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Geospatial-Temporal Modeling of Alcohol Acute Events

Abstract:

Public concerns about the cost of alcohol related problems are high. Amongst alcohol-related problems this study focuses on alcohol-related acute events such as driving while intoxicated (DWI) and violent crimes. Understanding and preventing alcohol-related problems is critical and to do so a public health model of prevention is needed. The world setting pertaining to alcohol and alcohol-related problems is exceptionally complex. In this result, it is very difficult to assess the adequacy of the interventions and to carry out experiments in the real world because of time and economic constraints. In addition, to date few studies have provided a general model that includes socio-economic variables with geospatial and temporal dependence in order to test interventions. Therefore, we are developing the alcohol system model to understand alcohol related problems and test interventions based on agent based simulation with data about Fairfax County, Virginia. The model that we are developing includes factors such as job class, ethnicity/race, alcohol availability, zip code, alcohol abuse status, age, gender, socioeconomic status, temporal variables and geospatial variables. Besides time scales in temporal factor, we may include day-of-week, week-of-year and month-of-year as well. We know the population distribution in Fairfax County from the Census data. The simulation begins by choosing an agent at random from one of the 54 postal codes in Fairfax County. Because we know the distribution of the job classes and the ethnicity within each zip code, we can attach to the selected agent information about the agent's ethnicity and his job class. We could also attach information about age, gender, and socioeconomic status based on the Census data. While the National Longitudinal Alcohol Epidemiological Survey (NLAES) of NIH does not provide information on whether someone is an alcohol misuser and is not conditioned on zip code, it does provide this information on the basis of the agent ethnicity and the job class. With this, we can estimate the probability that the agent will be a misuser of alcohol. We also have information from the VABC on the availability of alcohol principally in terms of sales volumes of distilled spirits for each ABC store within each zip code, but also more generally sales tax figures for outlets selling beer and wine. The prevalence of acute outcomes is dependent on the nature of the acute outcome. By aggregating figures in each acute outcome annually we can estimate the probability that the agent will engage in some acute outcome. This process associates with each agent the likelihood of a specific type of acute outcome and simultaneously gives us aggregated information for each zip code, job class, ethnicity/race, and so on. The proposed model of relationships between alcohol and alcohol-related problems will allow for the examination of the impact of changes without time and economic cost constraints.