The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light sky blue to deep navy blue. The shapes are primarily triangles and polygons, creating a dynamic, layered effect. The overall composition is clean and modern, with the text centered in the white space.

Proximity to Alcohol-Serving Establishments and Crime Probabilities in Savannah, Georgia: A Statistical and GIS Analysis

Naresh Kumar, Christopher R. M. Waylor, 2003

By: Alex Briault

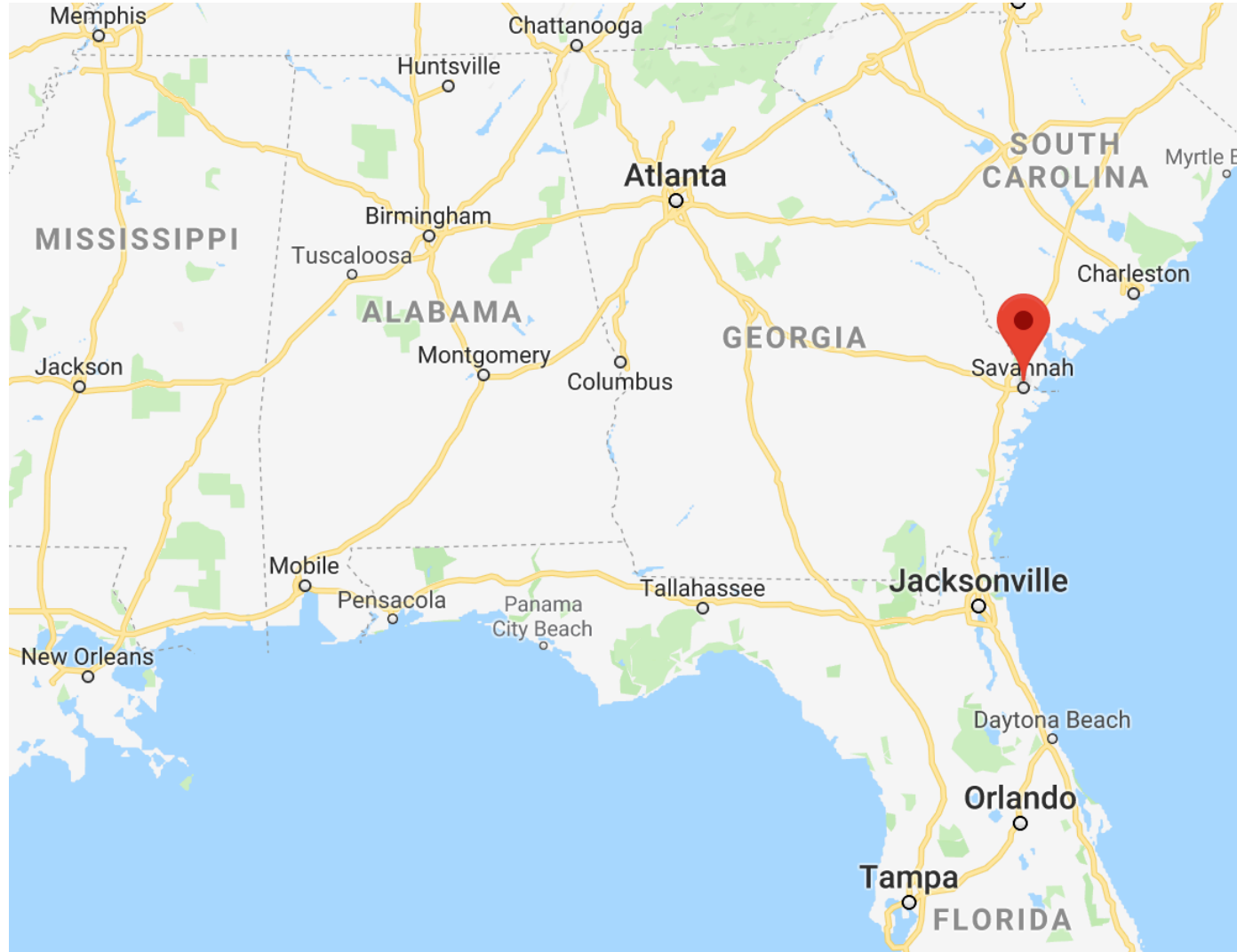
Background

- ▶ Link between alcohol consumption and violence well-established
 - ▶ 1993 study shows that a 15% increase in alcohol consumption was associated with a 5.9% increase in assault rate
 - ▶ 14 separate studies reported that 50% of homicides involved offender or victim consuming alcohol
- ▶ Crime hot spots include liquor stores, taverns, night life areas, restaurants, convenience stores, public housing, and high schools
- ▶ High densities of alcohol sales/services linked to higher rates of homicide, assault, and hospital admissions even when adjusted for other demographic variables

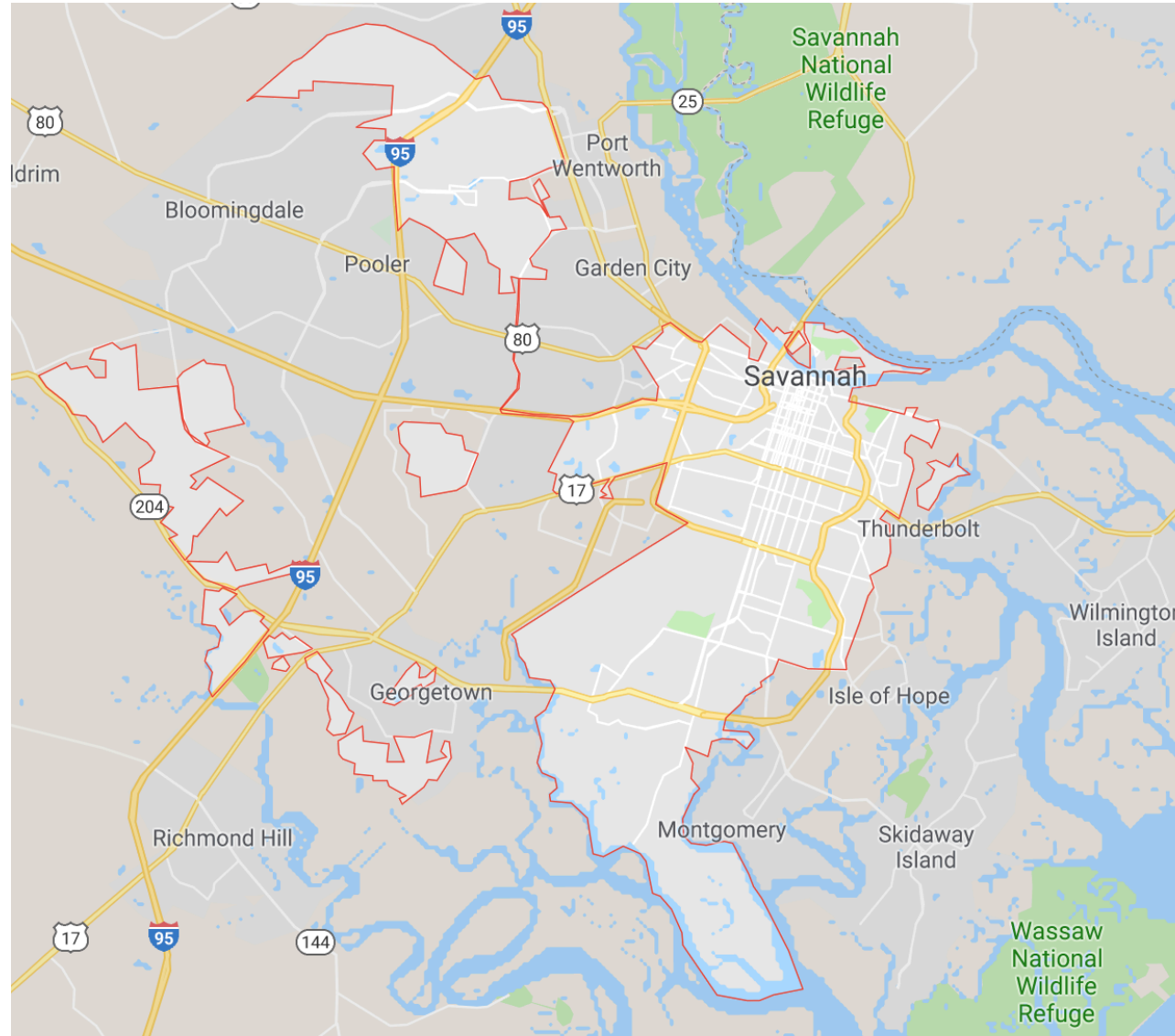
“Our hypothesis is that the spatial pattern of crime probabilities is an inverse function of distance from alcohol-serving establishments

”

Study Area: Savannah, Georgia, USA



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- ▶ 4.5% population decrease from 1990-2000
- ▶ 9,473 crimes per 100,000 inhabitants (over 2x crime rate for USA)
- ▶ 60% White, 38% Black, 2% Other

	Population 2000	Population 1990	% growth (2000 to 1990)	Crime rate (crimes/100000 inhabitants)	White, Black, Other (%)
Savannah	131,510	137,812	-4.5	9,473	60.0, 38.0, 2.0
Georgia	8,186,453	6,478,216	26.4	5,463	71.0, 27.0, 2.0
United States	281,421,906	248,709,873	13.2	4,615	75.1, 12.3, 12.6

Source: U.S. Census (2000) & FedStat (2001).

Data

- ▶ Savannah Police Department
 - ▶ Geocoded data of 12,458 crime locations and 247 alcohol-serving establishments
 - ▶ From 2000 only
- ▶ Georgia GIS Clearing House
 - ▶ Road/street data
 - ▶ Landuse data

Methods

- ▶ 5 methods

- ▶ Random point generation

- ▶ Logistic regression

- ▶ Crime classification

- ▶ Crime density

- ▶ Crime probability determination

Main methods

Random Point Generation

- ▶ Used Grid Module in ArcGIS 8.1
- ▶ Image of Savannah generated with random numbers in built-up areas
- ▶ Total number of pixels for the built-up area counted
- ▶ Random number cut-off value (RNCOV) calculated to produce a number of pixels approximately equal to the total number of crimes
- ▶ Random points created from centroid coordinates of random pixels

$$RNCOV = \frac{\text{Actual number of Crime Incidences in the Study Area}}{\text{Total Number of Pixels in the Built-Up Area}}$$

Logistic Regression

- ▶ Allows regression of binary variable on an independent variable
 - ▶ Binary variable = crime and random locations together
 - ▶ Independent variable = distance from random locations and crime incidences to closest alcohol services

$$\text{Log} \frac{CP_i}{(1 - CP_i)} = a + \beta x$$

Crime Classification, Densities & Probabilities

- ▶ Crime classification
 - ▶ 12,458 incidences grouped into 79 crime types, simplified into 4 groups
- ▶ Crime Densities
 - ▶ Distance zones of 650 ft intervals

$$CD_i = \frac{\text{Number of Crime}_i}{\text{Area}_i}$$

- ▶ Crime Probabilities

$$CP_i = \frac{\text{Number of Crime Incidences}_i}{\text{Number of Crime and Random Locations}_i}$$

Results: Crime Classification

Type of crime	Crime	
	Frequency	Percentage
1. Assault, extortion, blackmail, sex related	1,225	9.83
2. Burglary, theft, robbery, larceny related	5,514	44.26
3. Vehicle theft and related	5,675	45.55
Others (not in first three categories)	44	0.35
Total	12,458	100

Results: Crime Densities

Distance (feet)	Area, sq. mile	Number of crimes	Crime density (crimes/sq. mile)
1. >650	4.73	4390	928
2. 650-1300	7.00	3026	432
3. 1300-1950	6.98	1838	263
4. 1950-2600	6.99	1218	174
5. 2600-3250	6.36	719	113
6. 3250-3900	5.79	410	71
7. 3900-4550	5.37	223	42
8. 4550-5200	5.35	110	21
9. 5200-5850	5.50	57	10
10. 5850-6500	5.66	43	8
11. 6500-7150	5.68	47	8
12. \geq 7150	466.67	377	1
Total	532.08	12458	23

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Results: Crime Probabilities

Distance Zone (Feet)	Probability (odds ratio)			
	Vehicle related	Burglary, theft, robbery related	Assault, sex related	All crimes
>650	0.83 (4.89)	0.83 (4.98)	0.79 (3.72)	0.83 (4.95)
650-1300	0.69 (2.27)	0.73 (2.65)	0.73 (2.76)	0.73 (2.66)
1300-1950	0.62 (1.62)	0.60 (1.50)	0.63 (1.72)	0.62 (1.62)
1950-2600	0.56 (1.27)	0.54 (1.18)	0.60 (1.49)	0.56 (1.25)
2600-3250	0.51 (1.02)	0.44 (0.78)	0.59 (1.42)	0.48 (0.94)
3250-3900	0.46 (0.84)	0.39 (0.64)	0.53 (1.11)	0.43 (0.76)
3900-4550	0.40 (0.67)	0.28 (0.39)	0.34 (0.52)	0.36 (0.56)
4550-5200	0.24 (0.32)	0.29 (0.41)	0.31 (0.45)	0.28 (0.38)
5200-5850	0.16 (0.19)	0.13 (0.15)	0.25 (0.33)	0.16 (0.19)
5850-6500	0.11 (0.13)	0.15 (0.18)	0.16 (0.19)	0.14 (0.16)
6500-7150	0.23 (0.29)	0.15 (0.18)	0.10 (0.10)	0.18 (0.22)
≥7150	0.06 (0.07)	0.07 (0.07)	0.06 (0.06)	0.07 (0.07)
Total	0.50 (1.00)	0.50 (1.00)	0.50 (1.00)	0.50 (1.02)

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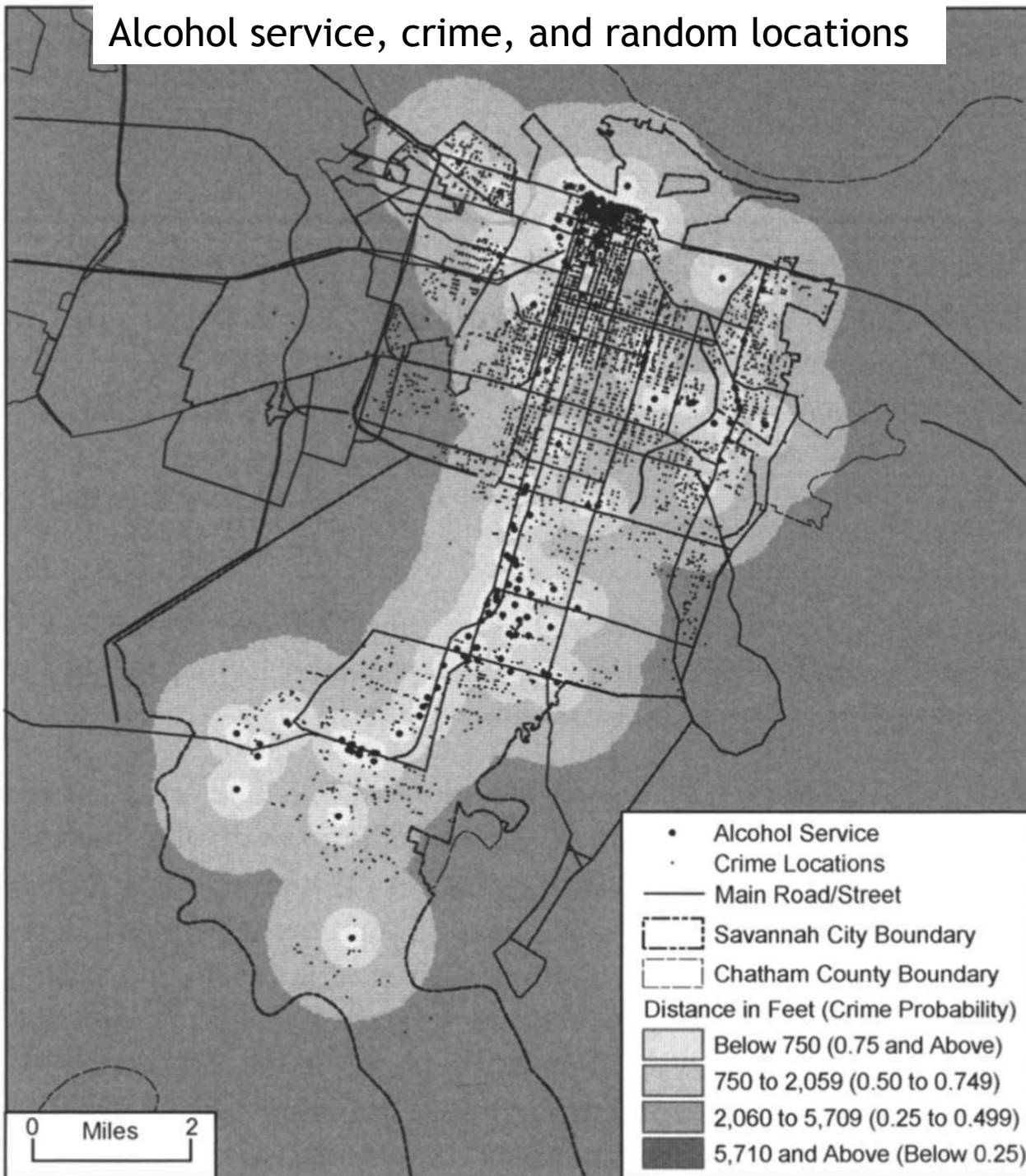
Results: Logistic Regression

	Regression coefficient	Standard error	Z-value	P > Z	95% confidence interval	
Vehicle theft and related crimes						
Distance from liquor service	-1.054	0.022	-48.716	0.000	-1.096	-1.011
Constant/intercept	8.023	0.167	48.145	0.000	7.697	8.350
Burglary, theft, robbery related crime						
Distance from liquor service	-1.097	0.022	-49.137	0.000	-1.141	-1.053
Constant/intercept	8.304	0.171	48.703	0.000	7.970	8.639
Assault sex related crimes						
Distance from liquor service	-1.021	0.047	-21.934	0.000	-1.112	-0.930
Constant/intercept	7.849	0.361	21.722	0.000	7.140	8.557
All crimes						
Distance from liquor service	-1.092	0.015	-72.971	0.000	-1.121	-1.063
Constant/intercept	8.328	0.115	72.318	0.000	8.102	8.554

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Alcohol service, crime, and random locations



Alcohol service and crime probabilities



“

A myriad of confounding variables renders human aggression and its relationship with alcohol a very complex subject to study. Our analysis cannot exclude the possibility of an alternate hypothesis—"whether alcohol is simply associated with crime or plays a causal role" (Parker, 1995, p. 3).

”

Limitations and Future Study

- ▶ Crime data is only from Savannah Police Department
- ▶ Crime location data based on officer/dispatcher's best estimate of exact location of crime event
- ▶ Inclusion of other cities of different sizes and demographics could strengthen assessed relationships or highlight effects unique to Savannah
- ▶ Proportions of crime attributable to alcohol consumption and actual levels of alcohol consumption could not be investigated with available data

Conclusions

- ▶ Goals and hypothesis clear
- ▶ Background research and literature review provided context
- ▶ Limitations are clearly reported and do not detract from the results
- ▶ Potential areas for future study and application of the author's methods practical and feasible.
- ▶ Tables and maps used to show data instead of being a very wordy paper
- ▶ **Rating: 9/10**

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Thank you!