Predictive Analytics: Aligning Community Resources for Prevention

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Carl Ayers – VDSS Director of Family Services

The Project Team

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- Dr. Jeff Price – Director of Research and Planning
- Dr. Dyann Daley – MD and CEO of Predict, Align, Prevent
- Dr. Ken Steif – U Penn
- City of Richmond

Defining Predictive Analytics

Predictive Analytics: “The practice of extracting information from data sets to determine patterns and predict outcomes and trends” (Predictive Analytics, Applications in Child Welfare, Casey Family Programs)

Predictive Risk Modeling: a specific type of predictive analytics, focused on using data patterns to identify predictors of risk and assign risk categories based on these patterns to individuals and/or families (Predictive Analytics, Applications in Child Welfare, Casey Family Programs)

Examples of Predictive Analytics

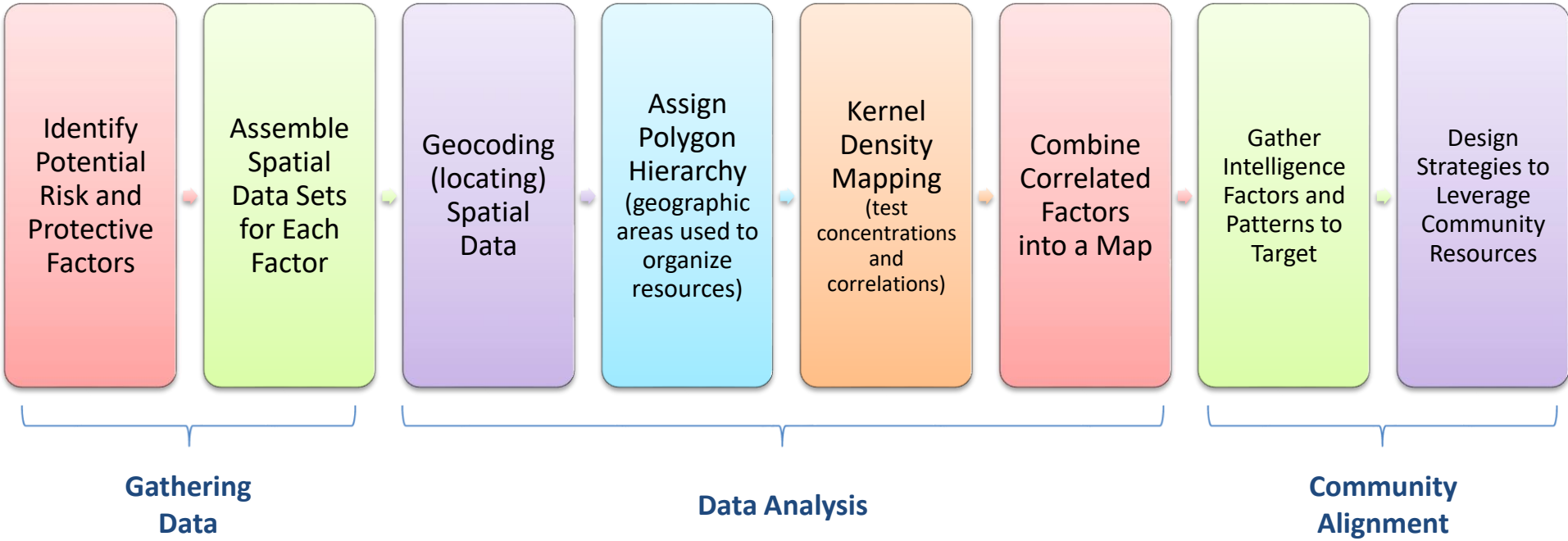
Amazon Product Recommendations

Healthcare Screenings

Facebook Ads

Fraud Detection

Predictive Analytics in Child Welfare



Geospatial Risk Modeling/Analysis

Protective Variables

6

- Social connections
- Parental supports
- Health
- Stable housing
- Employment
- More parental education
- Well resourced schools
- Places of worship
- Parks
- Community Centers
- Licensed child care
- Early learning centers
- Health clinics

Risk Factors

- Physical abuse
- Sexual abuse
- Emotional abuse
- Physical and emotional neglect
- Exposure to:
  - Domestic Violence
  - Substance misuse within household
  - Household mental illness
  - Parental separation or divorce
  - Incarcerated household member

Geospatial Risk Modeling applied to Child Abuse

If violent behavior is purely a psychological characteristic of the individual, where someone lives should have no bearing on their likelihood of experiencing ACEs and child maltreatment,

We would expect it to occur randomly across geographical regions.

This is not what we see.

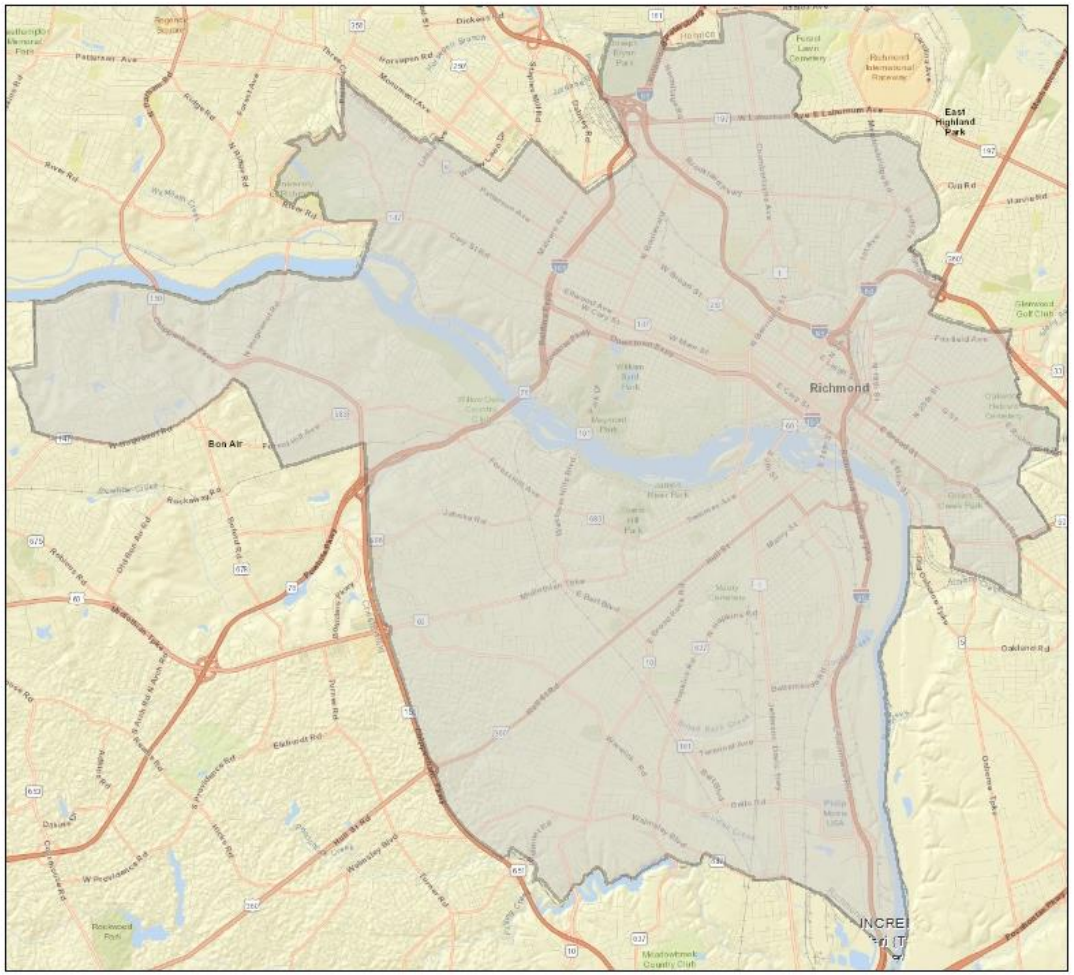
Geospatial Risk Modeling applied to Child Abuse

- Geospatial risk models are built on the notion that
  - Place matters and should be taken into account when estimating risk
  - Physical elements of the environment contribute to or reduce the likelihood of risk
- Information on these elements can be used to improve prediction – their frequency and distance from locations where child abuse occurs

Geospatial Risk Modeling applied to Child Abuse

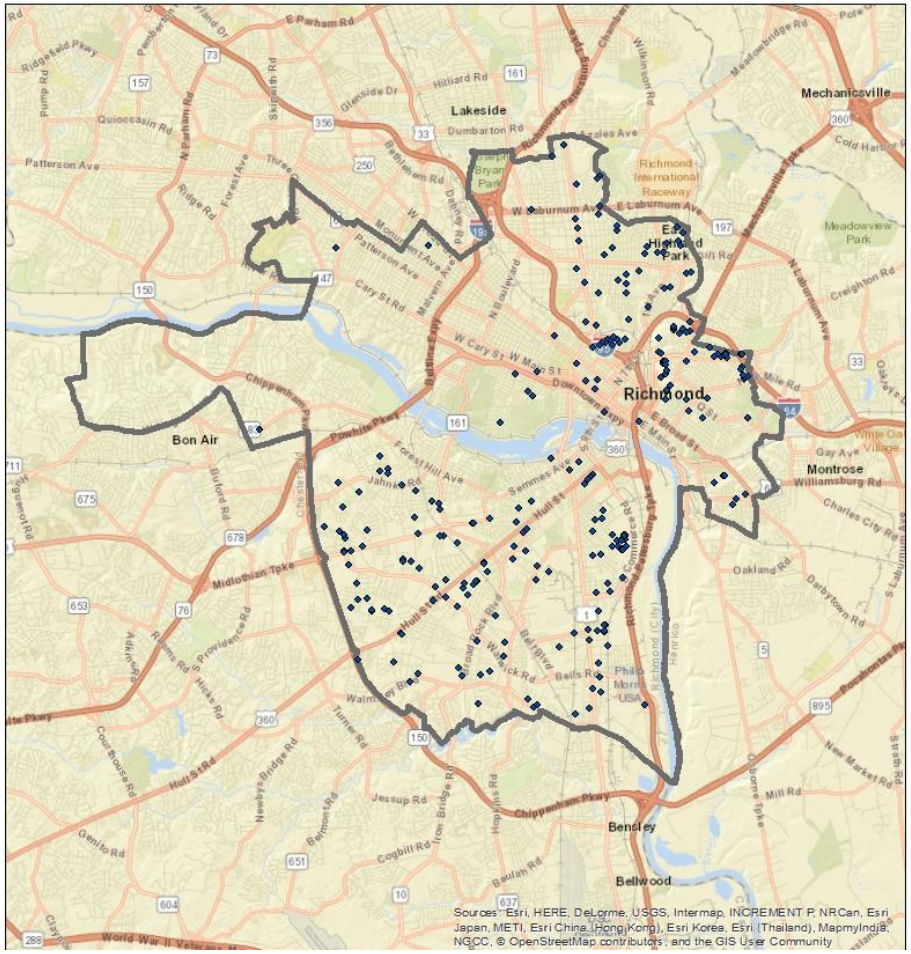
- We are interested in identifying the socio-economic and physical elements that make a neighborhood risky for children
- If features that enable or contribute to the likelihood of ACEs and child maltreatment can be identified, it is likely they can also be mitigated

The Study Area



Geocode Founded Child Maltreatment Cases

Richmond City
VDSS: Founded Referrals (SFY 2014 - 2017)
(n = 280)



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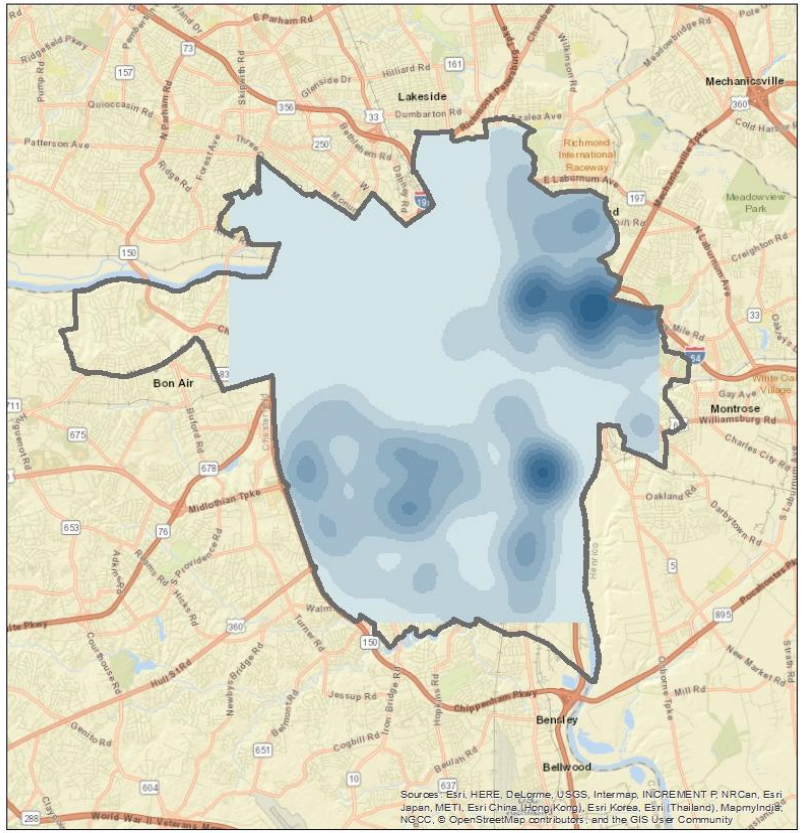
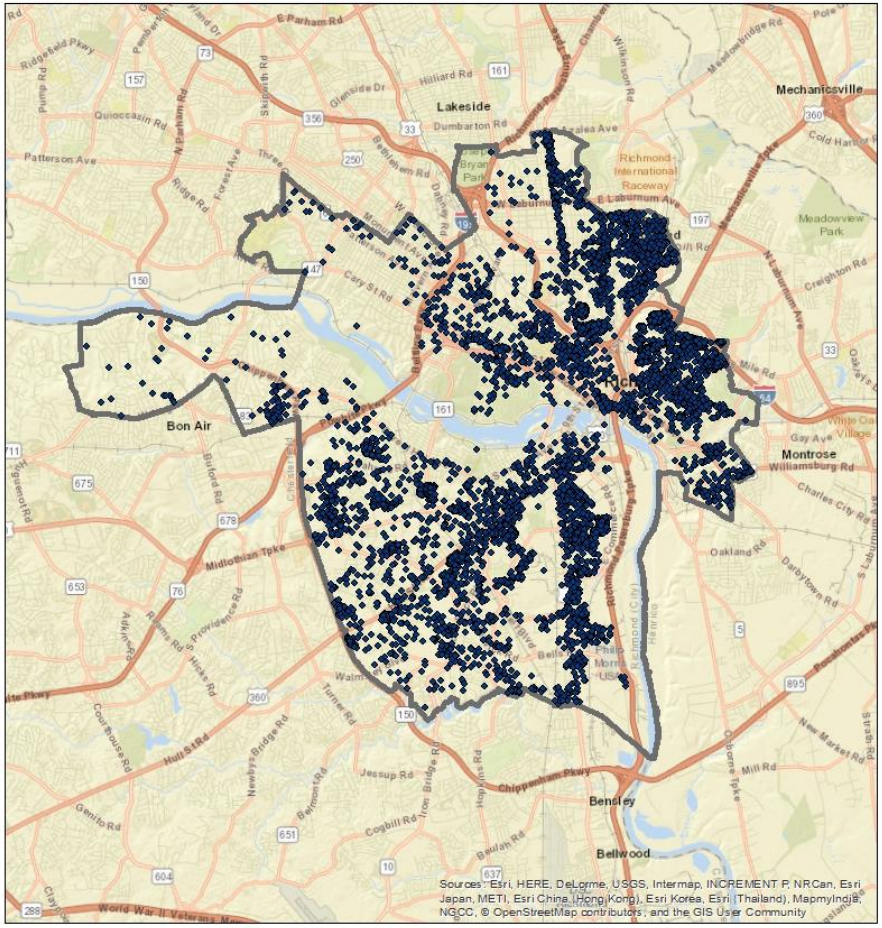


Data Source: Virginia Department of Social Services
DOS: 7/1/2013 - 6/30/2017

Look For Clustering and Associated Risk or Protective Factors

Richmond City
Violent Crime* Data January 2014 - December 2016
(n = ~8,700)



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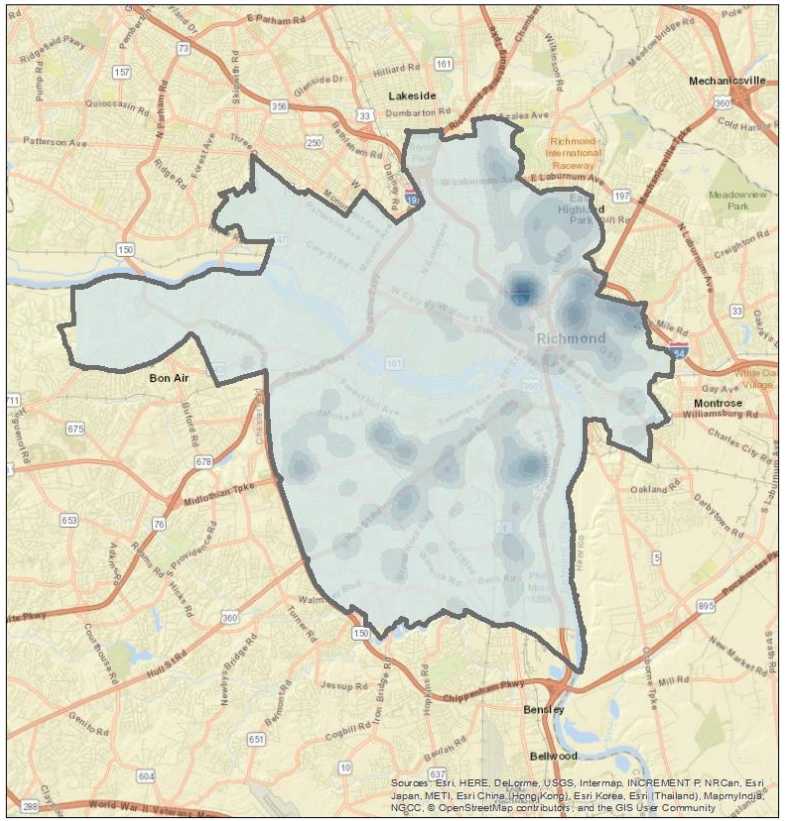
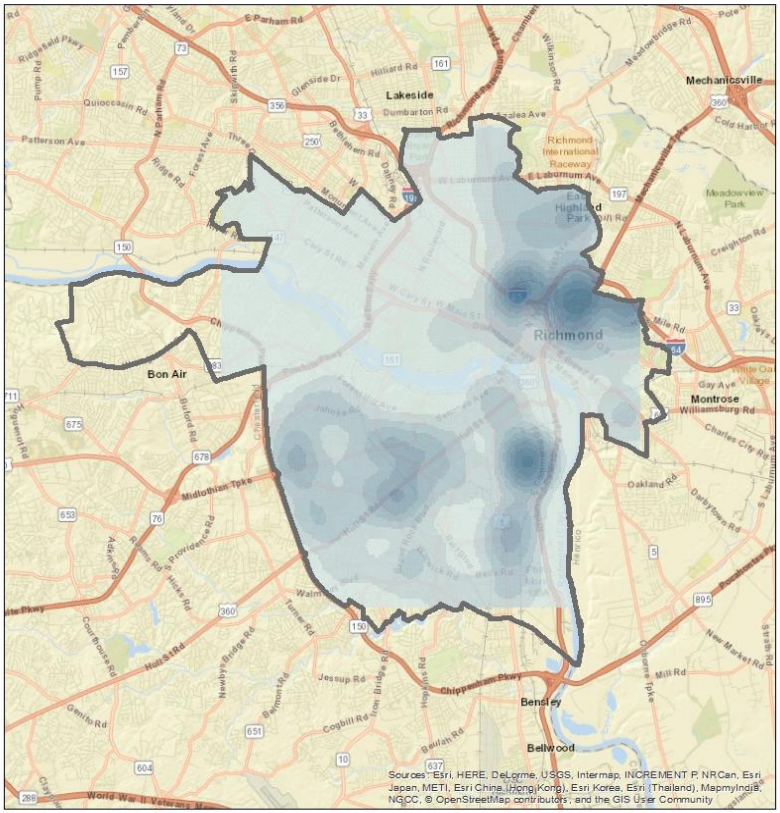


Intensity
Low — High

Data Source: Richmond City Police (edited for Violent Crime*); DOS = 1/1/2014 - 12/31/2016
*Aggravated Assault, Aggravated Assault Domestic, Forcible Rape, Forcible Sodomy, Kidnapping/Abduction, Murder/Non-Negligent Manslaughter, Sexual Battery, Simple Assault, Simple Assault Domestic

Founded CPS Investigations, Crime and Domestic Violence in Richmond, VA

Richmond City
CPS Founded & Domestic Violence - Weighted Sum - Kernel Analysis - Equal Weight



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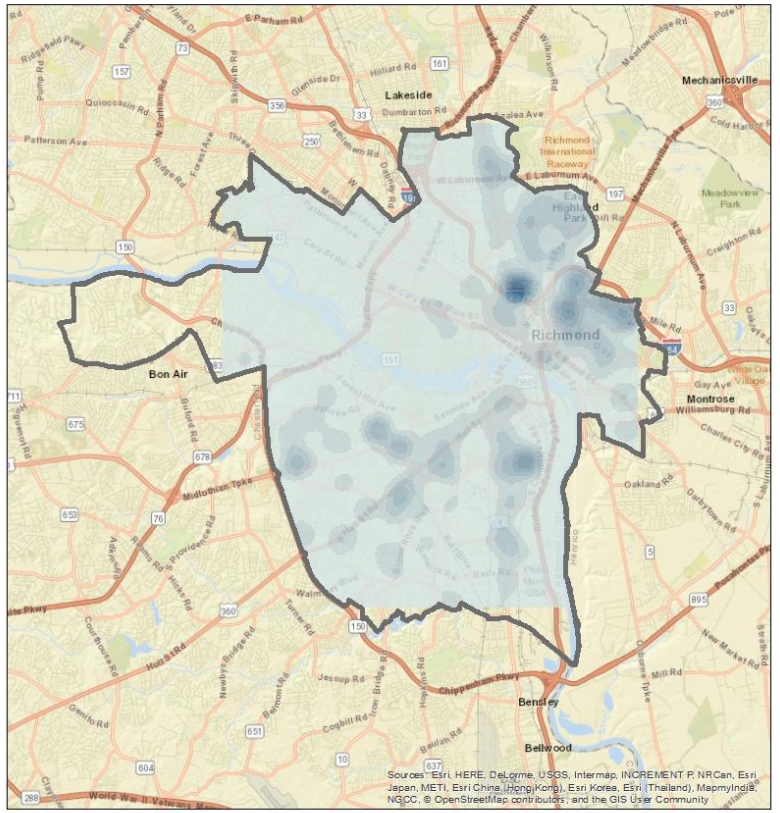
Richmond City
CPS Founded & Violent Crime - Weighted Sum - Kernel Analysis - Equal Weight



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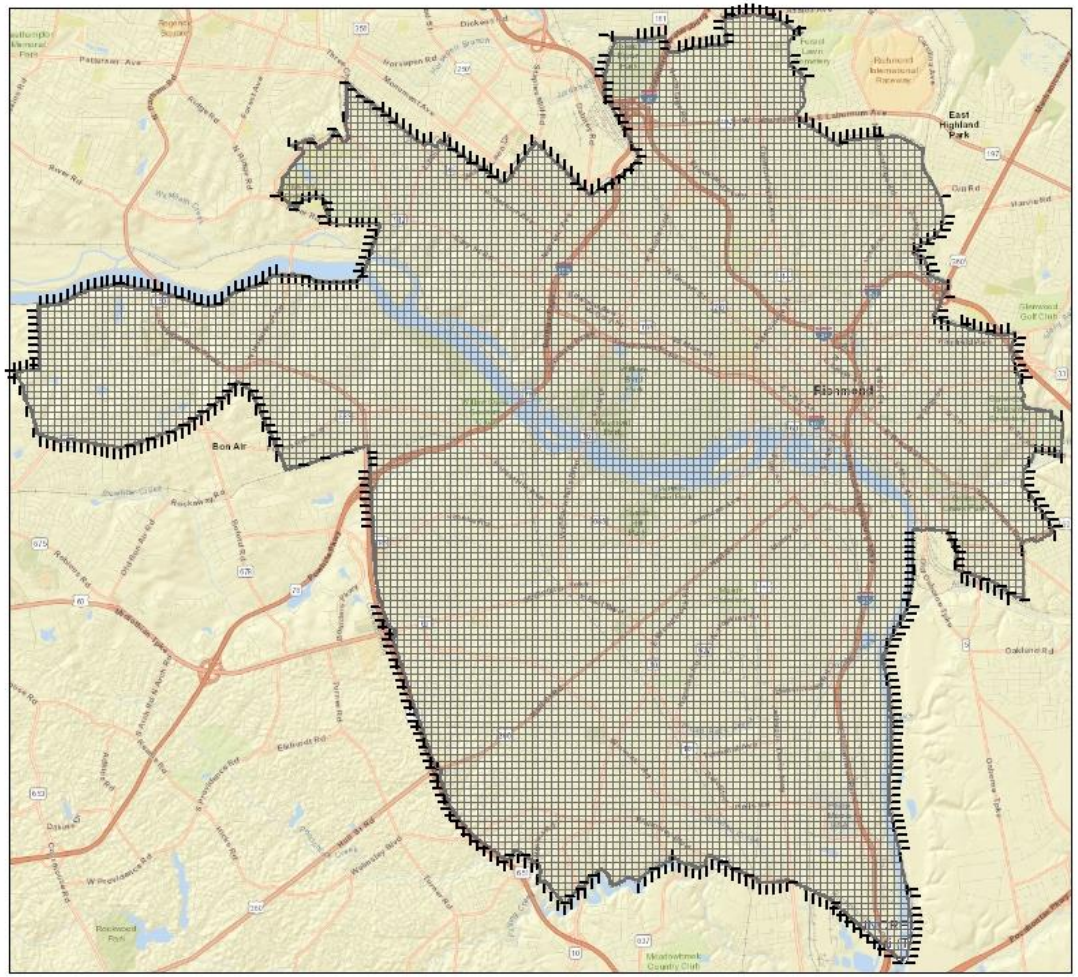
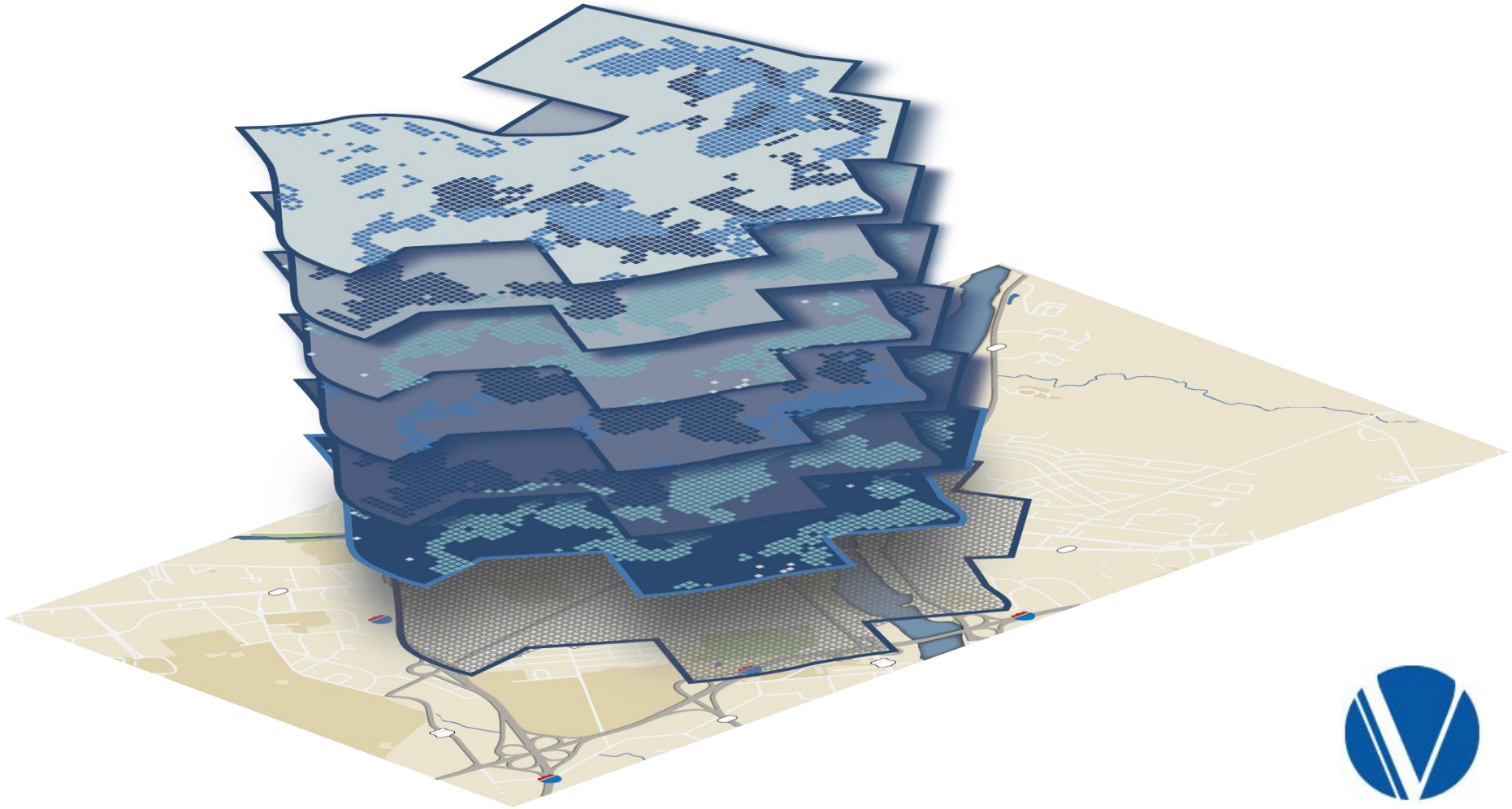
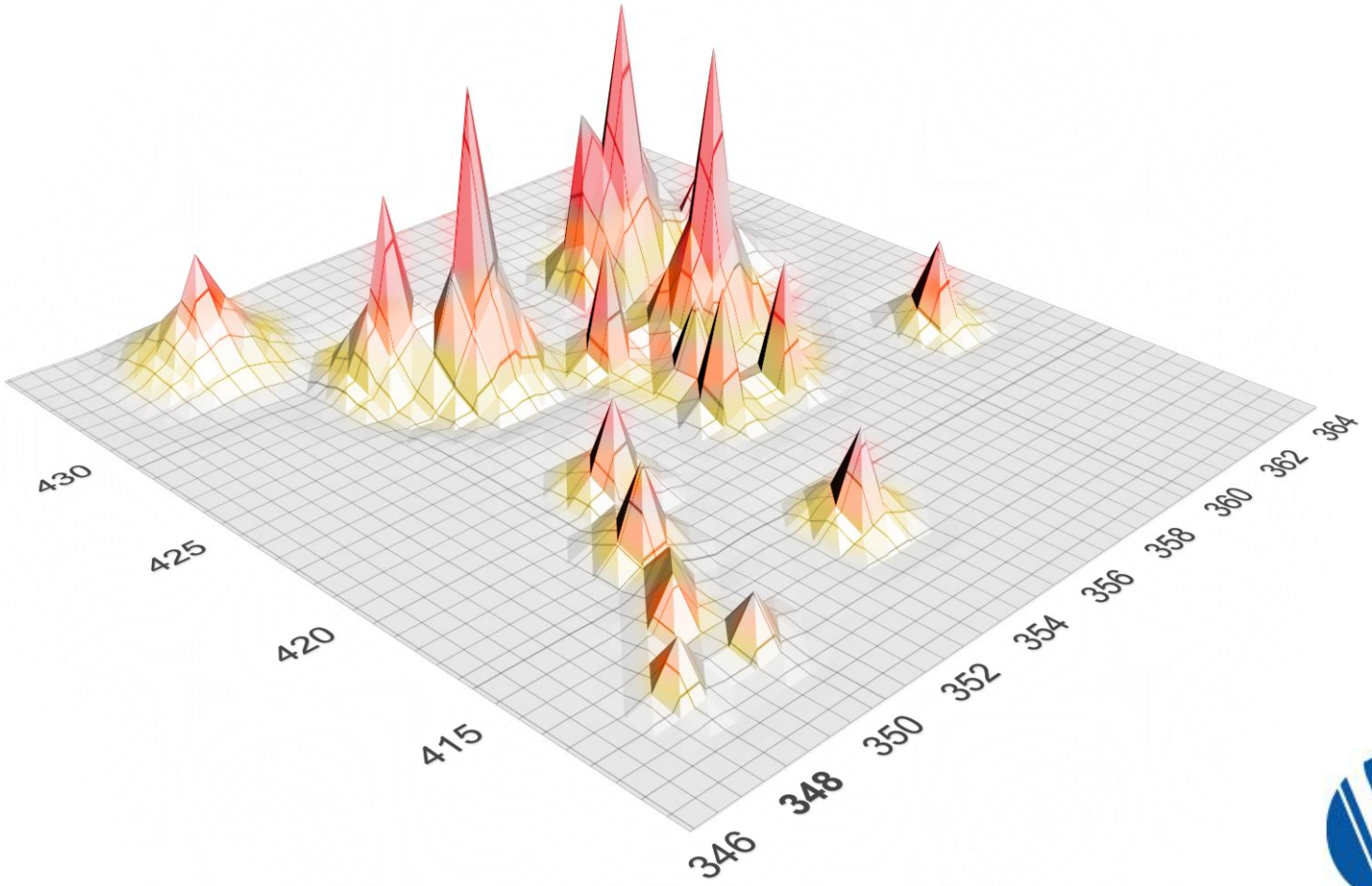
Apply ½ Block Size Grid To Study Area



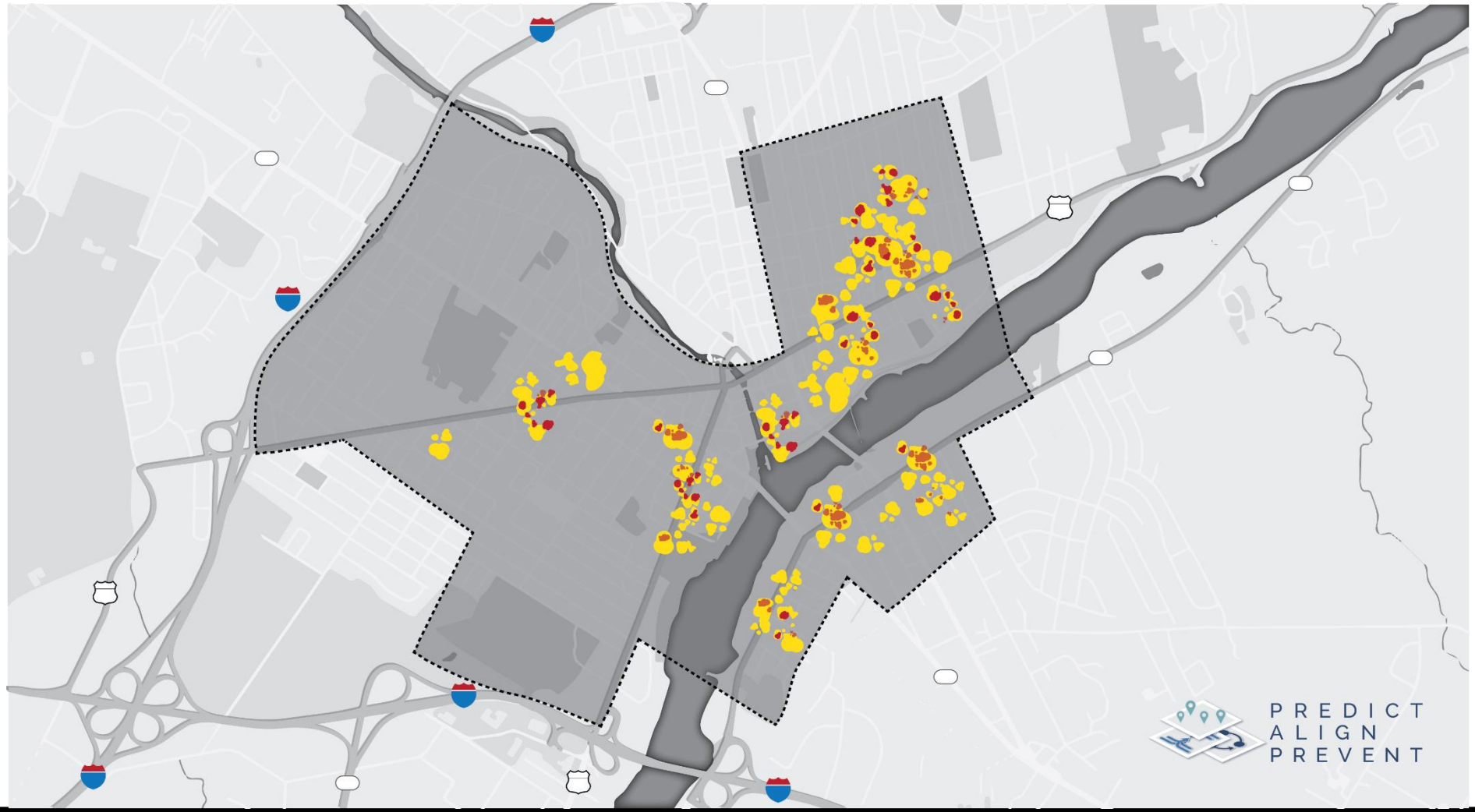
Map Risk and Protective Factor Layers



Conduct Risk Modeling and Map Results



Predict High Risk Areas



Aligning Project Components

Community Engagement

- What is the type of abuse to be targeted by the intervention?
- For each risk factor identified in the model, what is its relationship to the type of abuse?
  - What mechanisms link the risk factor to the type of abuse?
- What actions can DSS, local police, VDH, and other community partners take to mitigate the spatial influence of each risk factor?
- Given available resources and our understanding of how the risk factors are related to the type of abuse, what risk factors should be prioritized to receive attention?

Community Engagement

- Could be based on order of relative risk
- Could be based on financial cost of intervention
- Could be based on feasibility of coordinating and deploying necessary resources
- Could be based on community willingness to implement the intervention

Monitoring Progress

Parenting	Crime Prevention	Family Services	Community Wellbeing
• Preventable child injury and death • 3rd grade reading levels • Preventable hospital admissions • Employment rate • Graduation rate	• Drug arrests • Violent crime • Community engagement	• CPS referrals • Foster care • Mobility	• Teen pregnancy • Infant mortality • ER utilization • Uninsured • School readiness • School ratings

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