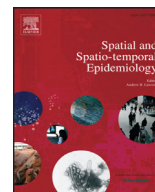




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Original Research

## Temporal trends in physical violence, gender differences and spatial vulnerability of the location of victim's residences

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### ABSTRACT

The aim of study was to describe trends in physical violence among Brazilian victims and investigate spatial vulnerability of the location of victim's residences. This study performed an ecological-level longitudinal analysis, examining violence rates over 4 years. Cases of 4795 victims of physical aggression attended at a Center of Legal Medicine were investigated. Trend analysis was used to evaluate the data, with the creation of polynomial regression models ( $p < 0.05$ ). Violence rates showed significant temporal variations according to sociodemographic characteristics of victims ( $p < 0.05$ ) and the circumstances of aggressions ( $p < 0.05$ ). Moreover, there was a significant increase in violence rate in the North ( $R^2 = 16.1\%$ ;  $p = 0.019$ ) and South ( $R^2 = 18.4\%$ ;  $p = 0.010$ ), whereas the rural zone ( $R^2 = 10.1\%$ ;  $p = 0.028$ ) presented a decrease. The findings highlight the need for protection policies that address spatial-temporal aspects.

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## 1. Introduction

Violence is a phenomenon that crosses geographical, social, and cultural frontiers and represents an important problem for public health, affecting all dimensions of victim's health (Costa et al., 2017; Gracia and Merlo, 2016; Sivarajasingam et al., 2014; Tappis et al., 2016; Unal et al., 2016; Zimmerman and Posick, 2016). Besides being one of the major causes of death among individuals aged 15–44 years, acts of violence also result in millions of non-lethal injuries, according to the World Health Organization (WHO, 2010). It should be considered as a serious public health problem due to inflicting injuries that may affect the population quality of life and overburden health

services (Gracia and Merlo, 2016; Silva et al., 2015; WHO, 2010).

Globally, it is estimated that every day the lives of over 15,000 individuals are cut short as a result of an injury (WHO, 2010). Among the main causes of injury are acts of violence against others or oneself, generating an immeasurable impact on the families and communities affected, whose lives are often changed irrevocably by these events (Gracia and Merlo, 2016; WHO, 2010). Many of those who survive acts of violence exhibit temporary or permanent disabilities, which contribute substantially to depression and risky behaviors, such as smoking and the harmful use of psychoactive substances (WHO, 2010; Zimmerman and Posick, 2016).

Interpersonal violence can materialize in many forms, the most common of which are cases of physical aggression (Silva et al., 2015). Physical abuse can include the

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act of hitting, kicking, punching, slapping, as well as other types of contacts that are able to result in physical harm to the victim (Ohene et al., 2015; Sapkota et al., 2016; Silva et al., 2014). Injuries and interpersonal violence have been neglected from the global health agenda for many years, despite being predictable and preventable. Evidence from many countries indicates that dramatic successes in preventing injuries and violence can be achieved through concerted efforts that involve, but are not limited to, the health sector (WHO, 2010).

In Brazil, gender differences are more accentuated regarding violence than other aspects of morbimortality, as measured by the demand for healthcare services and population surveys (Laurenti et al., 2005). In 2010, the state of Paraíba was sixth in the ranking of most violent Brazilian states and its capital was ranked as the second most violent in the country. The recent increase in homicide rates in instate regions (8% annually) and decrease in capital cities and metropolitan regions demonstrate a strong tendency toward the movement of violence to regions such as the study area of the present investigation (Waiselfisz, 2012a).

Scientific evidence has shown that 35% of women experience some type of physical and/or sexual violence at some point in their lives (WHO, 2013). Several factors have been reported as resulting increased risk of gender-based violence (GBV), such as extreme poverty, minority status, lack of access to food and water, and disrupted family and community support systems (Tappis et al., 2016). Therefore, understanding GBV goes beyond differences between the sexes and involves the way aspects of gender exert an influence on violence practiced against women and men (Russo and Pirlott, 2006).

Brazilian hospitals have received and treated many victims of physical violence, especially the most serious cases (Carvalho Filho et al., 2015; Silva et al., 2014). Nonetheless, not all individuals with injuries related to physical aggressions are treated in hospitals. In Brazil, many victims of interpersonal violence are referred to carry out forensic examinations in Centers of Forensic Medicine and Dentistry (Bernardino et al., 2016). The use of hospital data could have led to underestimation of the magnitude of the issue and its impact on the population (Nobrega et al., 2016).

After conducting a critical literature review, it was found that studies aimed at investigating trends in physical violence based on forensic data are rare (Bernardino et al., 2016; d'Avila et al., 2016). Such studies may provide useful information and can contribute to the direction and development of strategies aimed at the prevention of violence and support of its victims (d'Avila et al., 2016). Forensic medicine and dentistry services cover a greater variety of cases that involve violation of physical integrity and even injuries that can become life threatening (Nobrega et al., 2016; Bernardino et al., 2017).

Considering the relevant increase in violence rates, Brazilian society seems to be undergoing a deep transformation in the forms of interactions among individuals, who experience fear, isolation, and insecurity (Silva et al., 2015). Thus, researchers in different fields of knowledge have sought to elucidate how and in what settings violence occurs (Bernardino et al., 2016; Silva et al., 2015).

With this context in mind, the aim of this study was to describe trends in physical violence among Brazilian victims and investigate spatial vulnerability of the location of victim's residences, following a medico-legal and forensic perspective.

## 2. Materials and methods

### 2.1. Study design and setting

This study performed an ecological-level longitudinal analysis, examining violence rates over four years (between January 2008 and December 2011). Medico-legal and social reports of 4795 victims of physical aggression attended at a Center of Legal Medicine and Forensic Dentistry in Brazil were investigated. This institution is a referral center and performs forensic examinations on individuals from urban, suburban and rural areas who have suffered interpersonal violence.

The study region presents social, economic and cultural inequalities and high rates of injuries resulting from interpersonal violence and traffic accidents (Bernardino et al., 2016; d'Avila et al., 2016). In Brazil, the forensic examination is regulated by Decree-Law No. 3.689 of the Criminal Procedure Code, and its objective is to inform the judicial system about the injuries suffered by victims of interpersonal violence, representing a legal instrument that assists judges in the process of conviction or acquittal of aggressors (Brazil, 1941).

### 2.2. Measures

The number of physical violence cases against women and man was investigated. The aggression coefficients were calculated and corrected for population in each year (number of cases per 10,000 inhabitants) based on the estimates produced by the Brazilian Institute of Geography and Statistics (IBGE, 2010a). In addition, the number of violence events according to other characteristics: victim's age group ( $\leq 19$  years/20–29 years/30–39 years/40–49 years/50–59 years/ $\geq 60$  years); victim's place of residence (North/South/East/West/Rural zone); type of violence (domestic, which usually occurs between intimate partners and family/community, more associated with criminal behavior, such as assaults and fights); and mechanism of aggression (physical force, such as slaps, punches, hair pulling, kicking/firearm, such as gun, pistols, rifles/melee weapon, such as knife, dagger, sickle/other blunt objects, such as iron bar, bottles, cups/mixed aggression, i.e., more than one mechanism at the same time).

### 2.3. Statistical analysis

Trend analysis was used to evaluate the data, with the creation of polynomial regression models (Latorre and Cardoso, 2001), the aim of which is to find the curve that best fits the data and describes the relationship between violence rates (dependent variable) and month of the study (independent variable). Such analysis allows determining the regression equation that best describes the relationship

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