



# Examining the Relationship between Crime and Alcohol Outlets in Eau Claire County, WI

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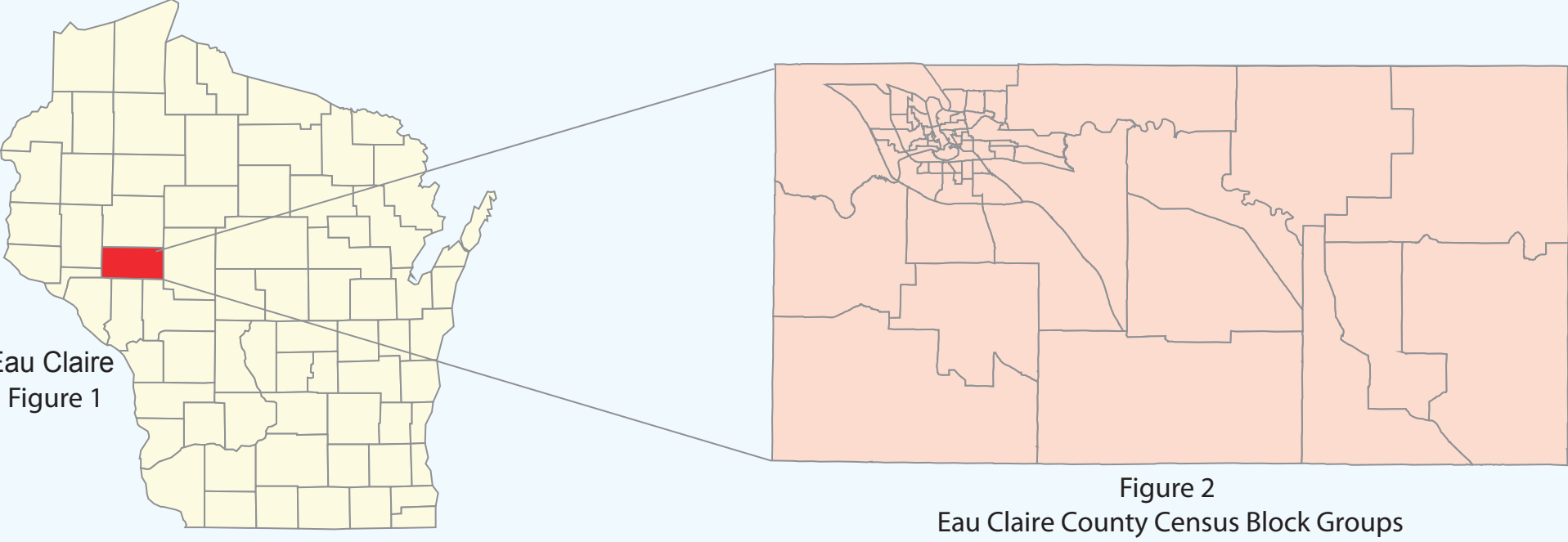
## Abstract

The goal of this study is to explore the geographic relationships between crime occurrences and alcohol outlets within Eau Claire County, Wisconsin through both ordinary least squares and step-wise regression. Independent variables include alcohol license density, and a suite of data from the U.S. Census Bureau 2000 census data (population density, median income, unemployment, poverty, education level, and race). The dependant variable, crime density, was categorized by incident type, for example driving under the influence, burglaries, robbery, etc., and analyzed separately against the suite of independent variables. Both independent and dependant variables were spatially aggregated to the block group level, the unit of analysis. The spatial clustering of crime occurrences within the county was also explored with hot spot analysis and spatial autocorrelation. LISA, Localized Indicator of Spatial Autocorrelation, was used to examine the spatial autocorrelation of crimes. A spatial time analysis was done using the crimes from years 2003 and 2007 using regression results. Results indicate a positive relationship between crime density and alcohol outlet density in both years. The outcomes of this research will inform the Eau Claire County Board in their evaluation process for alcohol license requests. These outcomes will also assist law enforcement in crime prevention and resource allocation.

## Introduction

Wisconsin has long been associated with a heavy drinking culture, commonly linked to the State's German history and heritage. From 2004 to 2005, Wisconsin led the Nation in high school drinking, underage drinking, and binge drinking (Baeseman, 2009). Crime is more likely to happen in areas where urban blight has occurred and within distressed communities (Baeseman, 2009; Gruenewald and Remer, 2006). However, crime also tends to occur more often in areas where there is a significant amount of surrounding alcohol outlets. Over the past several years, a number of studies have examined the spatial relationship between crime and alcohol outlets. These studies have demonstrated a correlation between alcohol availability and an increase in crime density. (Gruenewald and Remer, 2006; Zhu et al., 2004).

The purpose of this study is to explore the geographic relationship between crime occurrences and alcohol outlet density in Eau Claire County, WI (Figure 1). A majority of studies examine the relationship between alcohol and crime within a city limit at the zip code or census tract level (Gruenewald and Remer, 2006; Zhu et al., 2004; Gorman et al., 2001). This study is unique because it will examine the entire county of Eau Claire at the census block group level. Eau Claire County is made up of 66 block groups (Figure 2). Previous research using block group level analysis demonstrates a strong association between alcohol outlet density and crime density (Gorman et al., 2001; Zhu et al., 2004). With larger units of analysis, such as an entire county or a large number of zip codes, social characteristics commonly explain more of the variability in crime than alcohol outlets. This demonstrates the importance of scale, and choosing the correct unit of analysis for the study area.



## Objectives

1. Map crime occurrences (2003 and 2007) and alcohol outlets in the County of Eau Claire, WI.
2. Obtain socio-demographic U.S. Census Bureau data (2000) and aggregate crime and alcohol data to the block group level.
3. Use Ordinary Least Squares Regression and Stepwise Regression to explore the relationships between the dependent variables (socio-demographic variables and alcohol outlets) and crime density.
4. Determine if the relationships vary by crime type.
5. Identify crime hot spots in Eau Claire County.

## Methodology

1. Crime data for 2003 and 2007, provided by the City of Eau Claire Police Department, were geocoded using ArcGIS software. Available crime data were categorized into six distinct categories: Sex Offenses, Drug Offenses, Burglaries, Battery, Domestic Disturbances, and Drinking and Driving offenses.
2. Socio-demographic data were collected at the Census block group level, based on available 2000 Census data. Variables examined include: racial variables, median household income, education variables, poverty, and the number of persons aged 21 and older. Where needed, data was calculated as the percent of the total population.
3. All alcohol outlets were geocoded for Eau Claire County.
4. Subsequently all crime and liquor outlets were aggregated at the block group level using a spatial join function in ArcGIS. Similarly, all socio-demographic data was join to their respective block group.
5. A Stepwise Multiple Regression procedure were used to identify probable influences on crime in Eau Claire County. Total crimes, as well as individual crimes were set as dependent variables, while total alcohol outlets and socio-demographic variables per block group were tested as independent variables. A final set of 3 variables were used for the final regression model.
6. A Hot Spot analysis of total crimes were used in ArcGIS to identify hot spots of crime in Eau Claire County.
7. A Local Indicator of Spatial Autocorrelation (LISA) test was run to further identify areas with high levels of crime, as well as areas with low levels of crime.

## Acknowledgements

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## Crime Analysis

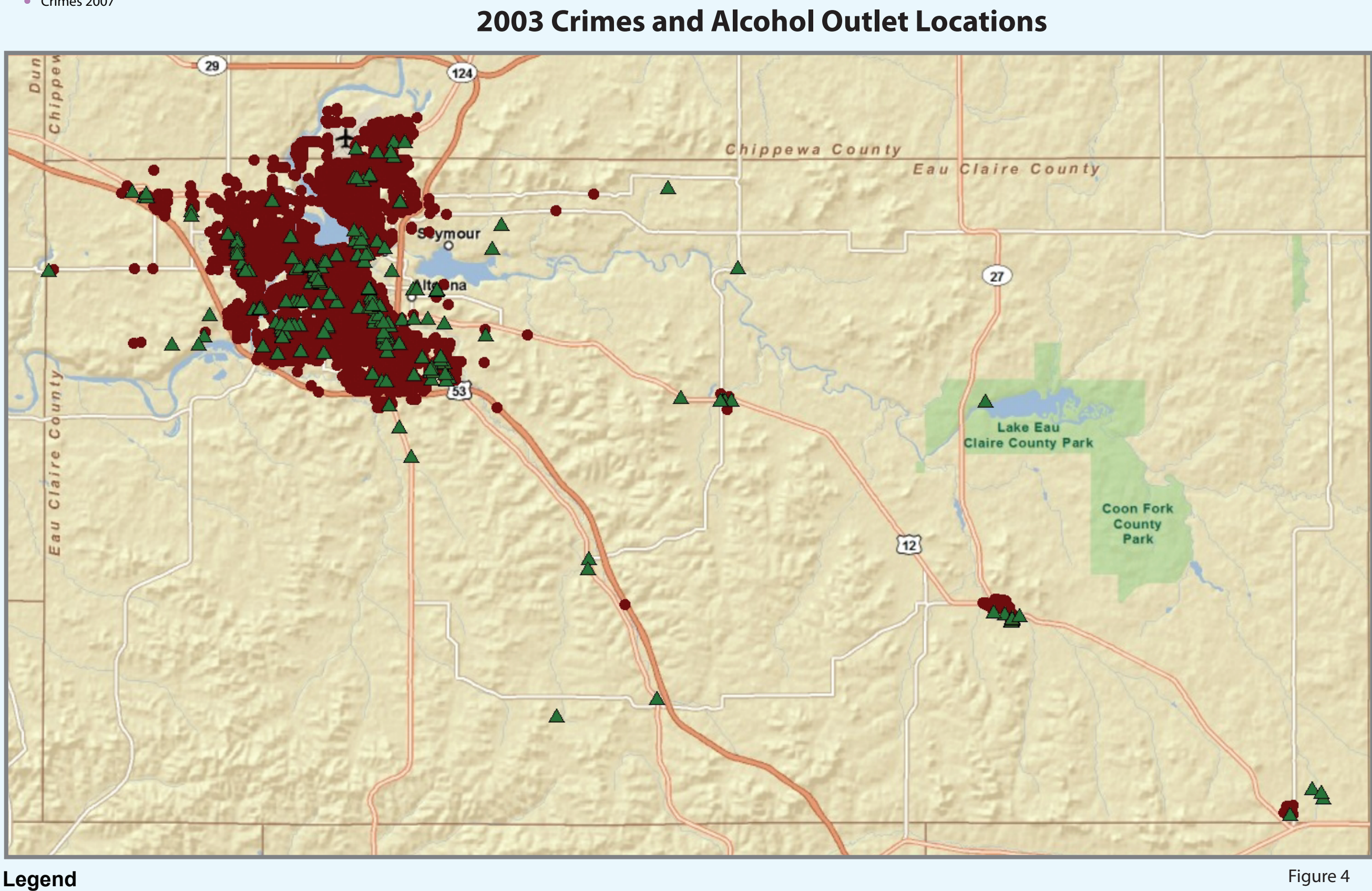
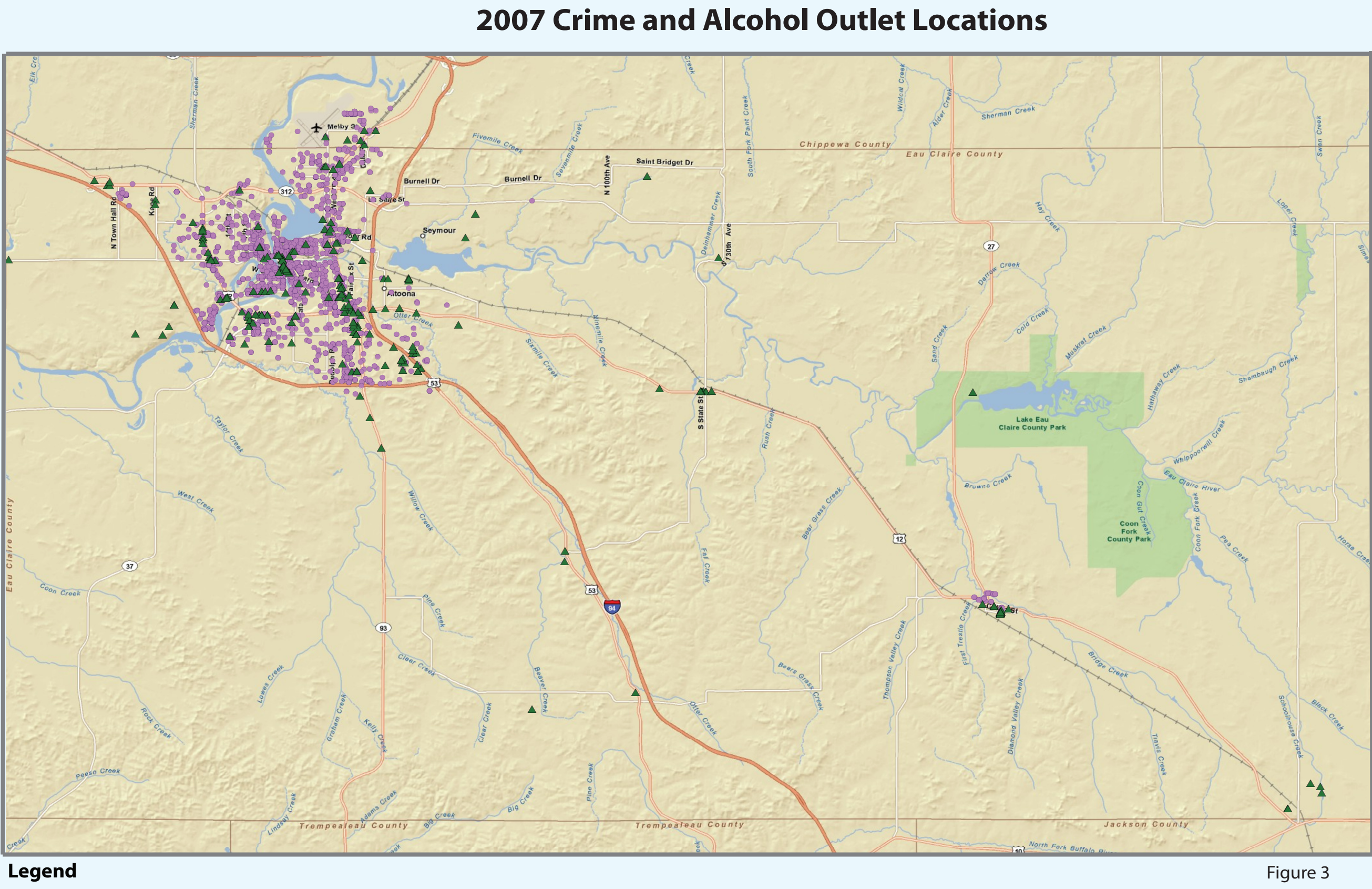
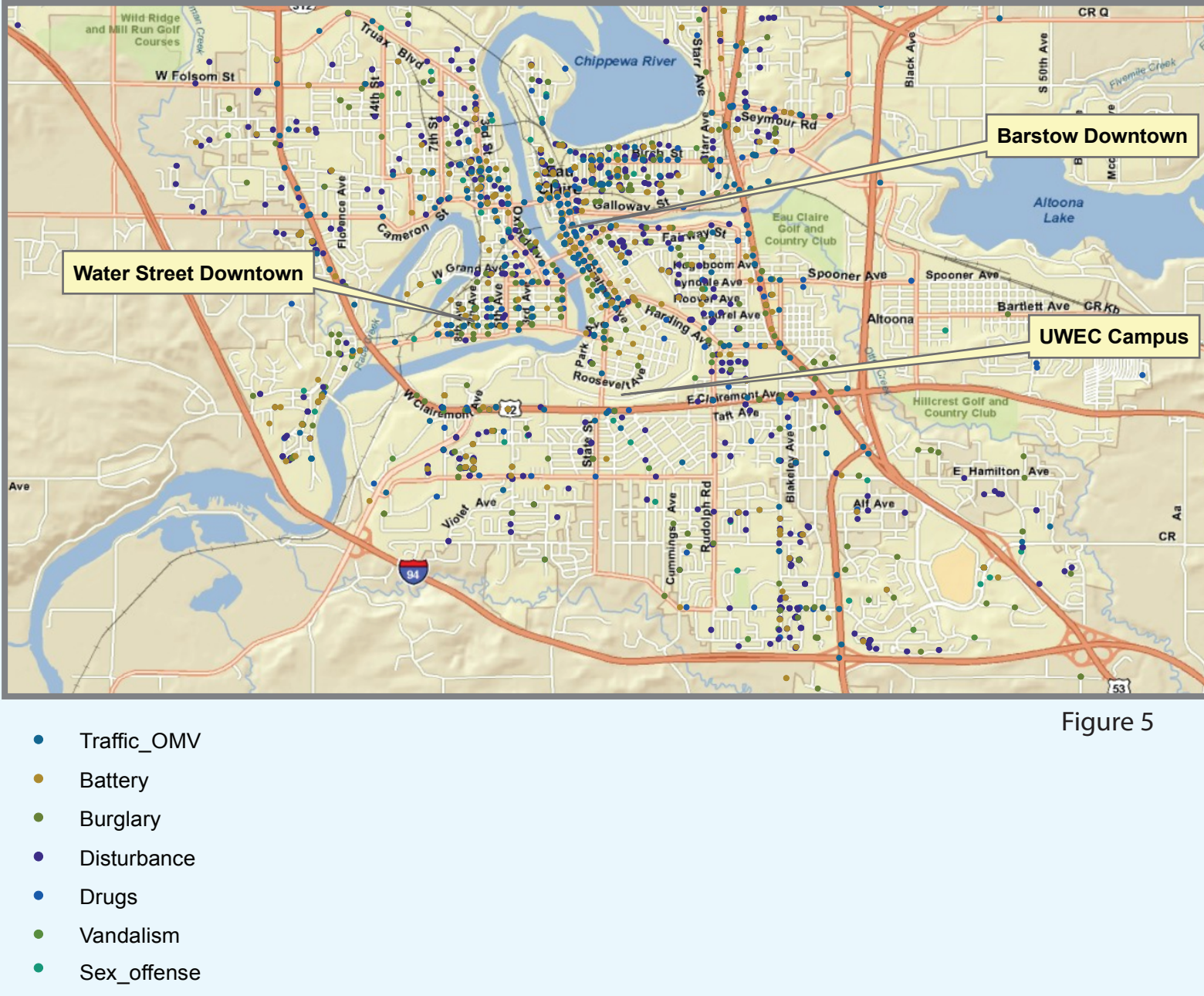


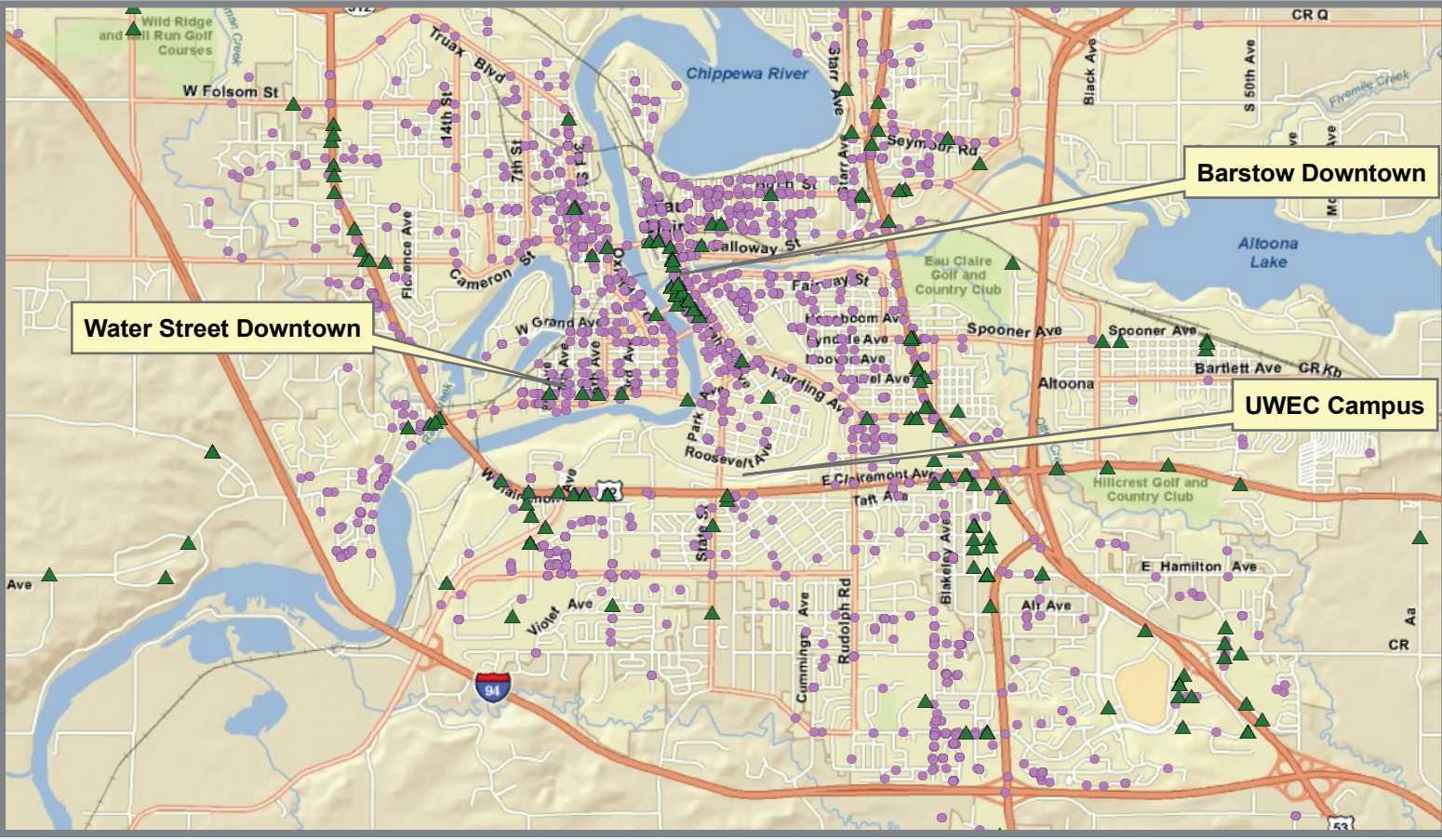
Figure 3 illustrates the geocoded crimes and alcohol outlets for Eau Claire County. In 2007, there were 2,504 crimes and 235 alcohol outlets, the majority of these within the City of Eau Claire. Figure 6 illustrates the clustering of crimes and alcohol outlets within Eau Claire and highlights areas such as Water Street Downtown and Barstow Street Downtown, where there are higher numbers of both crimes and alcohol outlets. Besides these two areas, greater numbers of alcohol outlets are located along Highway 12 running through the City of Eau Claire. Figure 5 demonstrates the individual crimes that were recorded, and highlights areas where certain crimes are more common than others such as drunken driving cases around the downtown areas.

Figure 4 illustrates the geocoded crimes and alcohol outlets for Eau Claire County for 2003. There were 31,538 crimes throughout the county in 2003. As with 2007, the crimes are mainly clustered within the City of Eau Claire. Figure 7 demonstrates the clustering of crimes within the City of Eau Claire for 2003. The 2003 dataset includes all calls, arrests, and tickets, whereas the 2007 dataset includes only arrests. Therefore, instead of the 7 categories of crimes, each with their appropriate subcategory, for 2007, there were 30 categories of crimes also with multiple subcategories for 2003. Examples of these added categories include Animal, Alarm, Child, Crash, Parking, Weapon, Juvenile, and Civil Dispute.

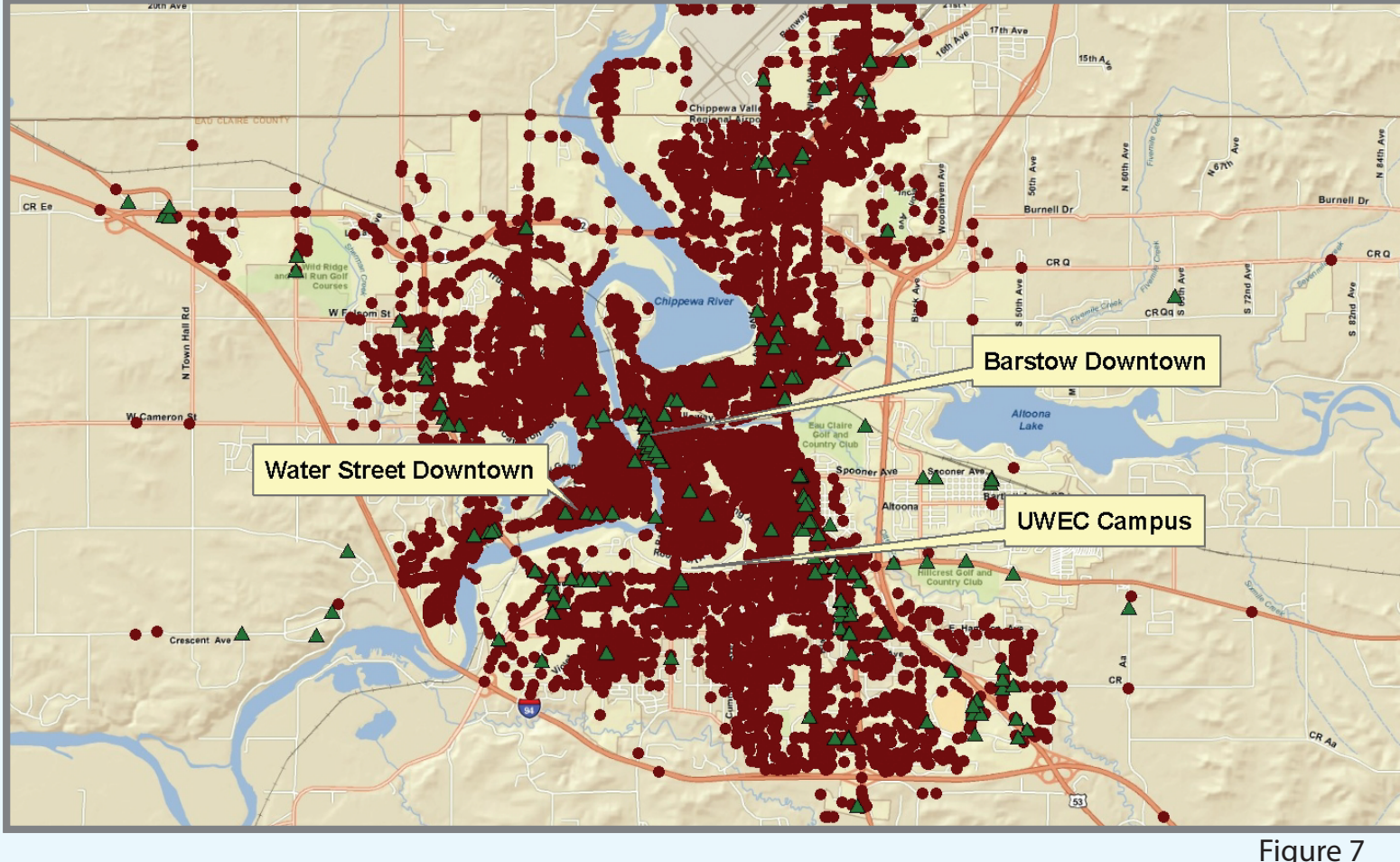
## Type of Crime 2007



## Eau Claire 2007



## Eau Claire 2003



## Regression Results

Dependent Variable	Independent Variable	Std. Error of Est.	B	Std. Error	Beta	t	Sig.	R	R <sup>2</sup>
Sex Offense	Constant	1.614	19.154	3.836		4.993	0	0.623	0.388
	Percent White		-19.242	3.923	-0.513	4.905	0		
	Percent No Education		33.96	16.145	0.22	2.103	0.039		
Drugs	Constant	4.287	36.816	10.45		3.523	0.001	0.692	0.479
	Alcohol Outlets		0.571	0.119	0.448	4.815	0		
	Percent White		-38.301	10.576	-0.358	3.621	0.001		
	Percent Unemployed		72.247	34.737	0.206	2.08	0.042		
Burglary	Constant	4.656	15.249	2.416		6.311	0	0.644	0.415
	Median Household Income		0	0	-0.5	4.79	0		
	Alcohol Outlets		0.534	0.138	0.407	3.865	0		
	Percent No Education		-101.536	49.355	-0.225	-2.06	0.044		
Battery	Constant	6.791	64.464	15.076		4.276	0	0.648	0.42
	Percent White		-57.823	16.465	-0.36	-3.51	0.001		
	Alcohol Outlets		0.683	0.192	0.355	3.565	0.001		
	Median Household Income		0	0	-0.221	-2.11	0.039		
Disturbance	Constant	13.61	147.314	30.207		4.877	0	0.574	0.329
	Percent White		-125.6	33.053	-0.42	-3.8	0		
	Median Household Income		0	0	-0.417	-2.96	0.004		
	Percent Higher Education		132.027	64.321	0.283	2.053	0.044		
Traffic-OMV	Constant	5.589	8.859	2.462		3.598	0.001	0.639	0.408
	Alcohol Outlets		0.786	0.158	0.485	4.86	0		
	Median Household Income		0	0	-3.18	-3.19	0.002		
All Crimes 2007	Constant	27.88	320.879	61.899		5.184	0	0.71	0.504
	Percent White		-276.753	67.601	-0.387	-4.08	0		
	Alcohol Outlets		3.079	0.786	0.36	3.915	0		
	Median Household Income		0	0	-0.278	-2.87	0.006		
All Crimes 2003	Constant	348.45	2343.87	784.092		2.989	0.004	0.732	0.536
	Alcohol Outlets		61.153	9.977	0.57	6.13	0		
	Median Household Income		-0.01	0.004	-0.256	-2.63	0.011		
	Percent White		-1775.82	857.965	-0.198	-2.07	0.043		

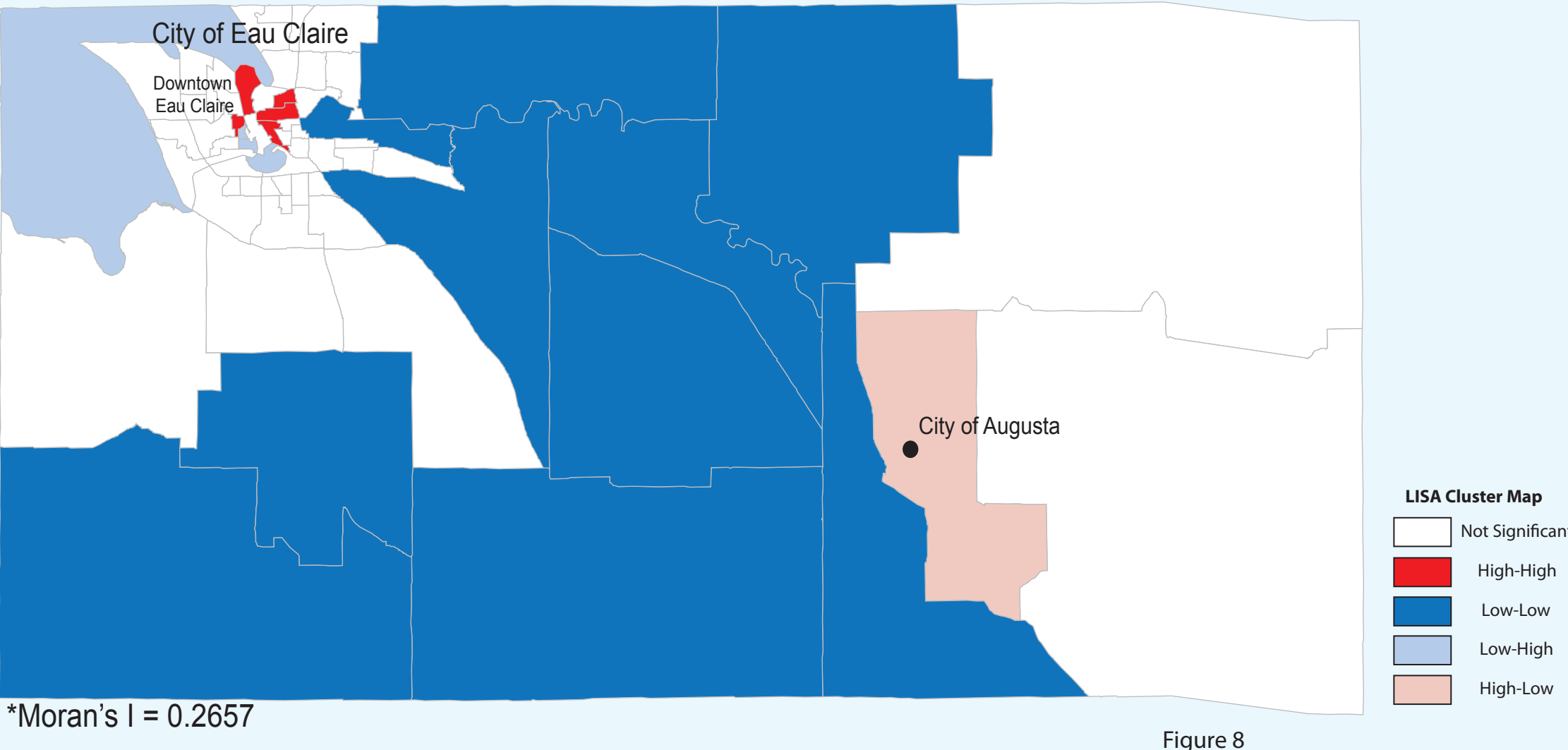
The Stepwise Multiple Regression procedure systematically identifies the significant independent variables that best explain the dependent variable. The results above indicate Stepwise results for the significant independent variables. For example, the test for the dependent variable "All Crimes 2007" tested all independent variables with the aggregated total number of crimes per block group. The interpretation of the results indicates that the three significant independent variables explained 50.4% of the total variance (see the R-squared value). As identified by the largest Beta Value (-0.387), Percent White, in relation to the other independent variables, is the most predictive variable in explaining crime in Eau Claire County. Overall, the results show that crimes decrease as proportions of white population and income levels increase, while crimes increase as the number of alcohol outlets increase. When using crimes from 2003 for a time analysis, the regression results indicate the same three variables account for most of the crime, however Alcohol Outlets is the strongest indicator of crime in 2003 rather than Percent White as in 2007.

When comparing individual crime results, percent white and the presence of alcohol outlets were the most often cited. Interesting examples include the connection to drugs and alcohol outlets, as well as drunken driving offenses and alcohol outlets. In each of the cases, incidents of both crimes increased as the number of alcohol outlets increased (see Figures 3 - 7). By and large, higher crime levels in Eau Claire County tend to be associated with the presence of alcohol outlets.

## Population Statistics of Eau Claire County

Total	White	Black	Hispanic	Asian	Native American	Other	Multi-Race
85,821	94.90%	0.55%	0.93%	2.50%	0.56%	0.34%	1.15%

## Spatial Clustering of Total Crime for 2007 for Eau Claire County



LISA stands for Localized Indicators of Spatial Autocorrelation. Figure 8 illustrates that crimes in Eau Claire County are spatially clustered around the downtown area of the City of Eau Claire. High-High refers to areas with higher than expected incidents of total crime located near areas with higher than expected incidents of total crime. Low-High, in the Northwest area of the county, are areas with lower than expected crimes next to areas with higher incidents of crime. High-low, comprising the City of Augusta, has higher incidents of crime surrounded by areas with lower than expected incidents of crime.

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