented by the cities of Parnaíba, Piripiri, Teresina, Campo Maior, Valença do Piauí, Oeiras, Picos, Floriano, Uruçuí, São Raimundo Nonato, and Bom Jesus (SESAPI, 2021).

The study population consisted of all reported cases of violence against older adults in the state of Piauí between 2010 and 2022. Inclusion criteria comprised cases of violence involving older adults, including physical injury, psychological/moral abuse, torture, sexual violence, threats,

harassment, rape, and neglect/abandonment. Cases of self-inflicted injury were excluded, as the study focuses on interpersonal violence.

Data were extracted from the SINAN notification forms for the years 2012 to 2022 via the DATASUS platform. The following variables were analyzed: year of notification, sex (male and female), age group (60 years and over), race/color (white, black, yellow, brown/mixed-race, and indigenous), educational attainment (illiterate, complete primary education, complete secondary education, and incomplete secondary education), perpetrator's relationship to the victim (father, mother, stepfather, stepmother, partner, ex-partner, sibling, friend/acquaintance, stranger, caregiver, or the person themselves), location of occurrence (residence, collective housing, school, sports facility, bar or similar, public street, and commercial/service area), referral to health services (outpatient referral, hospital admission), case outcome (discharged, elopement/absconded, death by violence, or death by other causes), and the notifying health region. The types of violence included were physical injury, psychological/moral abuse, torture, sexual violence, threats, harassment, rape, and neglect/abandonment.

The collected data were organized in Microsoft Excel 2019 and analyzed using descriptive statistics in SPSS software. Results were presented as absolute and relative frequencies in graphs and tables.

For the spatial analysis, a digital cartographic base was obtained from the Brazilian Institute of Geography and Statistics (IBGE) website. This vector file, in shapefile (.shp) format, contains polygons defining the municipal boundaries of Piauí, georeferenced to the Universal Transverse Mercator (UTM) projection, zone 23 South, WGS 84 datum. The georeferencing process was performed in a Geographic Information System (GIS), where tabular data (demographics and violence incidence) were linked to the geographic layer's attribute table using standardized IBGE geocodes.

The average incidence rate of violence against older adults was calculated for all municipalities in Piauí. These rates were then smoothed using the Local Empirical Bayesian method, which adjusts rates based on a neighborhood contiguity matrix to produce a more stable distribution.

Spatial autocorrelation techniques were used to identify spatial clusters. This included calculating the Global and Local Moran's I index and using the Getis-Ord Gi* statistic to map hotspots (high-incidence clusters) and coldspots (low-incidence clusters). Finally, the purely spatial scan statistic was employed to detect statistically significant spatial clusters ($p<0.05$).

GeoDa software was used for the Bayesian, spatial autocorrelation, and Getis-Ord Gi* analyses. SatScan software was used for the scan statistic, and all maps were created using QGIS.

Submission to a Research Ethics Committee was waived because the study used secondary, anonymized, publicly available data. Nevertheless, all ethical guidelines of Resolution No. 466/2012 of the National Health Council (CNS), which regulates research involving human subjects, were followed (Brasil, 2012).

RESULTS

In the analyzed period, 1,347 cases of violence against older adults were registered in the State of Piauí. Regarding the sociodemographic profile of the victims, the majority were male (n=740; 54.9%), identified as brown/mixed-race (n=782; 69.6%), and had low educational attainment, with most having only completed the 1st to 4th grade (n=237; 46.8%). The predominant age group was 60 to 69 years (n=686; 58.4%). Most victims were married or in a stable union (n=534; 52.2%) and did not have a disability or disorder (n=829; 79.0%), as shown in Table 1.

Table 1 - Sociodemographic profile of cases of violence against older adults in the state of Piauí, 2010-2022. Parnaíba, Piauí, 2024.

Characteristics	N	%
Sex		
Female	607	45.1%
Male	740	54.9%
Race/Color*		
White	206	18.3%
Black	113	10.1%
East Asian	20	1.8%
Mixed-race	782	69.6%
Indigenous	2	0.2%
Educational attainment*		
Completed 1st to 4th grade	237	46.8%
Completed 4th grade	42	8.3%
Incomplete 5th to 8th grade	87	17.2%
Completed primary education	42	8.3%
Incomplete secondary education	12	2.4%
Complete secondary education	63	12.5%
Incomplete higher education	6	1.2%
Completed higher education	17	3.4%
Marital status*		
Single	159	15.5%
Married/Stable union	534	52.2%
Widowed	249	24.3%
Separated/Divorced	81	7.9%
Has a disorder/disability*		
Yes	220	21.0%
No	829	79.0%
Age group		
60 to 69 years	686	58.4%
70 to 79 years	282	24.0%
80 to 89 years	160	13.6%
90 years or older	47	4.0%

* Missing/ignored cases were excluded for the following variables: Race/color: 198, Educational attainment: 394, Marital status: 217; Has a disorder/disability: 258; and 32 cases were ‘not applicable’.
Source: Information System for Notifiable Diseases (SINAN), 2024.

Regarding the types of violence, physical violence was the most common (n=1022; 57.9%), followed by psychological violence (n=281; 15.9%) and neglect (n=105; 5.9%). The predominant means of aggression included the use of bodily force (n=626; 40.6%), objects (n=358; 23.2%), and threats (n=153; 9.9%). The majority of cases occurred in the victim's residence (n=819; 75.6%). The main perpetrators were known to the victims (n=253; 27.7%), primarily their children (n=216; 23.6%), with male perpetrators being predominant (n=825; 43.0%) (Table 2).

Table 2 - Characteristics of cases of violence against older adults in the state of Piauí, 2010-2022. Parnaíba, Piauí, 2024.

Characteristics	N	%
Type of violence*		
Physical	1022	57.9%
Psychological	2081	15.9%
Torture	72	4.1%
Sexual	52	2.9%
Trafficking	2	0.1%
Financial	62	3.5%
Neglect	105	5.9%
Other	169	9.6%
Type of agression*		
Bodily force	626	40.6%
Strangulation	113	7.3%
Use of objects	358	23.2%
Poisoning	113	7.3%
Firearm	80	5.2%
Threat	153	9.9%
Other	98	6.4%
Location of occurrence*		
Residence	819	75.6%
Collective housing	8	0.7%
School	3	0.3%
Sports venue	1	0.1%
Bar or similar	38	3.5%
Public street	153	14.1%
Commercial área	28	2.6%
Industrial setting	0	0.0%
Other location	33	3.0%

Probable perpetrator*		
Father	11	1.2%
Mother	12	1.2%
Spouse	67	7.3%
Ex-spouse	11	1.2%
Boyfriend/Girlfriend	4	0.4%
Son	216	23.65
Sibling	21	2.3%
Acquaintance	253	27.7%
Stranger	179	19.6%
Caregiver	20	2.2%
Other	121	13.2%
Perpetrator characteristics*		
Sex		
Female	241	12.6%
Male	825	43.0%
Both sexes	48	2.5%
Under influence of alcohol	343	17.9%
Not under influence of alcohol	461	24.0%
Referral to health services*		
Yes	151	44.0%
No	192	57.9%

*Missing/ignored cases were excluded for the following variables: Type of violence: 261; Means of aggression: 423; Location of occurrence: 228; Probable perpetrator: 1687; Perpetrator characteristics: 676; Referral to health services: 103; and 2292 cases were 'not applicable'.
Source: Information System for Notifiable Diseases (SINAN), 2024.

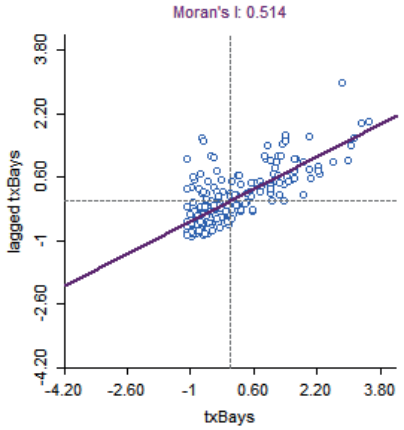
The present study reveals that men were the primary victims of violence, which contradicts other research. An epidemiological and descriptive analysis conducted from December 2018 to November 2019 in the state of Rio Grande do Sul indicated that the majority of violence victims were women. This is often explained by the "feminization of aging," where there are more older women than men due to differences in life expectancy between the sexes. However, that study also found that victims were predominantly white, which differs from our findings (Cunha *et al.*, 2021).

In contrast, a study in the state of Paraná revealed that over 50% of violence notifications against older adults involved women. Marital status was also a predominant factor, with married older adults being frequently mentioned in sociodemographic analyses of victims (Paiva *et al.*, 2019).

Furthermore, the victim's residence was the main location where violence occurred (n=837). Low educational attainment also stood out as a common factor, consistent with studies conducted in Aracaju. The age of victims ranged from 60 to 69 years, with an average age of 72.8 years in the capital of Sergipe (Cunha *et al.*, 2021; Nishida & Antunes, 2017; Santos *et al.*, 2020). The most frequent forms of aggression were physical and psychological violence. A quantitative and descriptive study from 2014 to 2016 showed that about one in three older adults suffered at least two types of violence, with psychological violence being the most prevalent (44.4%), followed by physical violence (30.2%). The use of bladed weapons and firearms had a low incidence (Santos *et al.*, 2020).

A relevant aspect is the profile of the aggressors. As evidenced by this and other studies, children are often the main perpetrators, with males being predominant. Frequently, these aggressors were under the influence of psychoactive substances. Regarding victim referrals, the protection offered by the Statute of the Elderly under Art. 43, which provides for protective measures whenever the rights of an older person are threatened or violated, has not been effectively utilized. The minority of victims receive outpatient care or legal protection (Santos *et al.*, 2020; Nishida & Antunes, 2017).

Graph 1 - Degree of correlation between violence rates in the municipalities of Piauí. Piauí, Brazil, 2010-2022.



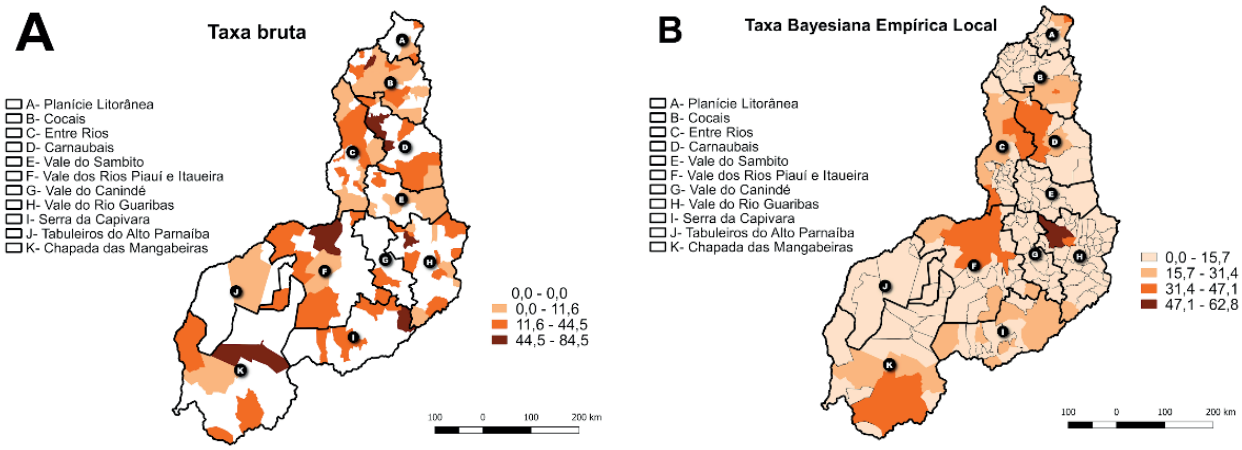
Source: Author's own elaboration, 2024.

Graph 1, generated by calculating the Global Moran's I, illustrates the degree of correlation between rates of violence against older adults in the municipalities of Piauí. The resulting value was 0.514 ($p < 0.001$), indicating a significant spatial autocorrelation of violence rates, where values closer to 1 suggest stronger autocorrelation.

Map A displays the distribution of crude rates of violence against older adults. This map shows an uneven distribution, with rates predominantly ranging between 11.6 and 44.5. The highest rates, shown in dark red, were identified in the following health regions: Cocais, Carnaubais, Vale dos Rios Piauí e Itaueira, Vale do Rio Guaribas, Serra da Capivara, and Chapada das Mangabeiras.

However, to smooth the rates and reduce variability, the local empirical Bayesian model was applied, resulting in Map B. This adjustment revealed that the highest rates of violence (ranging from 47.1 to 62.8) are concentrated exclusively in the Vale do Rio Guaribas health region.

Figure 1 - Crude violence rate and local empirical bayesian rate. Piauí, Brazil, 2010-2022.



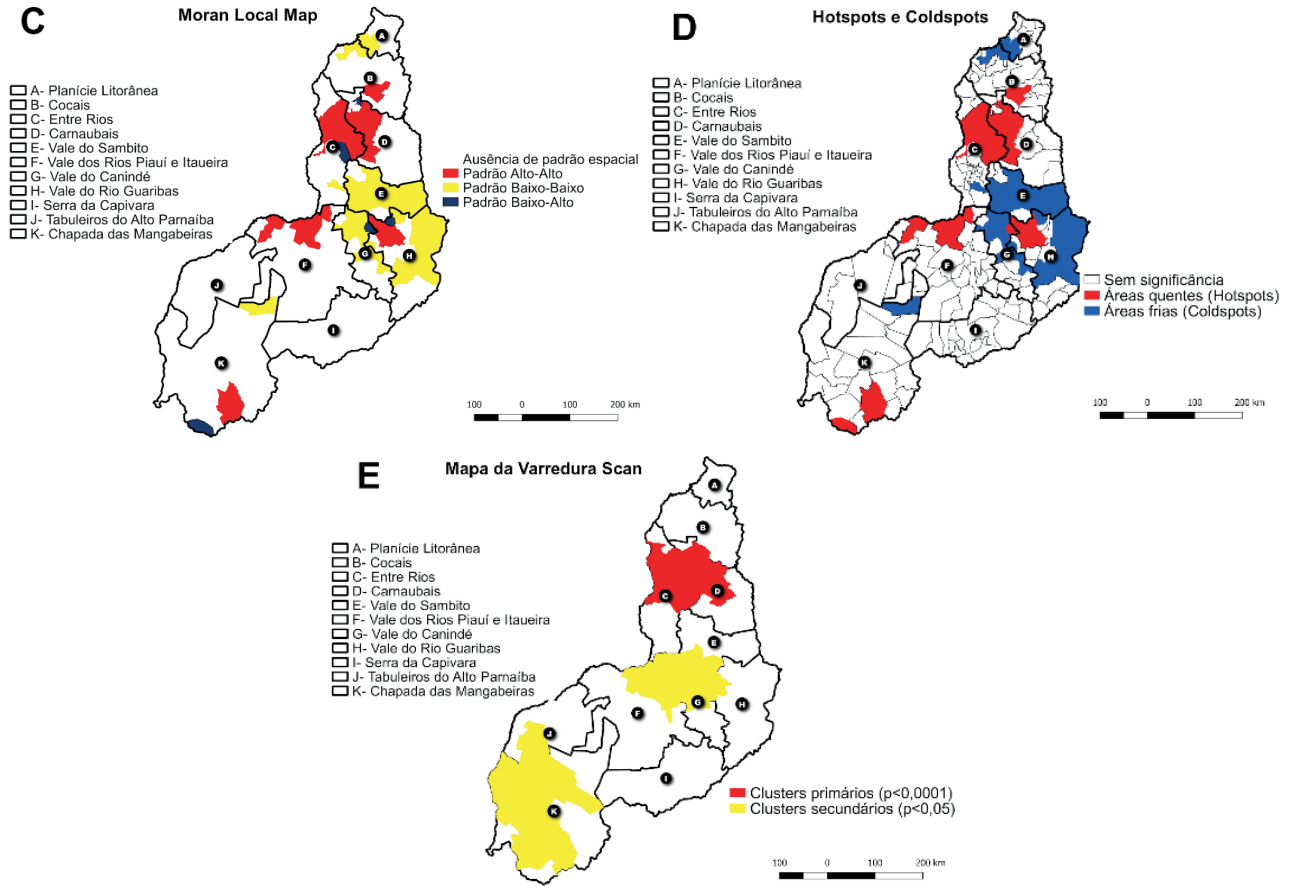
Source: Author's own elaboration, 2024.

Map C classifies the health regions of Piauí using the Moran scatter plot analysis. The regions highlighted in red have high rates of violence and are surrounded by other areas with similarly high rates, forming a High-High distribution pattern. These regions include Cocais, Entre Rios, Carnaubais, Vale dos Rios Piauí e Itaueira, Vale do Rio Guaribas, and Chapada das Mangabeiras. The areas in yellow and blue indicate epidemiological transition zones with spatial patterns that may vary over time.

The Getis-Ord Gi* statistic (Map D) confirms the pattern identified in the Moran map, highlighting hotspots (red areas) located mainly in Cocais, Entre Rios, Carnaubais, Vale dos Rios Piauí e Itaueira, Vale do Canindé, Vale do Rio Guaribas, and Chapada das Mangabeiras. These hotspots reveal concentrations of high rates of violence. Conversely, coldspots (blue areas) are situated in the Planície Litorânea, parts of the Cocais and Entre Rios regions, and the Sambito, Canindé, and Rio Guaribas valleys.

Finally, Map E shows the spatial clusters identified by the purely spatial scan statistic, highlighting five clusters. The primary cluster (in red), which has the lowest probability of occurring by chance, covers the Entre Rios and Carnaubais regions. The secondary clusters (in yellow) are also statistically significant and are located in Vale do Canindé, Tabuleiros do Alto Parnaíba, and Chapada das Mangabeiras.

Figure 2 - Moran local map, hotspot and coldspot map of violence rate patterns, and spatial clusters map (scan statistic). Piauí, Brazil, 2010-2022.



Source: Author's own elaboration, 2024.

Table 3 describes the 5 clusters identified by the scan statistic in detail. The first cluster stands out with a 1.93 times higher risk of violence cases compared to other areas. It had 458 observed cases versus 312.04 expected cases and a p-value of <0.001, indicating high statistical significance.

Table 3 - Spatial clusters of violence against older adults in Piauí (2010-2022), identified by the purely spatial scan statistic. Parnaíba, Piauí, Brazil, 2024.

Cluster	Radius	Observed cases	Expected cases	RR	LLR	p-value	No. of locations
1	1	458	312. 04	1.93	48.21	0	2
2	0	343	237. 53	1.72	29.44	0	1
3	1	144	77. 33	2.03	25.64	0	2
4	1	107	63. 22	1.79	13.69	0	3
5	0	115	76. 5	1.58	9.29	00.1	1

Source: Author's own elaboration, 2024.

The limitations of this study include the use of secondary data from information systems, which may contain inconsistent or incorrect information. During data analysis, numerous missing or

unspecified entries were found. In addition to these limitations, there is a scarcity of recent publications addressing this topic specifically for the state of Piauí, particularly those that conduct analyses by health region. This limits the ability to make precise comparisons of violence rates against older adults between states, regions, and municipalities within Piauí.

CONCLUSION

This research identified the epidemiological profile of violence against older adults, revealing that victims were predominantly male, aged between 60 and 69, of brown/mixed-race, married, with low educational attainment, and without disorders or disabilities. The most common forms of violence were physical and psychological, with physical force being the primary means of aggression. Most cases occurred in the victim's residence, with their children as the main perpetrators. More than half of the older adults did not have adequate access to or referral to health services.

The spatial analysis showed that cases occurred throughout Piauí, with a notable concentration in the Vale do Rio Guaribas region. Areas with higher incidence were identified through Moran's I analysis, concentrated in the Cocais, Entre Rios, Carnaubais, Vale dos Rios Piauí e Itaueira, Vale do Rio Guaribas, and Chapada das Mangabeiras regions. Five spatial clusters were detected, with the primary cluster showing a 1.93 times higher risk.

The identification of these patterns is essential for informing effective public policies. It is crucial that these policies consider the diversity of violence types and their associated factors. Further studies are needed to keep the data current, enabling better coordination between health services and the reality faced by this population. Evidence-based policies, combined with preventive and educational actions, are crucial for ensuring the dignity and safety of older adults.

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