Parent Training Resource Allocation Optimization
Using an Agent-Based Model of Child Maltreatment

Nicholas Keller and Xiaolin Hu

Department of Computer Science, Georgia State University, Atlanta, GA 30303

Abstract. This paper uses our previously created agent-based model to study the optimal way of allocating parent training resources to address unmet child need, a measure of child maltreatment. We consider parent training resource allocation prioritization based upon: a family’s own resources and the resources they have access to through their social network. Simulation results show that when targeting a community with a parent training intervention program, ignoring heterogeneity within a community is a mistake. This work demonstrates the utility of the developed agent-based model and suggests that child maltreatment research can benefit from a complexity science approach.

1 Introduction

Child Maltreatment (CM) likely affects over one million children a year in the United States [1]. Although each year more than $20 billion is spent on Child Protective Services (CPS) [1] there has been little research into the effectiveness of CPS interventions. To our knowledge our model is the first agent-based model of child maltreatment. This paper models CM rates by looking at the level of unmet child need. Most child maltreatment studies involve collecting data from communities over many months or years, which is expensive and slow. Additionally, the transient nature of those studied often means that they are difficult or impossible to contact for followup surveys. Child maltreatment research can benefit from computer modeling, because CM occurs in an inherently complex system. Computer models give us the ability to move beyond our mental models. Much of this complexity is due to the interactions of agents in a social graph.

In our previous work [4, 5], we developed an agent-based model of child maltreatment, where risk and protective factors of CM at different levels of the social ecology exert influences through several major pathways and feedback loops to determine the likelihood of child maltreatment. In the developed model, each agent represents a family unit in a community. At each step of the simulation parents have to decide whether or not they will meet their child's needs. The model takes into account caregivers' dynamic cognitive decision making process and the impact of their ability to both ask for help from their social network and their ability to provide help to other caregivers who request it. This paper utilizes the previously developed model to study CM intervention/prevention. Specifically, we focus on the problem of parent
training resource allocation and use the developed agent-based model to help optimize parent training resource allocation to minimize child maltreatment.

Often child maltreatment is a result of poor parenting. Parents and children perceive child maltreatment, such as hitting, as discipline, which is why they often freely admit to it when asked [3]. Therefore, CM interventions often focus on improving parenting skill. Parent training programs such as the Triple P-Positive Parenting Program have been shown to be effective at reducing child maltreatment [6]. Parent training is a common CM intervention/prevention strategy [1].

Given the success of parent training programs we asked how can the limited funds devoted to parent training programs be more effectively invested to increase the return on investment? Programs like Triple P are expensive and time consuming ways to test parent training resource allocation strategies, although Triple P attempts to control costs by using a tiered service delivery system [7]. Simulations like ours cannot replace field trials, but they can help to guide them. Agent-based models as opposed to other modeling techniques have the advantage that they can model the impact of the complex social graph.

To study parent training resource allocation strategies, we identified several different strategies for allocating parent training resources and simulated their impacts on the overall rate of CM using the developed agent-based model. We modeled different types of communities and compared the outcomes of each strategy in these different communities. By showing that the model can produce potentially valuable conclusions we seek to justify future validation research.

2 Model of CM and Parent Training Intervention

Our previous paper [4, 5] has a detailed explanation of our model; therefore we will only give a cursory overview of the model. Fig. 1 is a flowchart representation of the model. Currently sibling interactions are not modeled; however, child need could be used to represent the needs of more than one child. Child need is an abstraction of the various types of child needs such as physical and emotional. Similarly, physical resources are an abstraction of different types of resources. A family's resources are modulated by the parenting skill of the caregivers. The interactions between multiple caregivers are not modeled. The community resources perceived and available to a family depends upon how many neighbors a family has, what their relationships to those neighbors are, and what resources those neighbors have and how willing they are to give them. In the simulations, families are divided into communities and groups within communities based upon either their families' personal resources or the resources available to them in the social graph. Groups within communities are selected based upon some criteria and are singled out to receive parent training benefits; however, families in a group are not necessarily more connected to each other than to other families in the community.