Objectives

- Estimate the number of Drug/Alcohol-related intoxication deaths in counties of Maryland
- Estimate the number of admissions to state-supported drug/alcohol treatment in counties of Maryland

Data

- Y-variables: drug/Alcohol-related intoxication deaths and admissions to state-supported treatment
- X-variables: property crimes, violent crimes, population, demographics, quality of life, geography, employment, transportation, education, and government expenditures
- All observations organized by county

Methods

- Height of bar plots rendered from intoxication deaths and drug/alcohol treatment divided by population to obtain per capita values and minimize confounding from population
- Data from one year selected for consistency; 2010 has most available data
- Data on intoxication deaths and drug/alcohol treatment approximately follow the Poisson distribution but with some overdispersion

- Generalized linear model receives vector of possible explanatory variables
- Stepwise function compares y-variable to multiple x-variables to write equation that attempts to estimate true y-variable values with the least error
- 2010 population data used as offset variable to minimize confounding from population
- Extra code compensates for overdispersion of distribution of y-variables to provide more clarity on which x-variables are significant

Bar Plots of true values

Intoxication Deaths
map of expected values

Treatment Admissions
map of expected values

Conclusions

- Significant x-variables for intoxication death model

<table>
<thead>
<tr>
<th>X-Variable</th>
<th>Estimated Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Age</td>
<td>1.874e-01</td>
</tr>
<tr>
<td>Median Household Income</td>
<td>3.984e-05</td>
</tr>
<tr>
<td>Annual Number of Public High School Graduates</td>
<td>-3.299e-04</td>
</tr>
<tr>
<td>Total Average Annual Employment</td>
<td>7.857e-06</td>
</tr>
</tbody>
</table>

- Significant x-variables for treatment admissions model

<table>
<thead>
<tr>
<th>X-Variable</th>
<th>Estimated Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Number of Public High School Graduates</td>
<td>1.874e-01</td>
</tr>
<tr>
<td>Percent Bachelor's Degree Attainment</td>
<td>3.984e-05</td>
</tr>
<tr>
<td>Total Average Annual Employment</td>
<td>3.299e-04</td>
</tr>
</tbody>
</table>

Future Considerations

- Model may be successful at predicting future numbers of intoxication deaths and treatment admissions for counties in Maryland with only the above x-variables
- Could include other x-variables in the model
- Model is limited by inability of Poisson distribution to account for the overdispersion of the y-variables
- Negative binomial distribution may be a better fit for the data
- Could apply the model to x-variable data from other states
- Could apply similar model to predict other y-variables such as crimes or hospital needs

Acknowledgments

- Software used: R (www.r-project.org)
- Plots made with: ggplot2 package in R
- Maps made with: ggmap package in R
- Data acquired from DATA.GOV
- Thanks to Dr. Earvin Balderama, Dr. Mark Albert, and the following: