

Anne Arundel County EMS Hot Spot Analysis

URSP 688L | Partnership for Action Learning in Sustainability

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The Team

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Emergency Medical Services (EMS)

- ❑ The EMS system has evolved over the last 40 years from primarily a Basic Life Support (BLS) service, to a non-transport Advanced Life Support (ALS) service, to today's standard of an ALS transport service supported by a few BLS transport units
- ❑ The system has been supported in a variety of different forms including: apparatus maintenance, training, equipment and a variety of new technologies
- ❑ Types of emergencies that EMS responds to: fire protection, BLS, ALS-Paramedic, Hazardous Materials, Collapse, Confined Space, Dive Rescue and Marine Operations

Mission

The County

Identify challenges, improve overall effectiveness, identify strategies to improve the effectiveness of current efforts, and reduce potential budgetary shortfalls

Our Challenge

Analyze EMS dispatches for life-threatening incidents occurring during peak hours to identify spatial and temporal patterns

Our Goal

Assist the AAC Fire Department in providing effective emergency services to the population

Context

The County

- 588 sq. mi.
- 564,195 residents

Fire Department

- 31 fire stations
- Over 550 volunteers
- Over 850 career firefighters & EMS personnel

Emergency Medical Services

- Responds to a variety of emergencies

Primary Research Questions

- Where are most of the EMS incidents occurring?
- What patterns do the data indicate?
- Where are the most life-threatening EMS incidents occurring over years and at different times of day?
- Are there any possible underlying causes of life-threatening EMS incidents?

Variables

Incidents

- Day of the Week
- Times (Peak & Nonpeak hours)
- Types of Advanced Life Support (ALS) response:
 - ◆ PM1 - 1 ALS
 - ◆ PM2 - 2 ALS (more severe)

Other Data

- American Community Survey (ACS) data for socio-demographic attributes (**population density, senior population density**)
- AAC **land use** and AAC basic data

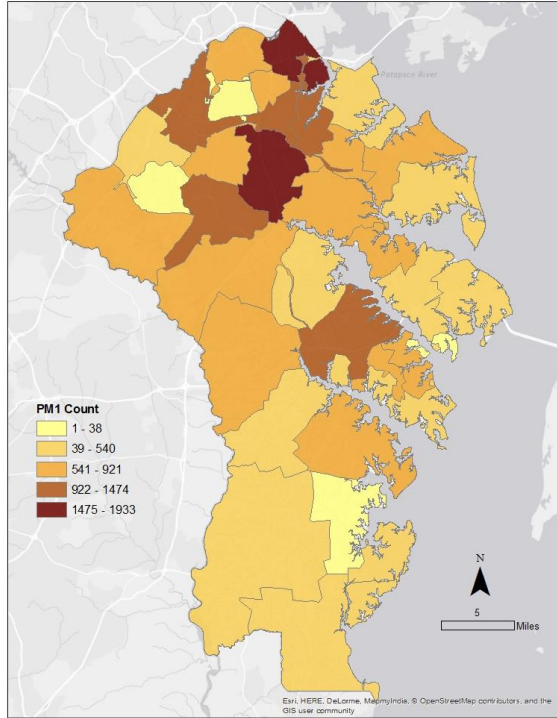


Methods

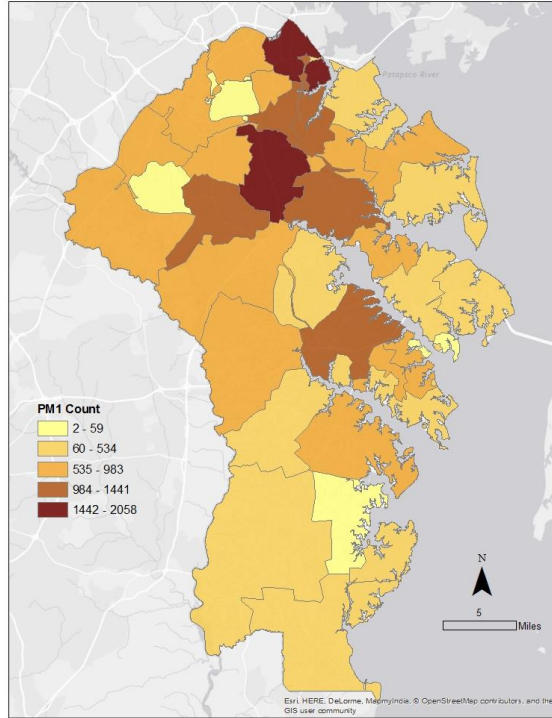
With ArcGIS software, we performed the following: joining of EMS incident data to times of day, spatial joining of incidents to fire companies, and the use of the kernel density tool to produce heat maps.

2014 - 2016 PM1

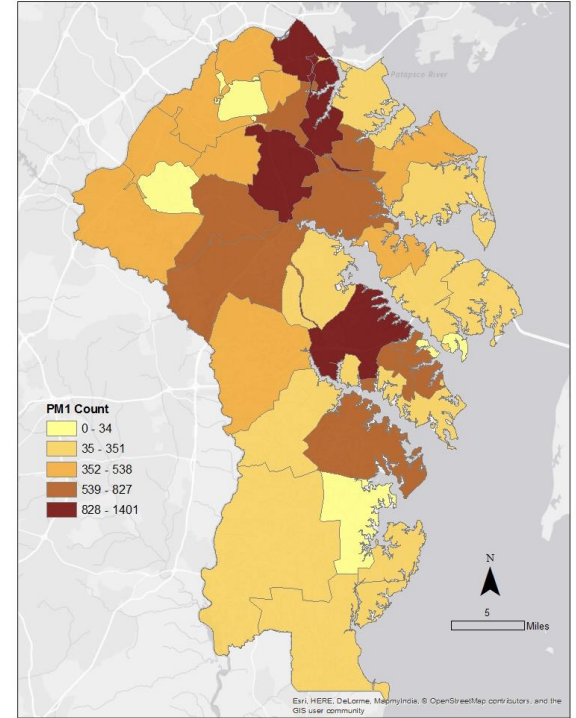
2014 PM1 Incidents Count



2015 PM1 Incidents Count

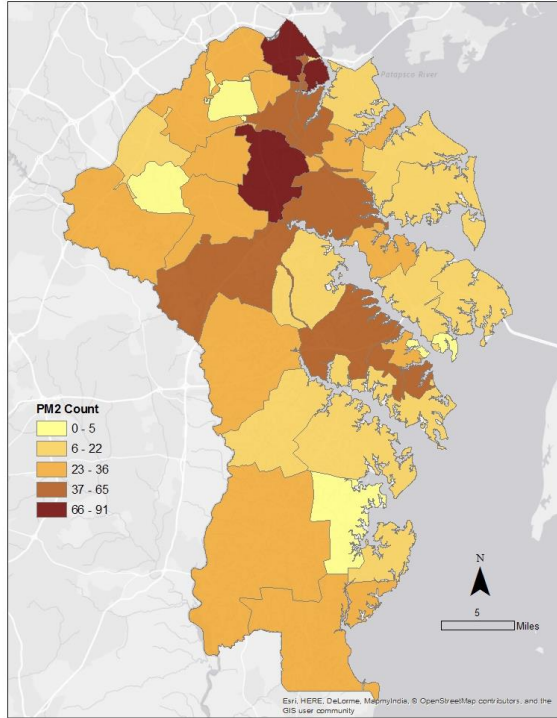


2016 PM1 Incidents Count

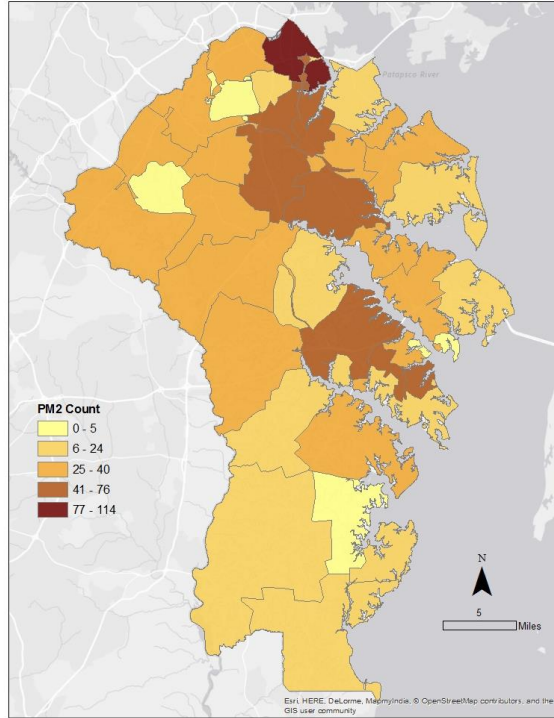


2014 - 2016 PM2

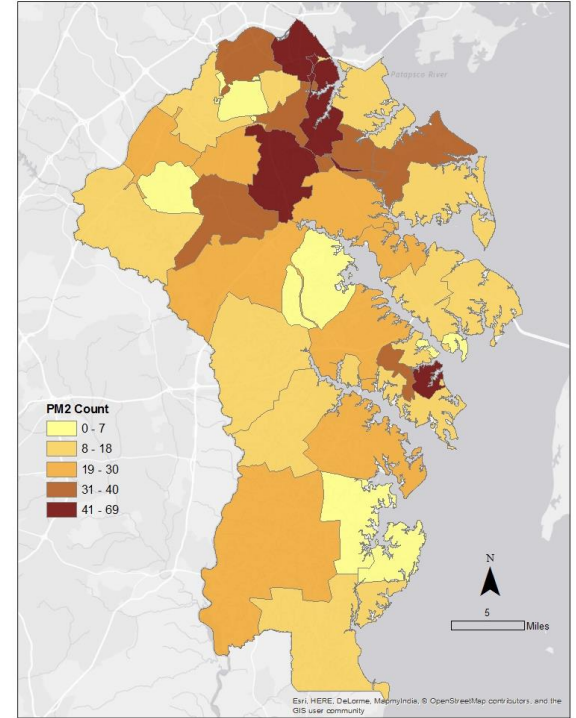
2014 PM2 Incidents Count



2015 PM2 Incidents Count

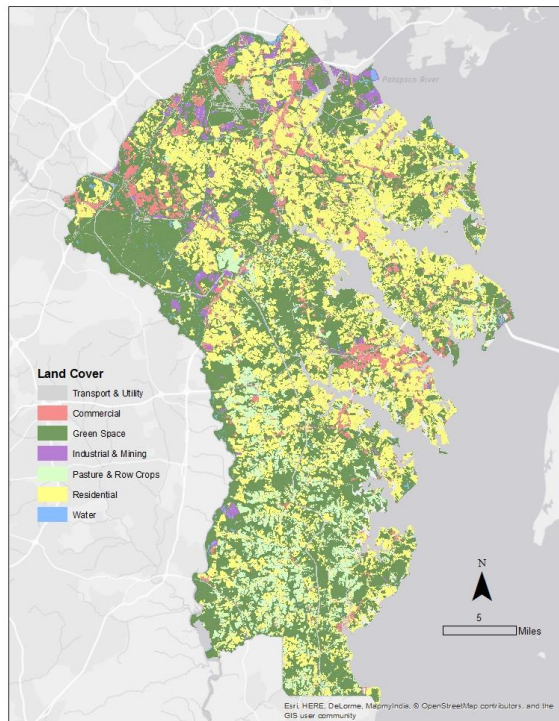


2016 PM2 Incidents Count

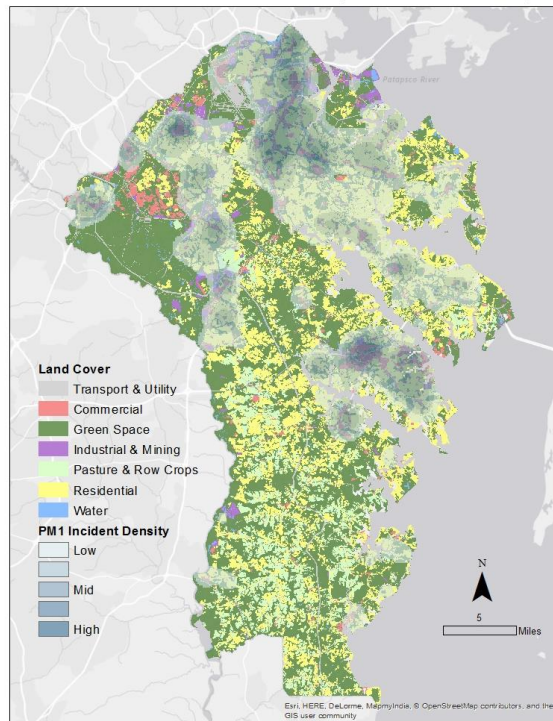


2015 Heat Map over Land Use

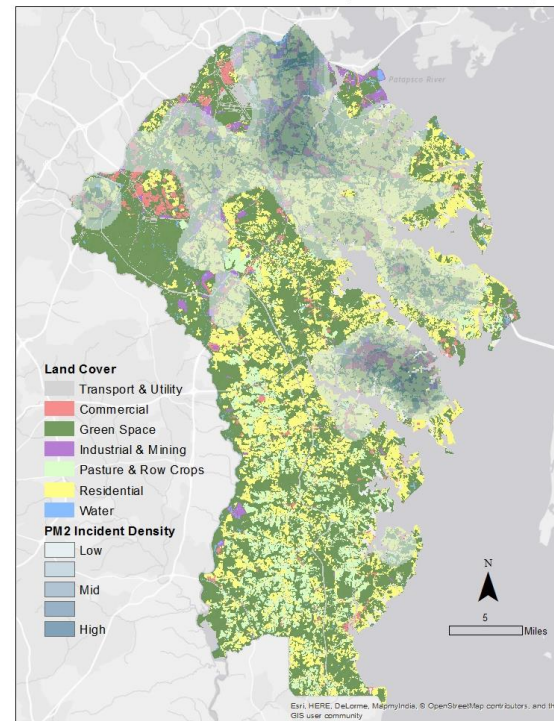
Anne Arundel County Land Use



2015 PM1 Peak Incidents Density - Land Use Overlay

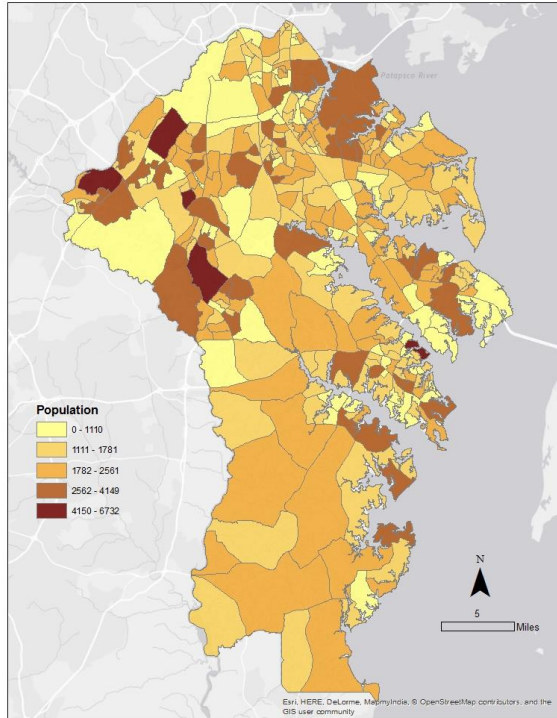


2015 PM2 Peak Incidents Density - Land Use Overlay

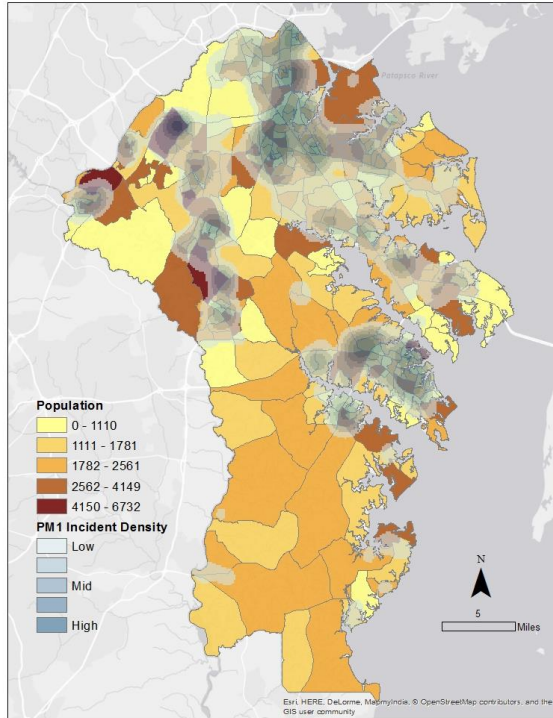


2015 Heat Map over Population

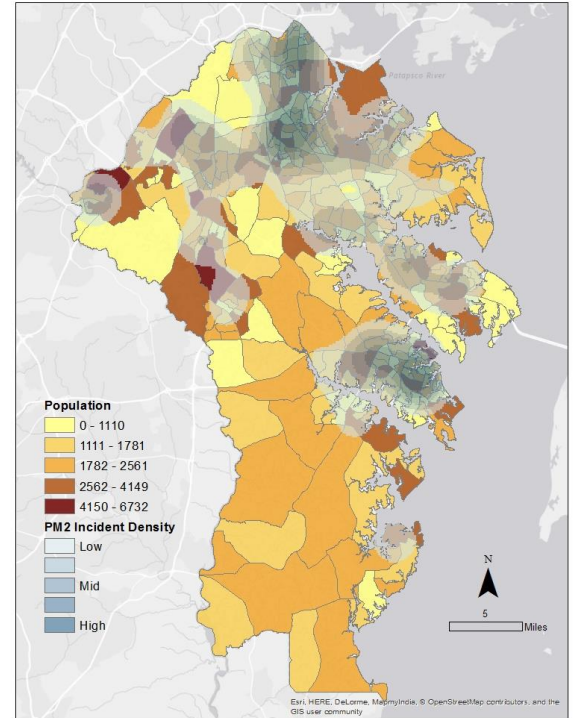
Anne Arundel County Population by Block Group



2015 PM1 Peak Incidents Density - Population Overlay

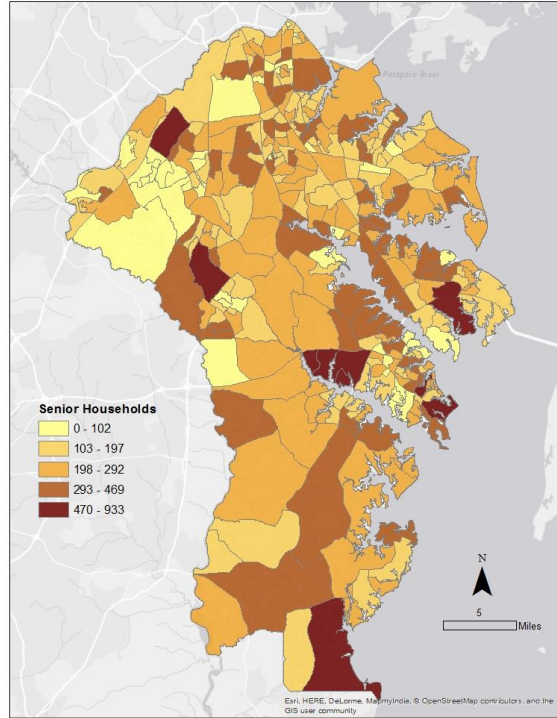


2015 PM2 Peak Incidents Density - Population Overlay

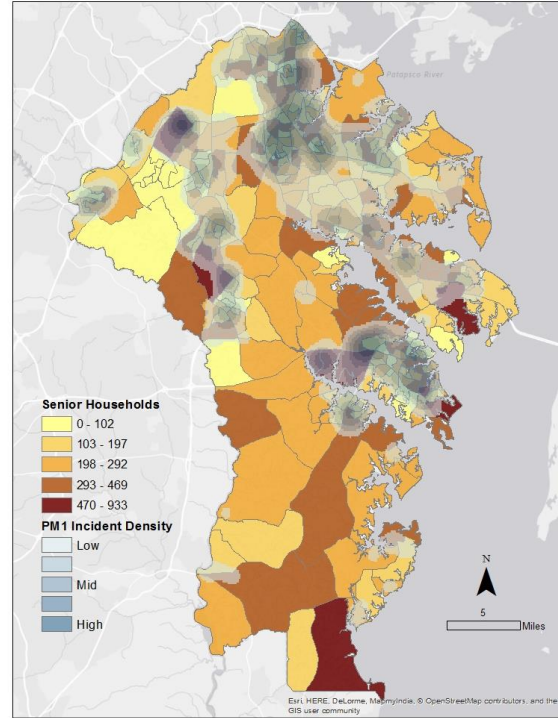


2015 Heat Map over Senior Households

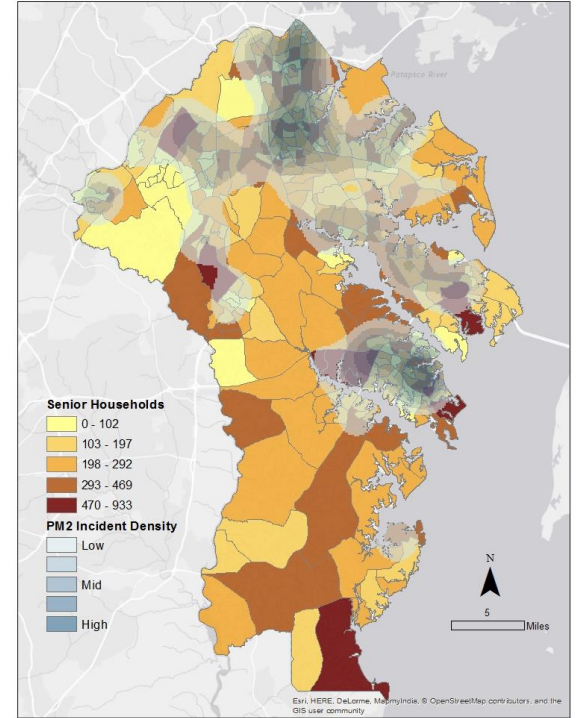
Anne Arundel County Senior Households by Block Group



2015 PM1 Peak Incidents Density - Senior Households Overlay



2015 PM2 Peak Incidents Density - Senior Households Overlay



Discussion

→ Summary of results:

- ◆ Highest concentrations are usually north of central AAC, around Annapolis, where some seniors are located, and in residential areas

→ Future directions:

- ◆ Incorporating the Network Analyst tool, which can analyze transportation routes and response times, to optimize emergency resources

→ Limitations:

- ◆ Limited Data for 2016
- ◆ Accounting for population growth across years using the

Thank you!



Photo Source: http://www.umdrighnow.umd.edu/sites/umdrighnow.umd.edu/files/annapolis_md_small.jpg