

UD Computational Science Day 2006

February 14, 2006

# An Epidemiological Model of Alcohol Problems and Treatment on Small World Networks

Richard Braun

Department of Mathematical Sciences  
University of Delaware  
Newark, DE 19716

## **Abstract**

A model of alcohol-related problem treatment on social networks is developed; the goal is to describe the prevalence of alcohol problems on a societal level to help inform policy decisions. The discrete model, which involves a cubic nonlinearity, is studied on both random and small world networks. The networks are graphs with the vertices representing people and the edges representing relationships between people; a small world network has a high degree of clustering and a similar path length when compared to a random graph. The model is a set of equations, one for each person, which evolves the likelihood of each person to develop an alcohol problem based on comparison with the average of the neighboring values on the network. Evolution to a steady state for various conditions are studied; the final percentage of people with alcohol problems depends on the network structure and initial conditions. A hypothetical treatment is added and the results are shown to be sensitive to the number of people treated in the population. Performance of the model implemented in the Matlab distributed computing toolbox will be described.