

Intertemporal Analysis of Child Mistreatment in Colombia

Análisis Intertemporal del Maltrato Infantil en Colombia

Análise intertemporal de maus-tratos na infância na
Colômbia

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Abstract

The area of social pediatrics and public health deals with the child and adolescent, healthy and sick, in their individual interactions and with the community in the physical and human environment in which it develops. This research analyzes the behavior of child maltreatment in Colombia during the years 2013 to 2018 in order to propose statistical models that explain it and make reliable predictions of great utility as a basis for the state's health plans. The work is developed from the databases of the National Institute of Legal Medicine and Forensic Sciences, the Child Welfare Observatory of the Colombian Family Welfare

Institute and the Integral Information System, for the variables: intrafamily violence, interpersonal violence and sexual crimes, disaggregated by age cohorts from 0 to 4, 5 to 9, 10 to 14 and 15 to 17 years. The corresponding ARIMA model is estimated in each case.

Keywords: Child abuse, Social Pediatrics, Model ARIMA

Resumen

El área de la pediatría social y salud pública se ocupa del niño y adolescente, sano y enfermo, en sus interrelaciones individuales y con la comunidad en el medio físico y humano en que se desarrolla. La presente investigación analiza el comportamiento del maltrato infantil en Colombia durante los años 2013 a 2018 con el fin de proponer modelos estadísticos que permitan explicarlo y realizar predicciones confiables de gran utilidad como fundamento a los planes de salud del estado. El trabajo se desarrolla a partir de las bases de datos

del Instituto Nacional de Medicina Legal y Ciencias Forenses, del Observatorio del Bienestar de la Niñez del Instituto Colombiano de Bienestar Familiar y del Sistema Integral de Información, para las variables: violencia intrafamiliar, violencia interpersonal y delitos sexuales, desagregando por cohortes de edades de 0 a 4, 5 a 9, 10 a 14 y 15 a 17 años. Se estima en cada caso el modelo ARIMA correspondiente.

Palabras clave: Maltrato infantil, Pediatría Social, Modelo ARIMA

Abstrato

A área de pediatria social e saúde pública lida com a criança e ao adolescente, saudável e doente, em suas interações individuais e com a comunidade no ambiente físico e humano em que se desenvolve. Esta pesquisa analisa o comportamento dos maus-tratos infantis na Colômbia durante os anos de 2013 a 2018, a fim de propor modelos estatísticos que o explicam e fazem previsões confiáveis de grande utilidade como base para os planos de saúde do estado. O trabalho é desenvolvido a partir dos bancos de dados do Instituto Nacional de Medicina Legal e Ciências Forenses, do Observatório da Previdência Infantil do Instituto Colombiano de Bem-Estar Familiar e do Sistema Integral de Informação, para as variáveis: violência intrafamiliar, violência interpessoal e crimes sexuais, desagregados por faixas etárias de 0 a 4, 5 a 9, 10 a 14 e 15 a 17 anos. O modelo ARIMA correspondente é estimado em cada caso.

Palavras-chave: Abuso infantil, Pediatría social, Modelo ARIMA

Introduction

Child maltreatment is a psychosocial problem, which can be studied from the Social Pediatrics, not only refers to the blows but also, as defined by the Code of Childhood and Adolescence, to other forms of damage such as cruel punishments, humiliation and Physical or psychological abuse, including the neglect of adults over children.

Child maltreatment can be defined as any interaction or lack of interaction between a child and his / her caregivers, by which non-accidental damage occurs in the child's physical state and development (Helfer, 1987). In this sense, the Save the Children Organization considers as mistreatment those lacks of care, attention and love that affect physical or mental health, physical abuse, abuse and sexual exploitation and the injustices of all kinds that affect girls and children the people responsible for their care, parents, carers, family members, neighbors, teachers, employers and the community in general.

In Colombia, according to the Colombian Family Welfare Institute (ICBF), the figures on child abuse are alarming, since there are about 30 cases recorded daily. 70% corresponds to cases of abuse by negligence, 24% to physical abuse and 6% to psychological abuse. Each year there is a decrease in complaints of child abuse during the months of school holidays. According to the life cycle, of every five cases, three occur in early childhood, one in childhood and one in adolescence (ICBF, 1013).

On the other hand, according to the information of the Crime Information Group (GICRI-DIJJIN), from the registration of more than 85,000 cases in 2017, it is found that in 81% the aggrieved person was female and in 19 % male. When classified by age of the victim, 1% of the cases involved pregnant women, 5% children and 22% adolescents.

By focusing attention on cases in which the victim is under 12 years, it is found that 48.4% of the attacks were on girls and 51.6% on children, with 12% corresponding to pregnant women. 65% of the aggressors did not use weapons, while 23% used forceful weapons and the remaining other types of objects of aggression. In 96% of reported cases, aggression only occurred once. The aggressors, for the most part, have some type of employment, have not established a formal relationship and have a low level of education.

In this investigation, only three of the non-fatal injuries reported to the National Institute of Legal

Medicine and Forensic Sciences are related to child abuse: Interpersonal Violence, Intrafamily Violence and Legal Medical Exams for Alleged Sexual Offenses. For each variable, the value of the number of cases registered monthly in the databases is taken and based on these a statistical model of univariadas time series is adjusted, since each variable in each age cohort is analyzed independently.

Metodología

Type of Study: The study is descriptive framed in the guidelines proposed by Hernández et al (2014) and Gallardo et al (2017). The validity of the design expressed as a type of study for the proposed research is synthesized in the aspects of internal, external and conceptual validity in relation to the quantitative approach expressed by Pardo et al (2010). Its purpose is to analyze the inter-temporal behavior of the legal medicine data series concerning nonfatal injuries and related to child maltreatment, in order to propose models to establish reliable forecasts, useful for establishing institutional plans and programs framed in the field of social pediatrics.

ARIMA model: A chronological series consists of a set of realizations of a random variable observed at regular intervals of time. The primary objective of the analysis of time series is to use statistical methods to describe that set of data that are observed over time and that do not obey any sampling plan or design of experiments, which result will be the proposal of a model mathematical that describes it and that allows the realization of reliable forecasts. The modeling process proposed by Box and Jenkins (2013), can be summarized as follows: the data is analyzed, generally from a graphic representation and the observation of its correlogram, spectogram and periodogram, identifying its inter- temporary; based on this information, an integrated autoregressive model of moving average, ARIMA, is proposed and its parameters are estimated, validated and used to make inter-temporal forecasts; that is, to predict the

next values that the series will take with sufficient reliability.

The ARIMA model involves the autoregressive and moving average components, after establishing that the series is stationary or that the necessary transformations have been made to obtain stationarity. The basic structure of an ARIMA model (p, d, q) is as follows:

$$Z_t = c\mu + \varphi_1 Z_{t-1} + \dots + \varphi_p Z_{t-p} + a_t - \theta_1 a_{t-1} - \dots - \theta_q a_{t-q}$$

in which, Z_t is the value of the variable in the period of time t , $c\mu$ is the level parameter, φ_t the coefficient of auto-regression, θ_t the moving average coefficient, a_t the random disturbance and d , the number of differentiations made up to get stationarity in the series. The estimation algorithm is repeated iteratively, modifying the structure of the model, until obtaining estimators with a significance level of less than 5% and compliance with the theoretical statistical requirements.

Variables and data: The analysis is carried out on the monthly chronological series from January 2013 to June 2018 constructed from the data obtained from the Statistical Bulletins of the Institute of Legal Medicine and Forensic Sciences (IML-CF), of the Welfare Observatory of the Childhood of the Colombian Institute of Family Welfare (ICBF) and of the Integral Information System (SISPRO) for the variables: interpersonal violence, intrafamily violence and sexual crimes, separated into four age cohorts: 0 to 4, 5 to 9, 10 to 14 and 15 to 17 years old.

Results and Discussion

Intrafamily violence is a social phenomenon that occurs in a family group and deals with any type of abuse of power by one member of the family over another, especially the weaker members who are in the care of the aggressor. This abuse includes physical, sexual, psychological or other types of mistreatment. It is considered that there is intrafamily violence in a home, if there is a repetitive

violent attitude about a family member (Valenzuela and Ramos, 2014).

Cases of intrafamily violence constitute, on average, 28% of those presented monthly in Legal Medicine. They occur more frequently in children under the age of 9 years. When disaggregated by age cohort, cases in the cohort from 0 to 4 years constitute 31% of those in that cohort, in the cohort from 5 to 9 years, 27%, in the cohort from 10 to 14 years, 22% and in the cohort from 15 to 17 years, 20%.

intrafamily violence in the group of 0 to 4 years presents a total of 120 to 130 cases per month and a slightly increasing trend with an average increase of one case every two months, observing that there is a seasonality in periods with a significant increase in the number of denunciations, being these included between July and August of each year diminishing in the last year. In the group of 5 to 9 years, it presents an average of 200 cases per month, with a variation that in most of the cases is between 150 and 250 cases and a slightly increasing tendency with an average increase of one case every two months, there is no evidence of seasonings. In the group of 10 to 14 years, there is an average of 300 cases per month, with a variation that in most cases is between 200 and 300 cases and a slightly increasing tendency; there is no evidence of seasonality. The group of 15 to 17 years old presents an average of 300 cases per month, with a decreasing tendency, it also shows a significant reduction in the variability of the data as of 2016, implying a lower heteroscedasticity of the variable over time, which must be taken into account when adjusting the model and making forecasts; there is no evidence of seasonality (figure 1).

Table 1 shows the corresponding ARIMA models to explain the intertemporal behavior of the intrafamily violence variable during the period January 2013 to July 2018.

Interpersonal violence is a phenomenon of intentional aggression that results in an injury or damage to the body or the health of the victim and

not death, whose performer is not a relative in a consanguineous or affinity of the victim, and which excludes cases of transport; however, this type of violence occurs between members of a family, usually, but not always, taking place at home (Dueñas, 1011).

The cases of interpersonal violence constitute, on average, 47% of those presented monthly in Legal Medicine. They occur more frequently in children over 9 years of age. When disaggregated by age cohort, cases in the cohort of 0 to 4 years constitute 9% of those in that cohort, in the cohort of 5 to 9 years, 7%, in the cohort of 10 to 14 years, 28% and in the 15 to 17 year old cohort, 58%.

Table 2 shows the corresponding ARIMA models to explain the intertemporal behavior of the interpersonal violence variable during the period from January 2013 to July 2018.

Interpersonal violence in the group of 0 to 4 years has a decreasing trend with an average of 50 cases per month in 2013 and reducing the level to an average of 30 cases per month in 2018, in December 2014 the highest number of cases with significant difference over others. The group of 5 to 9 years has a decreasing trend with an average of 70 cases per month in 2013 and reducing the level to an average of 40 cases per month in 2018, in October 2014 a very low value is presented representing a number of cases with significant difference over others. In the cohort from 10 to 14 years, there is also a decreasing tendency with greater accentuation than in the previous groups, with an average of 500 cases per month in 2013 and reducing the level to an average of 300 cases per month in 2018, in October 2015 a very high value is observed that represents a number of cases with significant difference over the others. The variability decreases from the year 2016. The cohort of 15 to 17 years has a decreasing trend with an average of 1200 cases per month in 2013 and reducing the level to an average of 800 cases per month in 2018, in October 2014 a very low value that represents a number of cases with significant difference over others. In a similar way to the previous one, the variability decreases from the year 2016 (figure 2).

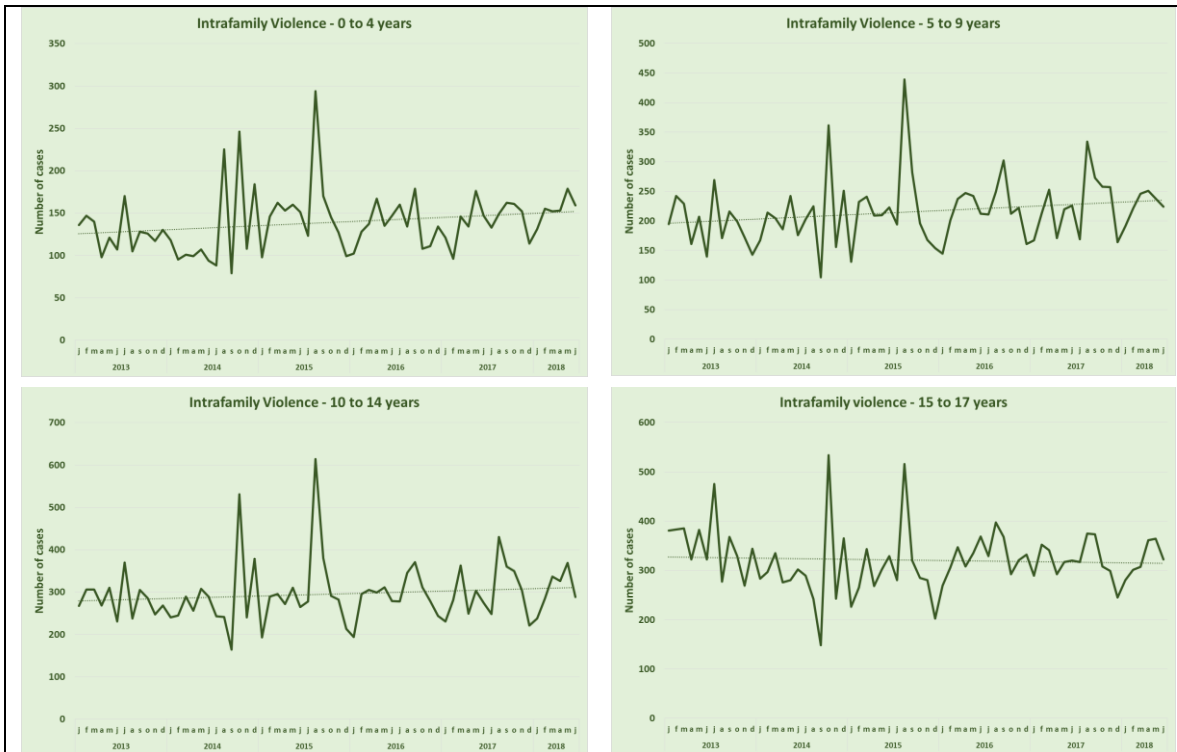


Figure 1. Monthly cases of intrafamily violence

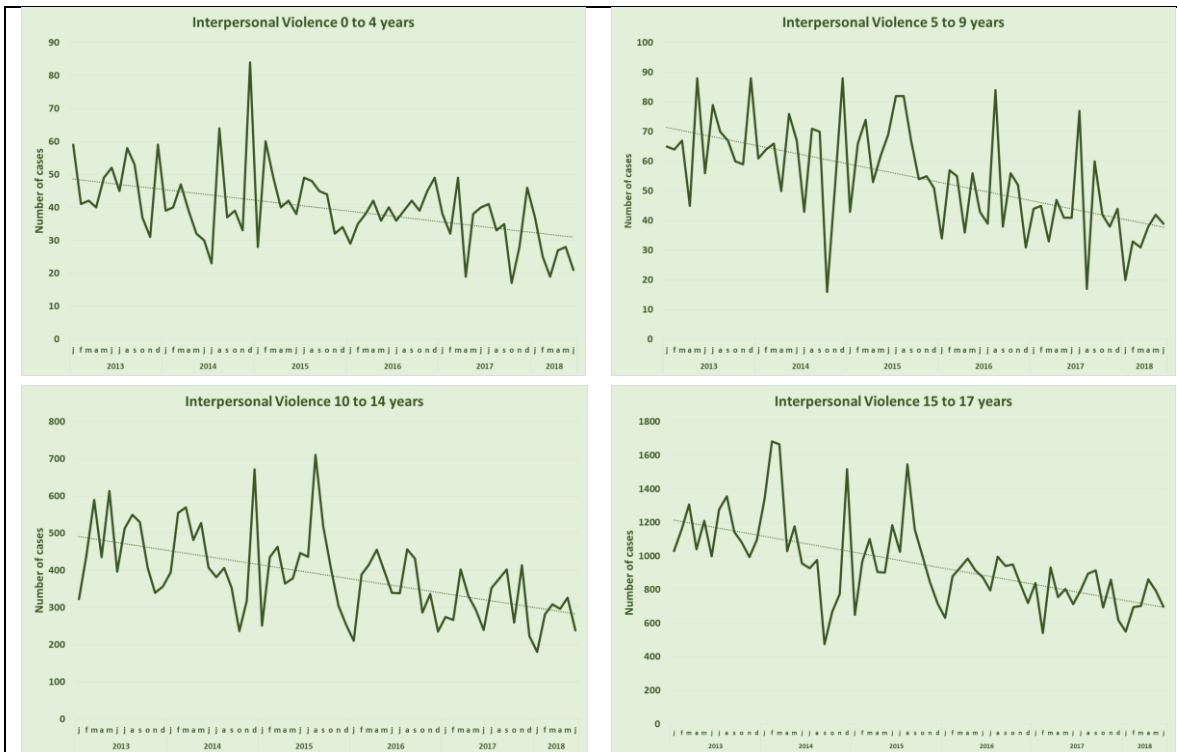


Figure 2. Monthly cases of interpersonal violence

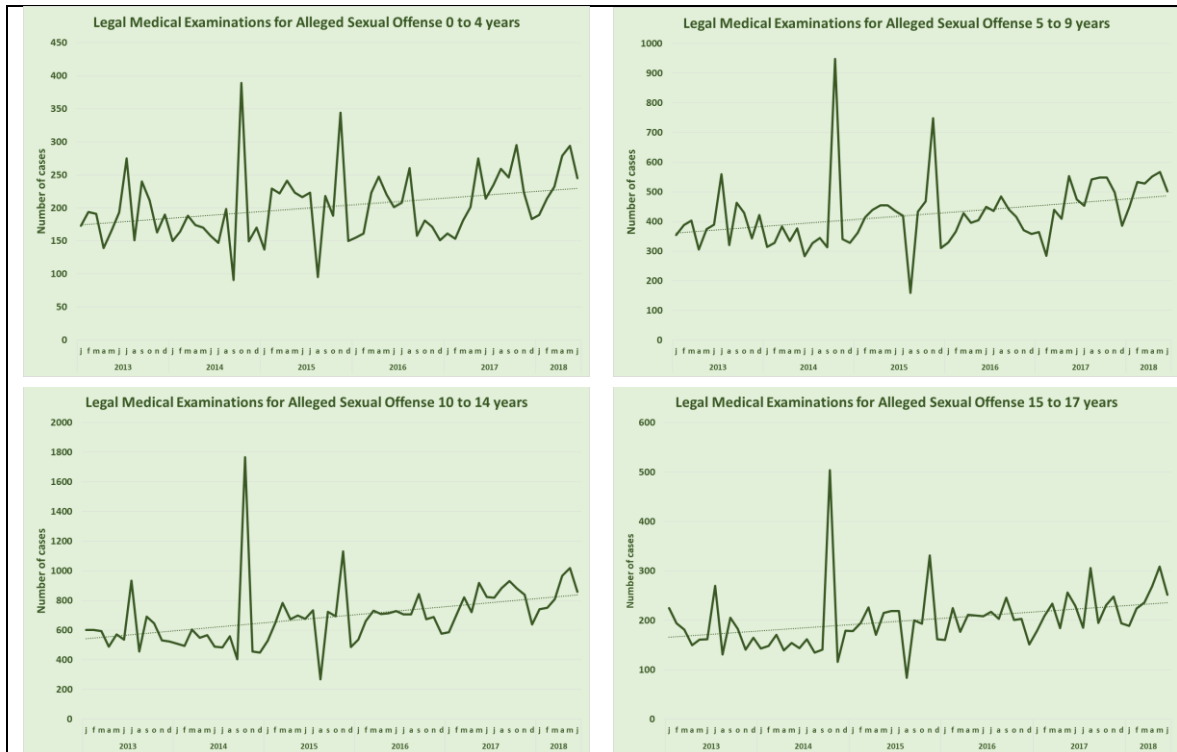


Figure 3. Monthly cases of legal medical examination for alleged sexual offense

Table 1. ARIMA models for cases of intrafamily violence

Intrafamily Violence - Intertemporal Model	
Cohort	ARIMA model
0 to 4 years	$Z_t = 0,9 + 0,3 * Z_{t-1} + 0,7 * Z_{t-2} + 0,2 * Z_{t-12} - 0,2 * Z_{t-13} + a_t$
5 to 9 years	$Z_t = 1,1 + 0,2 * Z_{t-1} + 0,6 * Z_{t-2} - 0,2 * Z_{t-3} + a_t$
10 to 14 years	$Z_t = 0,6 + Z_{t-1} - 0,5 * Z_{t-2} + a_t$
15 to 17 years	$Z_t = 0,5 + 0,85 * Z_{t-1} - 0,15 * Z_{t-2} + a_t - 0,89 * a_{t-1}$

Table 2. ARIMA models for cases of interpersonal violence

Interpersonal violence - Intertemporal model	
Cohort	ARIMA model
0 to 4 years	$Z_t = -0,6 + 0,4 * Z_{t-1} - 0,6 * Z_{t-2} + a_t$
5 to 9 years	$Z_t = -0,5 + 0,6 * Z_{t-1} - 0,6 * Z_{t-2} + 0,2 * Z_{t-12} - 0,2 * Z_{t-13} + a_t$
10 to 14 years	$Z_t = -0,7 + 0,6 * Z_{t-1} - 0,4 * Z_{t-2} + 0,3 * Z_{t-12} - 0,3 * Z_{t-13} + a_t$
15 to 17 years	$Z_t = -5,5 + 0,6 * Z_{t-1} - 0,5 * Z_{t-2} + 0,1 * Z_{t-3} + a_t$

Table 3. ARIMA models for cases of legal medical examination for alleged sexual offense

Legal Medical Examination for Alleged Sexual Offense - Intertemporal Model	
Cohort	ARIMA model
0 to 4 years	$Z_t = 1,3 + 0,4 * Z_{t-1} - 0,6 * Z_{t-2} + a_t$
5 to 9 years	$Z_t = 2,5 + 0,5 * Z_{t-1} - 0,5 * Z_{t-2} + a_t$
10 to 14 years	$Z_t = 4,4 + 0,4 * Z_{t-1} + 0,6 * Z_{t-2} + 0,2 * Z_{t-12} - 0,2 * Z_{t-13} + a_t$
15 to 17 years	$Z_t = 0,9 + 0,44 * Z_{t-1} + 0,56 * Z_{t-2} + a_t$

The **sexual offense** implies on the part of the sexual aggressor, the abuse of power and control, with the use of violence or without it, to subject a person to perform sexual activities or to witness them without their consent; implicitly, it has aggressive and harmful purposes, given the disrespect of the rights and needs that the victim has as a free and autonomous human being. These characteristics of the crime entail the violation of the rights of sexual freedom and human dignity (Pérez. 2001).

In the present work, the number of cases that monthly require a legal medical examination for presumed sexual offense registered in Legal Medicine is analyzed. The cases of sexual offense constitute, on average, 8% of those presented monthly in Legal Medicine. They occur more frequently in children under the age of 15 years. When disaggregated by age cohort, the cases in the cohort from 0 to 4 years constitute 45% of those in that cohort, in the cohort from 5 to 9 years 53%, in the cohort from 10 to 14 years 52% and in the cohort from 15 to 17 years, 13%.

The number of legal medical examinations for presumed sexual offense in the cohort from 0 to 4 years has a slightly increasing tendency with an average of 200 cases per month. In the cohort from 5 to 9 years old, it also presents a slightly increasing tendency with an average of 400 cases per month. The cohort from 10 to 14 years old also shows a slightly increasing trend with an average of 700 cases per month. The variability of the data, in these three cohorts decreases from the year 2016. In the cohort of 15 to 17 years also presents a slightly increasing trend with an average of 180 cases per month (figure 3).

Conclusions

An increase is observed over time in cases of domestic violence and sexual offense, while there is a decrease in interpersonal violence. As of January 2016, there is a decrease in the variability of information.

The estimated models satisfy criteria of specificity and validity, and then they can be used for the realization of reliable short-term forecasts, useful in national planning and preparation of health proposals.

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