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Mathematical Modeling of Intimate Partner Violence: Simulations of Loss of Control Scenarios

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Abstract

A mathematical model to help predict the level of violence between a perpetrator and submissive victim of intimate partner violence is developed in this paper. Herein is considered that violence can be measured through the violence accumulated from previous months, starting from a initial condition of violence. The proposed model is developed from a difference equation with a probabilistic parameter, known as the perpetrator's loss-control parameter. This parameter of loss-control, is modeled by means of a discrete Markov chain of two states: the self-control and the loss thereof. Other important factor incorporated into the model is the proportionality factor that takes into account the proportion of loss of control of the perpetrator, which will manifest itself in violence or injury towards his/her partner in a probable cycle of violence. With the dynamic indicator, computational simulations are created to generate probable scenarios of intimate partner violence with varying levels of severity. A qualitative analysis of the probable behaviors, controllable (semi-stable) and uncontrollable (potentially deadly), that can occur to different intervals of time monthly is performed. This dynamic indicator is then applied to a specific study of physical violence, where the prevalence of violence is used as an approximation of the state of loss of control of the perpetrator.

Keywords: Dynamic indicator, Mathematical model, Violent Scenarios, Self-regulation, Intimate Partner Violence.

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