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SPATIAL ANALYSIS OF VIOLENCE IN ADOLESCENTS: A TOOL FOR ACTIONS OF PREVENTION AND REDUCTION OF INEQUALITIES

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ABSTRACT

Objective: To analyze the correlation between the gross rates of general violence and year of occurrence and the spatial pattern of occurrence of reported cases of general violence against adolescents. **Method:** This is an ecological study with temporal trend, conducted from the records of the notification of cases of general violence against adolescents residing in the state of Pernambuco, in the period from 2009 to 2014, per municipality, obtained by the Health Information Systems Program (*Sistema de Informação de Agravos de Notificação* in Portuguese). The analysis occurred through the TerraView program, version 4.2.2, from the digitized cartographic bases of the municipalities of Pernambuco and population data provided by the Brazilian Institute of Geography and Statistics. **Results:** There is lack of significant spatial association and the positive statistical linear correlation between the gross rates and the years of occurrence. **Conclusion:** The geographical identification of cases of violence provided the priority areas for the construction of preventive strategies, coping and planning of intersectoral actions for a full and fair attention for the population.

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INTRODUCTION

Violence is a polysemic phenomenon that accompanies, since the beginning, the evolution of human civilization and covers various conceptions and areas of knowledge. For adolescents and young adults, this phenomenon constitutes a barrier to the achievement of autonomy and their life projects. The multidimensionality of this experience requires considering health social determinants present in the course of life and their relationship with the territory (Moura et al, 2015).

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Violence is a disease inserted between the 17 objectives of sustainable development, in Agenda 30, as proposed by the UN, which aims to promote peaceful, fair and inclusive societies, free of fear (United Nations, 2015). The World Health Organization defines violence as "the use of physical force or real power or threat, against oneself, another person, or against a group or community, that either results or has any possibility of resulting in injury, death, psychological harm, disability or deprivation" (World Health Organization, 2002). Violence against the adolescent population represents a harmful event that results in high stress factors for the person who commits it and the one who suffers it, as well as for

anyone who sees it, whose manifestations result in human actions performed at individual or collective levels - groups, classes and nations. In addition, this social phenomenon affects the family, influence the community life, the socio-spatial settings in territories with context of social vulnerability and influence the dynamics of cities, being a violation of the fundamental rights of societal groups (Moura *et al.*, 2015). In this context, the socioeconomic, political and cultural variables comprise a set of factors that aggregate and influence the prevalence of this theme in the various age groups (Biagiotti *et al.*, 2017). The child-adolescent age group is part of the populations most vulnerable to violence because of the sociocultural context and history. Only in the 20th century, this group began to be regarded as part of humanity and, since then, social representatives began to think about children and adolescents' safety and valuation (Martins *et al.*, 2010). The Ministry of Health (MH), in order to ensure the fundamental rights inherent to the human being and in line with one of the pillars of the Unified Health System (UHS) (Brazil, 1990) - the integral care -, launched, in the 1990's, the Child and Adolescent Byelaw (ECA - Estatuto da Criança e do Adolescente in Portuguese). Such providence began to govern the protection of the child-adolescent population against any type of violence, punishing, in law, acts that may infringe its considerations (Brazil, 1990). The adolescence, when occurs the transition from childhood to adulthood, is a period when adolescents need to deal with situations, questions, uncertainties and attitudes that may affect positively or negatively their development process, which expose this population to various situations of vulnerability, such as interpersonal, collective, self-inflicted violence or self-harm, which are associated with other forms of violence - neglect, physical, psychological or sexual (Martins *et al.*, 2015; Oliveira *et al.*, 2016). Due to the inherent characteristics of adolescents, the spatial analysis through geoprocessing and Geographical Information Systems becomes relevant to identify territorial areas and their scenarios, because these reflect the dynamics of interpersonal relations - conflicts, health problems and human needs. Therefore, mapping the cases of violence in certain space allows visualizing their frequency, their form of distribution, as well as the triggering variants of this process that contribute to the high rates of mortality from this event (Muller *et al.*, 2010). In this context, the present study aimed to analyze the correlation between the gross rates of general violence and year of occurrence and the spatial pattern of occurrence of reported cases of general violence against adolescents.

MATERIALS AND METHODS

This is an ecological study, with temporal trend, performed in the state of Pernambuco (PE), with secondary data of cases of general violence, in the period from 2009 to 2014. The population consisted of 6,544 reported cases of general violence (threat, firearm, sexual harassment, obscenity, hanging, poisoning, rape, sexual exploitation, body strength and beating, violence by legal intervention, self-harm, neglect and abandonment, blunt object, needle-sharp object, pornography, psychological, moral, sexual violence, hot substance or object, torture, child labor, human trafficking, financial or economic violence, violence of repetition, physical violence, other assaults and other violence) in adolescents from 10 to 19 years of age, residents of the state of PE. The study included all data notified within the specified period, obtained by the Department of Informatics of the Unified

Health System (DATASUS), through access to the Health Information Systems Program (SINAN/SVS/MS) (*Sistema de Informação de Agravos de Notificação*, 2017).

The present study occurred three phases: 1. Recruitment of vector files linked to the population data to obtain the cartographic bases associated with municipal census information. Then, there was the elaboration of two spreadsheets regarding population quantitative of the two phases of adolescence from 10 to 14 years and 15 to 19 years of age of the municipalities of the state of PE, per year, provided by the Brazilian Institute of Geography and Statistics (IBGE) (Brazilian Institute of Geography and Statistics, 2016); Selection of the spreadsheets of registered cases of general violence with adolescent victims residing in PE, for both phases of adolescence acquired from the SINAN/SVS/MS (*Sistema de Informação de Agravos de Notificação*, 2017); Systematization of the worksheets, spelling and calculation of gross rates. The study analysis based on the calculation of gross rates of incidence of cases of general violence against adolescents by municipality of residence and by year of occurrence in the period from 2009 to 2014. These data were analyzed in two perspectives: territorial expression and temporal progression. The first part consisted of the territorial analysis of crude rates to calculate the spatial association by means of indices of global and local Moran. In this stage of the analysis was applied a Bayesian tool in order to soften the values of rates according to the empirical statistical criterion linked to the influence exerted by the territorial approach. The second aspect was analyzed using the linear correlation between the dependent variable expressed by crude rates and the independent variable of the year of occurrence.

Data analysis was carried out using the SPSS TerraView, version 4.2.2 for constructing the Thematic Maps by smoothed rates in the employment of empirical Bayes technique and Moran Index (LisaMap) (National Institute for Spatial Researches, 2010). The dependent variable of the rates of general violence in relation to 100,000 inhabitants was calculated with Bayesian smoothing. This type of analysis decreases random instability and fluctuations, and possible bias resulting from the identification of the cases to obtain the crude rates, because the estimates in less populous municipalities tend to have high sensitivity to events by mere chance (Honorato *et al.*, 2010). The construction of the thematic maps by global empirical Bayes estimator occurred from the calculation of the weighted average between the gross rate of the locality and overall rate of the region. For the elaboration of thematic maps expressed by local Bayesian rates, the representativeness of the local estimates from geographical neighborhood rates of the area of interest was obtained (Honorato *et al.*, 2010). Therefore, the significance of LisaMap Moran Index - Local Indicator for Spatial Autocorrelation. The local indicator enables the correlation of the values of a municipality in relation to its neighbors, qualifies and quantifies the association in relation to the sociodemographic aspects in the surroundings. Furthermore, it allows the statistical significance by comparison of the local attributes, after random permutations between the values of rates conferred by municipality. Thus, the p-value greater than 0.05 indicates low significance index, lower than 0.05 significant correlation, being the areas classified into five levels of significance: without significance; significance of 0.05 (95% confidence); 0.01 (99% confidence); of 0.001

(99.9% of confidence); and 0.0001 (99.99% of confidence) (Nunes *et al*, 2013). The demonstration of the rates of cases of general violence used the *EqualSteps* grouping type, because it allows associating each class on the color scale with a subclass divided between minimum and maximum value for the formation of five classes with equal intervals, which facilitates the interpretation of rates (Francisco *et al*, 2014). To understand the temporal progression of rates of general violence, there was the exploratory analysis of cases, which aims at unveiling implicit information, anomalous behavior, from the calculation of the coefficient of correlation. The coefficient of correlation zero indicates no correlation between the two variables and the correlation coefficient between -1 and +1 indicates a perfect linear correlation. This value, when squared (ρ^2), reveals the determination coefficient which expresses the strength of linear association, categorized into: $\rho^2(0.1 - 0.3)$ weak; $\rho^2(0.4 - 0.6)$ moderate; $\rho^2(0.7 - 1)$ strong (Mukaka *et al*, 2012). The present study is in accordance with resolution 466/2012, thus, the use of secondary data available

in the Health Information Systems Program/DATASUS-TABNET-(*Sistema de Informação de Agravos de Notificação*, 2017) and Brazilian Institute of Geography and Statistics (IBGE) (Brazilian Institute of Geography and Statistics (IBGE, 2016), did not require the submission to the Research Ethics Committee (REC).

RESULTS

The study analyzed the pattern of distribution of cases of general violence against adolescents residing in the state of Pernambuco, with data universe of 6,544 reported cases of general violence. The thematic maps relating to smoothed rates of cases of general violence with adolescent victims according to the Global Empirical Bayes estimator in the period from 2009 to 2014 evidenced in darker tones the municipalities with Limoeiro (625.41) as displayed in Figure (1). higher Global Bayesian rates, with greater emphasis for the first phase of

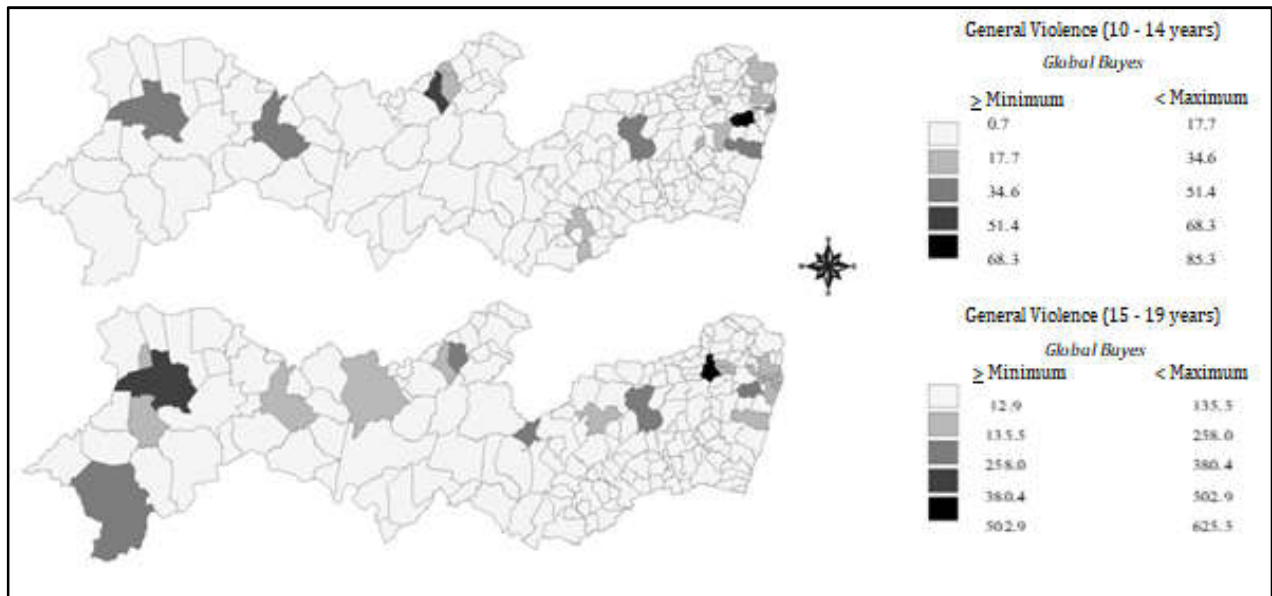


Figure 1. Thematic Map of smoothed rates by Global Empirical Bayes, referring to cases of violence with adolescent victims in the age ranges from 10 to 14 years and 15 to 19 years, per 100 thousand inhabitants, in the municipalities of the state of Pernambuco

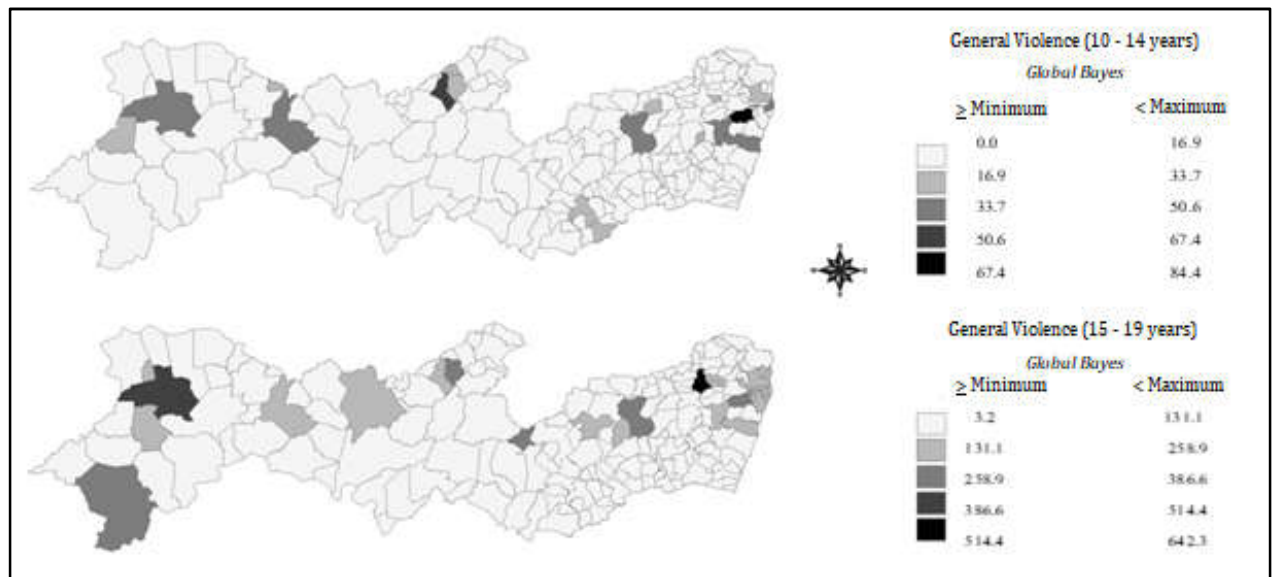


Figure 2. Thematic Map of smoothed rates with Local Empirical Bayes, referring to cases of violence with adolescent victims in the age ranges from 10 to 14 years of age and from 15 to 19 years of age, per 100 thousand inhabitants, in the municipalities of the state of Pernambuco

adolescence the municipality São Lourenço da Mata (85.24) and for the second phase, the municipality of The maps of Figure 2 show the local Bayesian rates that identified the municipalities: for the age range 10 through 14 years of age, the rate was more expressive in the municipality of São Lourenço da Mata (84.31).

The municipality of Limoeiro (642.21) presented the highest rate in the age range 15 through 19 years of age. The analysis of Moran Index for the stages that comprise adolescence presented p-value equal to 0,049 and index value equal to 0.0824284, from 10 to 14 years of age and for the age range from 15 to 19 years, p-value equal to 0.157547 and index value equal to 0,009.

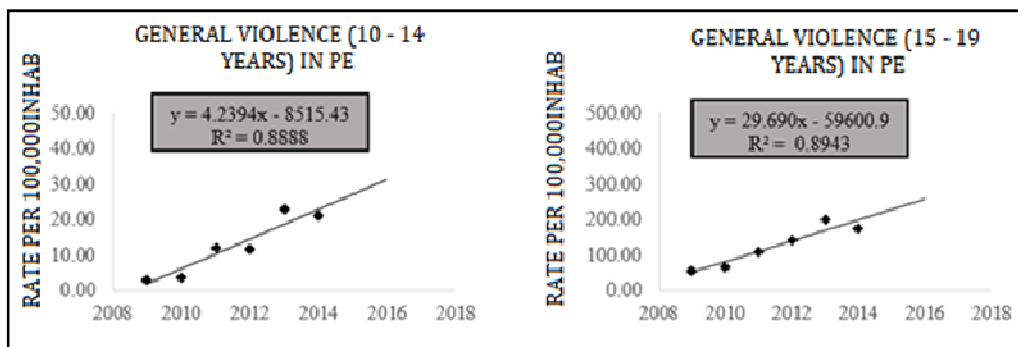


Figure 3. Linear correlation, in the period from 2001 to 2015 and projection until 2020 of cases of violence with adolescent victims per 100 thousand inhabitants, in the state of Pernambuco

Table 1. Data of Violence in Adolescents according to the aggressor’s profile, gender, type of violence and most frequent place of occurrence in the state of Pernambuco in the period from 2009 to 2014

Violence in Adolescents 10-14 years						
Municipality	Bayes Rate	Main Aggressor	Gender		Type of Violence	Occurrence
	100,000 inhab		F	M		
São Lourenço da Mata	7.67	Mother	63.63%	36.36%	Sexual Violence	Ignored
Ouricuri	5.21	Friend	67.88%	32.11%	Sexual Violence	Residence
Carnaíba	5.00	Friend	57.14%	42.85%	Body Strength and Beating	Street
Salgueiro	4.63	Friend	66%	40%	Sexual Violence	Residence
Cabo de Stº Agostinho	4.39	Friend	58.92%	41.08%	Sexual Violence	Residence
Paulista	3.88	Friend	57.27%	42.73%	Sexual Violence	Residence
Caruaru	3.69	Friend	52.57%	47.43%	Physical Violence	Ignored
Vitória de Santo Antão	3.19	Friend	61.29%	38.71%	Physical Violence Sexual Violence	Residence
Lagoa do Carro	2.99	Friend	-----	100%	Sexual Violence	Ignored
Chã Grande	2.61	Friend	-----	-----	Sexual Violence Rape	Ignored
Afogados da Ingazeira	2.40	Father-in-law	61.29%	38.71%	Physical Violence	Residence
Lagoa do Ouro	2.00	Brother	100%	-----	Violence by Repetition	Residence
Igarassu	1.98	Mother	70.73%	29.27%	Sexual Violence	Ignored
Garanhuns	1.90	Father Unknown	81.81%	18.19%	Sexual Violence	Residence
Solidão	1.79	-----	-----	-----	-----	Ignored
Goiana	1.67	Friend	46.15%	53.85%	Sexual Violence	Residence
Violence in Adolescents 15-19 years						
Municipality	Bayes Rate	Main Aggressor	Gender		Type of Violence	Occurrence
	100,000 inhab		F	M		
Limoeiro	53.52	Spouse	46.44%	53.55%	Physical Violence	Ignored
Ouricuri	41.35	Friend	76.19%	23.80%	Physical Violence	Residence
Afogados da Ingazeira	32.86	Spouse	67.9%	38.27%	Sexual Violence	Residence
São Lourenço da Mata	28.16	Own Person	47.46%	52.53%	Sexual Violence	Residence
Petrolina	26.89	Other relationships	92.35%	7.65	Sexual Violence	Residence
Caruaru	26.35	Own Person	39.44%	60.56%	Physical Violence	Ignored
Arcoverde	23.72	Friend	40.74%	59.26%	Physical Violence	Street
Carnaíba	20.62	Friend	71.42%	28.58%	Physical Violence	Residence
Salgueiro	20.15	Friend	73.25%	26.75%	Physical Violence	Residence
Lagoa do Carro	18.16	Friend	50%	50%	Threat Rape Psycho-Moral Violence Sexual Violence	Residence
Cabo de Santo Agostinho	18.07	Own Person	62.44%	37.56%	Physical Violence	Residence
Olinda	17.07	Unknown	77.93%	22.07%	Physical Violence	Ignored
Paulista	14.91	Own Person	65.90%	34.1%	Negligence and Abandonment	Residence
Abreu e Lima	13.62	Own Person	40%	60%	Negligence and Abandonment	Residence
Belo Jardim	13.25	Spouse	91.66%	8.34%	Physical Violence	Residence
Carpina	13.12	Unknown	55.26%	44.74%	Rape Body Strength Sexual Violence Physical Violence	Ignored
Serra Talhada	12.68	Spouse	93.65%	6.35%	Body Strength	Residence
Igarassu	12.32	Boss/Chief	56.06%	43.94%	Negligence and Abandonment	Ignored
Goiana	12.17	Friend	75%	25%	Physical Violence	Residence
Recife	11.80	Other relationships	60%	40%	Physical Violence	Residence

The graphs shown in Figure 3 express the exploratory analysis of gross rates of cases of violence in adolescents for the period between 2009 and 2014. These have statistically positive linear correlation for the rates of reported cases of general violence and year, thus being classifying the strength of the association as strong for both phases of adolescence. The most common violence in the first stage of adolescence is sexual violence and the female sex is the most victimized; in the second phase of adolescence, physical violence and sexual abuse are the most prevalent, and females are the most abused. The main site of occurrence of violence was the victims' residence. For a better understanding of the findings evidenced by the thematic maps and linear correlation graphs, it was chosen to deepen the nuances of the studied event in the municipalities that presented higher Bayesian rate as shown in Table 1.

DISCUSSION

Violence is regarded as a serious global public health problem that arises from the violation of basic human rights of the individual (Nascimento *et al.*, 2016). Brazil, a country full of economic, social and cultural inequalities, highlights this heterogeneity, because the phenomenon occurs in all social strata regardless of race, class, religion or culture (Rodrigues *et al.*, 2016). Many are the groups vulnerable to violence, highlighting the child-adolescent population, due to their physical weaknesses and personality development (Nunes *et al.*, 2016). Brazil is in the fourth place among the countries regarding deadly violence against children and adolescents (13 homicides/100,000 children and adolescents), which implies that its number is 150 times greater than that of countries such as England, Portugal, Spain and Egypt (Waiselfiz *et al.*, 2012). According to data from the Mortality Information System, Brazil recorded more than 59 thousand deaths from violence in 2014, with 11,238 cases among individuals in the age range from zero to 19 years (ABRINQ Foundation, 2016). Violence and accidents represent the main causes of deaths in the age range between 5 and 19 years when compared to inflammatory and parasitic diseases (Martins *et al.*, 2005).

Violence has been gradually reaching expressive rates, and such behavior becomes an alarm signal to direct the attention of the Brazilian authorities to this event¹⁹. In this sense, the intersectoral action in management, political and educational sectors is of great relevance to decrease rates of violence (Garbin, 2015). A survey conducted by IPEA (Institute of Applied Economic Research - *Instituto de Pesquisa Econômica Aplicada* in Portuguese) shows that the northeast region presents the largest scale of violence in historical series from 2004 to 2014 (*Instituto de Pesquisa Econômica Aplicada*, 2016). The DATASUS data show that, of the 131,279 reported cases of violence, 29% of the victims belonged to the age range from 10 to 19 years in the period from 2009 to 2014 (*Sistema de Informação de Agravos de Notificação*, 2017). The state of Pernambuco is the northeastern state with the highest percentage of violence in the age group of adolescence (10 through 19 years of age) in the period from 2009 to 2014, and this fact implies in 27% of the total number of notified cases in the region (*Sistema de Informação de Agravos de Notificação*, 2017). The thematic maps obtained in the present study by global and local empirical Bayes estimator, for the period 2009 through 2014, allowed recognizing areas with greater occurrence of cases of violence against adolescents.

The neighboring areas showed no spatial dependence of cases, thus, the rates of cases of violence do not obey emphatically the same pattern. The visualization of cases of violence against adolescents in Pernambuco ratified that, in the adolescent population, this event stood out in the metropolitan and rural mesoregions, as evidenced by the large amount of intrafamily and community violence in the municipalities that presented the highest rates of the event. This phenomenon may be linked to the use of drugs, poverty and poor infrastructure (Carlos *et al.*, 2016). The linear correlation was positive for the occurrence of cases of violence against adolescents residing in the state; the increased number of cases each year showed increasing linear trend of this phenomenon. The innumerable consequences of this practice affect life expectancy, security and protection of this population regarding the violent events in society. Adolescence is a period of socio-historic construction whose manifestations are strongly influenced by the adolescent's socioeconomic, political and cultural context. The structure of the territory presents opportunities for young people and their interaction with the social, economic and cultural characteristics of the population result in the vulnerability of young people who reside in this territory (Reis, 2013).

The most prevalent cases of violence reported in the adolescent population from 2009 to 2014 were sexual and physical violence, and its main victims were female adolescents (*Sistema de Informação de Agravos de Notificação*, 2017). Marilena Chauí, one of the first theoretics to study, still in 1980's, the violence against the female population, in her work entitled "Participating in the Debate on Women and Violence", states that violence against women results from an ideology of male domination, produced and reproduced by both men and women. These actions transform hierarchical differences in inequalities in order to dominate, exploit, oppress, treat the being, called as "object" and not as "subject", who tends to mute oneself and become dependent and passive (Chauí, 1985). Since the adolescent aged between 10 and 14 years is more fragile and dependent, he/she becomes the most vulnerable victim to the aggressor, who is often a friend of the victim or keeps an intrafamily relationship and practices the violence preferably in residential spaces (Alves *et al.*, 2017). The bonds of trust and proximity by friendship or kinship may give opportunities to violent practices. In every phase of adolescence, sexual violence was the most prevalent type violence. The objective of the present study was not to evaluate the impact of sexual violence for the mental health of this population, however, it is evident that there is a need for attention to mental health, which, when absent, may trigger the development of lifelong damages (Facuri *et al.*, 2013). Law 12.845/2013 features about the mandatory and integral care to people in a situation of sexual violence and states that hospitals should offer emergency, integral and multidisciplinary care to victims, including medical, psychological and social services, prevention of pregnancy and Sexually Transmitted Diseases, with possibility of referral, if necessary, to social assistance services (Brazil, 2013). Other violence prevalent in the second phase of adolescence - physical violence - stems from the autonomy gained while trying to relate to their peers, leaving them susceptible to involvement with alcohol and other drugs, a factor associated with involvement in physical violence and aggressor's profile, who, in 20.51% of cases, is unknown (*Sistema de Informação de Agravos de Notificação*, 2017).

The consumption of psychoactive substances such as alcohol and other drugs act as stimulants for adolescents to become more aggressive and involved in violent situations. The multicentric study developed by PeNSE (National Research on Students' Health - *Pesquisa Nacional de Saúde do Escolar* in Portuguese) in Brazilian capitals and the federal district identified a greater relationship between consumption of alcohol and illicit drugs and involvement in situations of physical violence, which is greater among boys when considering alcohol consumption, and among girls, considering use of drugs (Andrade *et al.*, 2012). In Pernambuco, the violence against adolescents occurs with greater frequency in the age range from 10 to 14 years, by friends/acquaintances (22.13%), mother (13.31%), boyfriend (12.6%) of the victims. In the age range from 15 to 19 years, the aggressor's profile varies as unknown (20.51%), friends/acquaintances (18.25%) and the own person (11.8%) (*Sistema de Informação de Agravos de Notificação*, 2017). The interpersonal bonds established by affinity throughout life are fundamental to support physical and psychological needs (Sanicola, 2015). On the other hand, the bonds of trust and proximity by friendship or kinship can offer opportunities to violent practices, especially in the first phase of adolescence. According to the results of the present study, the aggressor's profile in municipalities with the highest rates in the age range from 10 to 14 years was friend of the victim, in 61.11% of the municipalities. In the age range from 15 to 19 years, the most frequent were friends (32%), friends of the victim (24%) and spouse (20%) (*Sistema de Informação de Agravos de Notificação*, 2017). A similar study conducted in a state of northeastern Brazil showed high rates of violence in the age group from 10 to 14 years, and the most frequent were psychological, sexual and physical violence. Regarding the aggressor's profile, it is often represented by friends of the victim or close people from family. The aggressions often occur in residential spaces (Alves *et al.*, 2017).

The family is the center of the primary network, has a central role of protection, education and care through the symbolic construction of social integration. Thus, it conceives the cultural development and shares the values and experiences transaction (Sanicola, 2015). Despite this, the residence is the most frequent place of cases of violence in the municipalities with the highest rates. These values show the weaknesses of social networks, precariousness of public safety services and low social commitment in the construction of preventive measures and promotion of a peace culture. In this context should be formulated health promotion strategies with adolescents promoting the strengthening of their autonomy and self-esteem, especially for those who are in situation of social vulnerability (Gonçalves, 2016). The Health at School Program (PSE - *Programa Saúde na Escola*), instituted by Decree 6,286, of 5 December 2007, is one of the allied strategies to strengthen the Care Line, and aims at the full attention to students of public education. It proposes, among other actions, the reduction of violence and inclusion of topics of health education in political pedagogical project of schools. In this way, the program contributes to the prevention of cases, notification and promotion of a peace culture, in addition to requiring interdisciplinary intervention in the network context (Brazil, 2016). In the context of the Family Health Strategy, coping with violence in the community requires support from the multiprofessional healthcare team through reception, identification, notification, and agreements with the services of protection. The limitations inherent to these behaviors include

the fear of suffering threats or aggressions, unpreparedness regarding the identification of emotional and physical signs of the victim, lack of knowledge about the types of violence and necessary referrals (Galindo, 2017). Coping with violence demands the strengthening and linkage between the social support networks, forums, committees and councils, at national, regional and local level. Moreover, it requires social and services accountability regarding the fight against impunity, skilled care to adolescents and families in a situation of violence and notification. It is essential to promote the child-adolescent role, through awareness and empowerment, focused on the protection and realization of human rights to protection and integral health care (Brazil, 2013). A limiting factor was the possible underreporting of cases of violence in the adolescent population. Another limitation may be the significant variation between the municipalities regarding the process of notification and submission to the system of health surveillance, which can result in loss of information. The set of data resulting from notification and proper conduct of the cases would imply minimization of possible biases and results that are more consistent. The contribution of this study focuses on the identification of areas that have higher prevalence of cases of violence in the studied population and has the potential to facilitate the planning of coping actions involving all levels of intersectoral management in order to reduce this phenomenon. In this perspective, the present study will facilitate the implementation of the Integral Care Line by municipalities with the aim of stimulating the actions of health promotion and peace culture, as well as prevention of violence in the population daily life. The importance of care integrality, reception, service, notification and follow-up of the care and social protection network must pass through all social actors involved. In this sense, the integration between community, support groups and health managers of the three spheres is fundamental for achieving integral assistance to families of adolescents, in addition to strengthening the protection networks.

Conclusion

The geographical identification of cases of violence by means of global and local empirical Bayes estimator, for the period from 2009 to 2014, provided the identification of priority areas with higher risk and their neighborhoods for the spatial visualization of this phenomenon in the territory. Violence against adolescents is a multi-causal phenomenon associated with social vulnerabilities and requires support and protection resources, for the effective implantation of public policies. Therefore, geoprocessing will facilitate the construction of strategies of preventive, coping and planning of intersectoral actions aiming at reducing inequalities, social justice, integral and fair healthcare to the population.

REFERENCES

- Alves, J.M., Vidal, E.C.F., Fonseca, F.L.A., Vidal, E.C.F., Silva, M.J., Pinto, A.G.A., *et al.* Notificação da violência contra crianças e adolescentes por profissionais de saúde. *Rev da Fac Ciências Médicas Sorocaba*[journal on the Internet][cited 2017 18 jun] 2017;19(1): [About 7p.]. Available: <https://revistas.pucsp.br/index.php/RFCMS/article/view/26596/pdf>
- Andrade SSCA, Yokota RTC, Sá NNB, Silva MMA, Araújo WN, Mascarenhas MDM, *et al.* Relação entre violência física, consumo de álcool e outras drogas e *bullying* entre

- adolescentes escolares brasileiros. *Cad. Saúde Pública* [journal on the Internet][cited 2017 04 set] 2012; 28(9): [About 12p.]. Available: <http://www.scielo.br/pdf/csp/v28n9/v28n9a11.pdf>
- Brasil. Lei n. 12.845, de 1º de agosto de 2013. Dispõe sobre o atendimento obrigatório e integral de pessoas em situação de violência sexual. Diário Oficial da União 2013; 02 ago.
- Brasil. Lei n. 8.080, de 19 de setembro de 1990. Dispõe sobre as condições para a promoção, proteção e recuperação da saúde, a organização e o funcionamento dos serviços correspondentes e dá outras providências. *Diário Oficial da União* 1990; 19 set.
- Brasil. Ministério da Educação. Programa Saúde na Escola. Brasília: MEC; 2016.
- Brasil. Resolução nº. 466, de 12 de dezembro de 2012. Pesquisas E testes envolvendo seres humanos. Diário Oficial da União 2013; 13 jun.
- Brasil. Secretaria de Direitos Humanos. Plano Nacional de Enfrentamento da Violência Sexual contra Crianças e Adolescentes. Brasília: SDH; 2013.
- Carlos DM, Ferriani MGC. Contextualizando a violência intrafamiliar contra crianças e adolescentes: a implicação dos territórios de cuidado. *Rev Latino-Am Enfermagem* [journal on the Internet][cited 2017 21 jun] 2016; 24: [About 8p.]. Available: http://www.scielo.br/pdf/rlae/v24/pt_0104-1169-rlae-24-02735.pdf
- Chauí M. Participando do Debate sobre Mulher e Violência. In: Franchetto B, Cavalcanti MLVC, Heilborn ML. *Perspectivas Antropológicas da Mulher*. São Paulo: Zahar; 1985.
- Facuri CO, Fernandes MAS, Oliveira KD, Andrade TS, Azevedo RCS. Violência sexual: estudo descritivo sobre as vítimas e o atendimento em um serviço universitário de referência no Estado de São Paulo, Brasil. *Cad. Saúde Pública* [journal on the Internet][cited 2017 16 jul] 2013; 29(5):[About 10 p.]. Available: <http://www.scielo.br/pdf/csp/v29n5/08.pdf>
- Francisco CN. *Conceitos de Geoprocessamento: Sistemas de Informações Geográficas*. 2 edição. Niterói: Universidade Federal Fluminense; 2014.
- Fundação ABRINQ. *Cenário da infância e adolescência no Brasil 2016*. São Paulo: Fundação ABRINQ; 2016.
- Galindo NAL, Gonçalves CFG, Galindo Neto NM, Santos SC, Santana CSC, Alexandre ACS. Violência infanto-juvenil sob a ótica da enfermagem. *Revenferm UFPE online* [journal on the Internet][cited 2017 13 dez] 2017; 11(supl 3): [About 10p.]. Available: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/viewFile/13986/16843>
- Garbin CAS, Lima TJV, Garbin AJI, Rovida TAS, Saliba O. Conhecimento e percepção dos educadores do ensino infantil sobre violência. *Rev Ciênc Plural* [journal on the Internet][cited 2017 12 jun] 2015; 1(2): [About 11p.]. Available: <https://periodicos.ufrn.br/rcp/article/view/7614/5656>
- Gonçalves JRFR. Bullying: o comportamento violento no âmbito escolar, sua interferência no processo de aprendizagem e o papel da família na dissolução desse conflito. *Rev Jurídica Cesumar – Mestr* [journal on the Internet][cited 2017 18 ago] 2016; 16(1): [About 16 p.]. Available: <http://periodicos.unicesumar.edu.br/index.php/revjuridica/article/view/4292/2733>
- Honorato T, Lapa PPA, Sales CMM, Reis-Santos B, Tristão-Sá R, Bertolde AI *et al*. Análise espacial do risco de dengue no Espírito Santo, Brasil, 2010: uso de modelagem completamente Bayesiana. *Rev Bras Epidemiol* [journal on the Internet] 2014[cited 2017 09 set]; 17 (Supl 2):[About 10p.]. Available from: http://www.scielo.br/pdf/rbepid/v17s2/pt_1415-790X-rbepid-17-s2-00150.pdf
- Instituto Brasileiro de Geografia e Estatística. Estimativa populacional 2016-Pernambuco [Internet]. [cited 2018 Abr 14]; Available from: www.ibge.gov.br/home/estatistica/populacao/estimativa2016/estimativa_dou.shtm
- Instituto de Pesquisa Econômica Aplicada (IPEA) [Internet]. Atlas da Violência 2016 [cited 2017 jun 25]. Available from: http://www.ipea.gov.br/portal/images/stories/PDFs/nota_tecnica/160322_nt_17_atlas_da_violencia_2016_finalizado.pdf
- Instituto Nacional de Pesquisas Espaciais (INPE). TERRAVIEW 4.2.2. 2010. [Internet]. [cited 2017 jun 15]. Available from: <http://www.dpi.inpe.br/terraview/index.php>
- Lugarinho LP, Avanci JQ, Pinto LW. Perspectivas dos estudos sobre violência na adolescência e cortisol: revisão bibliográfica sistemática. *CienSaude Colet* [journal on the Internet]. 2017 [cited 2017 jun 01]; 22 (4): [about 12p.]. Available: <http://www.scielo.br/pdf/csc/v22n4/1413-8123-csc-22-04-1321.pdf>
- Martins CBG, Alencastro LCS. Características da violência sofrida por adolescentes escolares de uma capital brasileira. *Rev EletrEnf* [journal on the Internet]. 2015 [cited 2017 03 jul]; 17(3): [About 10p.] Available from: <https://www.fen.ufg.br/revista/v17/n3/pdf/v17n3a13.pdf>
- Martins CBG, Andrade SM. Epidemiologia dos acidentes e violências entre menores de 15 anos em município da região sul do Brasil. *Rev. Latino-Am* [journal on the Internet][cited 2017 06jun]. *Enfermagem* 2005; 13(4): [About 8p.]. Available: <http://www.scielo.br/pdf/rlae/v13n4/v13n4a11.pdf>
- Martins CBG, Jorge MHPM. Maus-tratos infantis: um resgate da história e das políticas de proteção. *Acta Paul Enferm* [journal on the Internet]. 2010 [cited 2017 24 jun]; 23 (3): [About 6p.]. Available: <http://www.scielo.br/pdf/ape/v23n3/v23n3a18.pdf>
- Moura LBA, Oliveira C, Vasconcelos AMN. Violências e juventude em um território da Área Metropolitana de Brasília, Brasil: uma abordagem socioespacial. *CiêncSaudeColetiva* [journal on the Internet] 2015 [cited 2017 jun 17]; 20 (11): [about 10p.]. Available from: <http://www.scielo.br/pdf/csc/v20n11/1413-8123-csc-20-11-3395.pdf>
- Mukaka MM. Statistics Corner: A guide to appropriate use of correlation coefficient in medical research. *Malawi Med J* [journal on the Internet] [cited 2017 01 set] 2012; 24 (30): [About 3p.]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3576830/>
- Muller EPL, Cubas MR, Bastos LC. Georreferenciamento como instrumento de gestão em unidade de saúde da família. *Rev Bras Enferm* [journal on the Internet] 2010 [cited 2017 09 set]; 63(6): [About 5 p.]. Available from: <http://www.scielo.br/pdf/reben/v63n6/17.pdf>
- Nascimento AF, Deslandes SF. A construção da agenda pública brasileira de enfrentamento da violência sexual infanto-juvenil. *Rev Esc Enferm USP* [journal on the Internet][cited 2017 01 set] 2016; 26 (4): [About 21p.]. Available: <http://www.scielo.br/pdf/physis/v26n4/1809-4481-physis-26-04-01171.pdf>
- Nunes AJ, Sales MCV. Violência contra crianças no cenário brasileiro. *Ciênc Saúde Coletiva* [journal on the Internet][cited 2017 02jun] 2016; 21(3): [About 10p.].

- Available: <http://www.scielo.br/pdf/csc/v21n3/1413-8123-csc-21-03-0871.pdf>
- Nunes FG. Análise exploratória espacial de indicadores de desenvolvimento socioambiental das regiões de planejamento do norte e nordeste goiano. *Ateliê Geográfico* [journal on the Internet] [cited 2017 09 set] 2013; 7(1): [About 23p.]. Available from: <https://www.revistas.ufg.br/atelie/article/view/19809/13918>
- Oliveira BMF; Daher DV. Implantação do serviço de referência contra violência infanto-juvenil: um relato de experiência. *Rev Enferm UFPE online*. 2016 [cited 2017 02 jul]; 10 (supl. 4): [About 6 p.]. Available: [file:///C:/Users/Mariana/Downloads/11147-24840-1-PB%20\(1\).pdf](file:///C:/Users/Mariana/Downloads/11147-24840-1-PB%20(1).pdf)
- Organização das Nações Unidas. *Objetivos de Desenvolvimento Sustentável*. Brasília: ONUBR; 2015.
- Organização Mundial de Saúde (OMS). *Relatório Mundial sobre Violência e Saúde*. Genebra: OMS/OPAS; 2002.
- Reis DC, Almeida TAC, Miranda MM, Alves RH, Madeira AMF. *Vulnerabilidades à saúde na adolescência: condições socioeconômicas, redes sociais, drogas e violência*. *Rev Latino-Am Enfermagem* [journal on the Internet] [cited 2017 24 jun] 2013; 21(2). [About 9p.] Available: http://www.scielo.br/pdf/rlae/v21n2/pt_0104-1169-rlae-21-02-0586.pdf
- Rodrigues JLSA, Lima APB, Nagata JY, Rigo L, Cericato GO, Franco A, Paranhos LR. Domestic violence against children detected and managed in the routine of dentistry: a systematic review. *J Forensic Leg Med* [journal on the Internet] [cited 2017 01jul] 2016; 43: [About 8p.]. Available: [https://www.jflmjournal.org/article/S1752-928X\(16\)30074-9/fulltext](https://www.jflmjournal.org/article/S1752-928X(16)30074-9/fulltext)
- Sanicola L. *As Dinâmicas de Rede e o trabalho social*. 2. edição. São Paulo: Veras; 2015.
- Sistema de Informação de Agravos de Notificação (SINAN) [Internet]. [cited 2017 maio 27]. Available from: <http://portalsinan.saude.gov.br/o-sinan>. Consultado em 03-09-2016
- Waiselfiz JJ. *Mapa da violência 2012: crianças e adolescentes do Brasil*. Rio de Janeiro: Centro Brasileiro de Estudos Latino Americanos; 2012.
