Committee Minutes

Committee on Research
Duck Pond Room
The Inn at Virginia Tech
3:45-5:00 p.m.

August 28, 2016

Committee Members Present:

Mr. Mehmood Kazmi
Mr. Stephen Sturgis
Mr. Jeff Veatch

Guests:

Dr. Timothy Sands, Dr. Thanassis Rikakis, Mr. Dwight Shelton Jr., Mr. James L. Chapman, Ms. Greta J. Harrris, Mr. Charles T. Hill, Ms. Deborah Petrine, Mr. Michael J. Quillen, Rev. Wayne H. Robinson, Dr. J. Thomas Ryan, Mr. Mehul Sanghani, Mr. Dennis H. Treacy, Ms. D'Elia Chandler, Mr. Martin Daniel, Dr. Karen DePauw, Mr. Viet Bien Doung, Dr. Srinath Ekkad, Dr. Michael Friedlander, Ms. Kay Heidbreder, Mr. Tim Hodge, Ms. Elizabeth Hooper, Dr. Ed Jones, Dr. Paul Knox, Ms. Sharon Kurek, Dr. Mike Lambur, Dr. Steven McKnight, Dr. Scott Midkiff, Ms. Kim O'Rourke, Mr. John Pastor, Dr. Patricia A. Perillo, Mr. Charles Phlegar, Dr. Ellen Plummer, Mr. J. Scot Ransbottom, Dr. Sherwood Wilson, Mr. Chris Yianilos, Ms. Tracey Vosburg and Ms. Beth Tranter.

1. **Opening Remarks and Approval of March 20, 2016 Minutes.** Mr. Kazmi called the meeting to order and welcomed those in attendance. The minutes were unanimously approved.

2. **Remarks from the President.** Dr. Sands welcomed those in attendance, and highlighted recent advances in the quarter, including Virginia Tech's leadership of a $19.4 million National Science Foundation-funded initiative form a Molecular Sciences Software Institute under the leadership of Dr. Daniel Crawford, in the Department of Chemistry. Through the Software Institute, Virginia Tech will build a national team of software scientists to design and build new, powerful software tools that can help researchers across disciplines to tackle wide-ranging, complex, data-intensive research. Dr. Sands also noted that researchers in need of space to store, preserve, and share data have a new option available. VTechData, Virginia Tech's new data repository, is an initiative of the University Libraries.

3. **Resolution for Exclusion of Certain Officers/Directors**: Mr. Kazmi provided an overview of the Resolution for Exclusion of Certain/Officers/Directors. The resolution was unanimously approved by the committee.

4. **Global Research Profile:** Dr. Mayer discussed the importance of Virginia Tech's global research profile to attract and retain talented, and to engage a broad network of collaborators and sponsors to create and apply knowledge to improve the human condition. Dr. Mayer reviewed the metrics on which the university is evaluated relative to our peers, and how external entities view our strengths and weaknesses. The global research profile transcends individual undergraduate or graduate programs, to include publications, books, citations, conference publications, international collaborations, Ph.D.s awarded and other measures of scholarly and translational impact. Globally-recognized areas of strength include engineering, plant and animal science, materials science, social sciences and public health, chemistry, biology and biochemistry.

5. **Research Highlight: The Science of All Data**: Dr. Sallie Keller, Professor of Statistics and Director of the Social and Decision Analytics Laboratory of the Biocomplexity Institute of Virginia Tech. The Biocomplexity Institute focuses on the study of life and environment as a complex system and understanding biology in the context of ecosystems and human-created systems. The Social and Decision Analytics Laboratory brings together statisticians and social and behavioral scientists to embrace today's data revolution, developing evidence-based research and quantitative methods to inform policy decision-making. Dr. Keller provided an overview of projects within the laboratory addressing diverse problems and scales from molecules to policy.

Adjournment.

There being no further business, the meeting adjourned at 5:17 p.m.

Virginia Tech's Global Research Profile

August 28, 2016


Today’s land-grant university must address economic and societal needs of this generation - our graduates must have the capacity to solve complex problems of a regional, national, and global scale

Global Profiles and Reputation

Why is our global reputation important?

Talent: recruit and retain a diverse faculty, staff and student body that is globally competitive, collaborative, and compassionate

Partners: engage a broad network of collaborators and sponsors to create and apply knowledge to improve the human condition

Based on academic and research reputation overall rather than on separate undergraduate or graduate programs

Global Profiles and Reputation

How are profiles used?

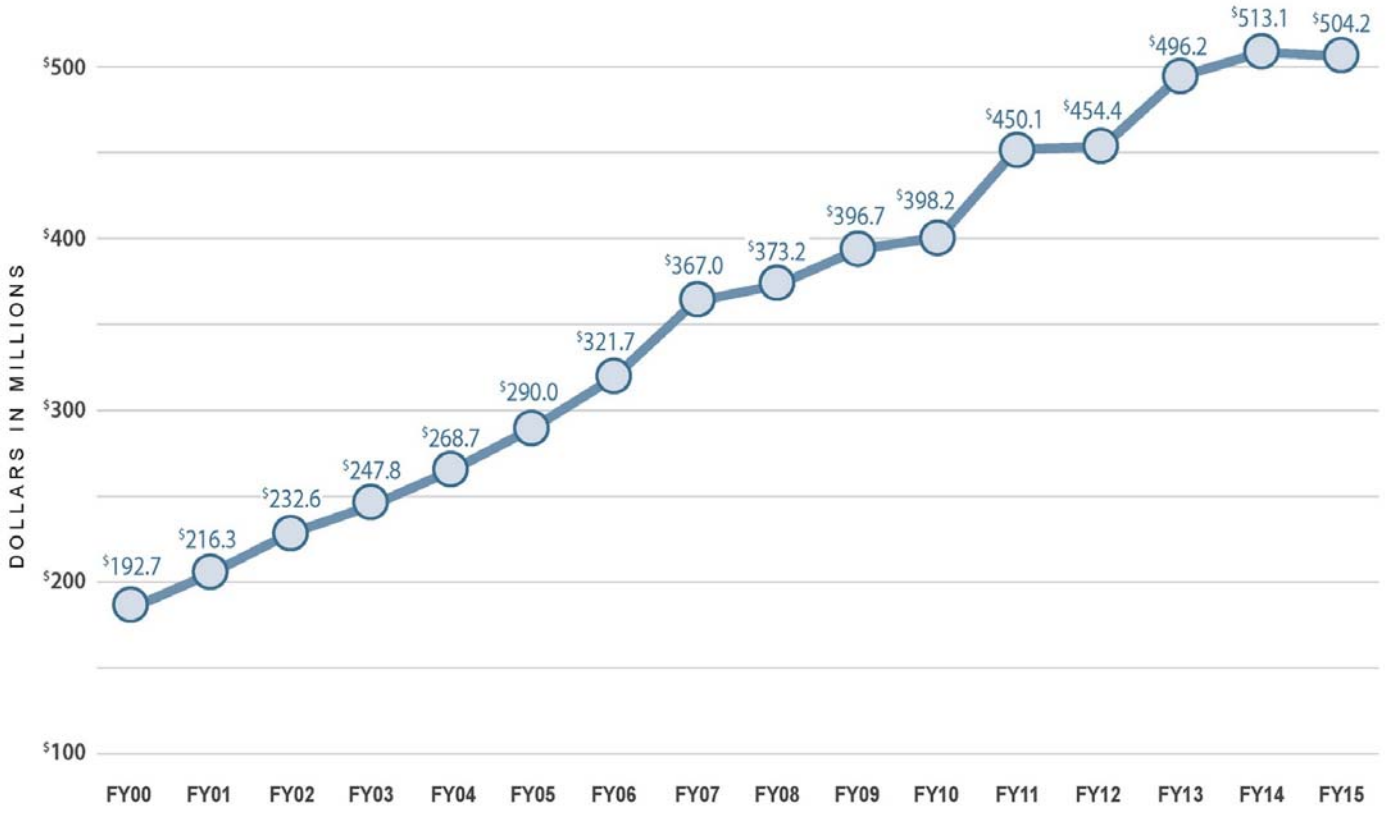
Valuable to identify strengths and weaknesses, find peer institutions and partners, compare to global or regional benchmarks and to promote achievements to stakeholders

How are profiles created?

Combine bibliometric information with data on reputation, demographics of staff, students and funding to create a 360 degree view of an institution's performance regardless of mission, size, location, or disciplinary mix

http://www.usnews.com/education/best-global-universities/

Our growth in expenditures is a reflection of our impact and momentum, and a signal to talented people everywhere that we are a university in action



Global Profile and Reputation

Indicator	Weight
Global research reputation	12.5%
Regional research reputation	12.5%
Publications	10%
Books	2.5%
Conferences	2.5%
Normalized citation impact	10%
Total citations	7.5%
# of publications among 10% most cited	12.5%
% of publications among 10% most cited	10%
International collaboration	10%
# Ph.D.s awarded	5%
# Ph.D.s awarded per academic staff	5%

Global and Regional Reputation:

Survey used to quantify opinions on both the research and teaching reputations of global academic institutions within familiar disciplinary programs

Broad subject categories:

- Arts & Humanities
- Clinical, Pre-Clinical & Health
- Engineering & Technology
- Life Sciences
- Physical Sciences
- Social Sciences

http://www.usnews.com/education/best-global-universities/

Global Profile and Reputation

Indicator	Overall*
Global research reputation	101-200
Regional research reputation	<100
Publications	201-300
Books	201-300
Conferences	<100
Normalized citation impact	301-600
Total citations	201-300
# of publications among 10% most cited	201-300
% of publications among 10% most cited	301-600
International collaboration	301-600
# Ph.D.s awarded	101-200
# Ph.D.s awarded per academic staff	201-300

Globally Recognized Areas of Strength for Virginia Tech

Engineering

Plant and Animal Science

Materials Science

Social Sciences and Public Health

Chemistry

Biology and Biochemistry

* University overall relative to top 750

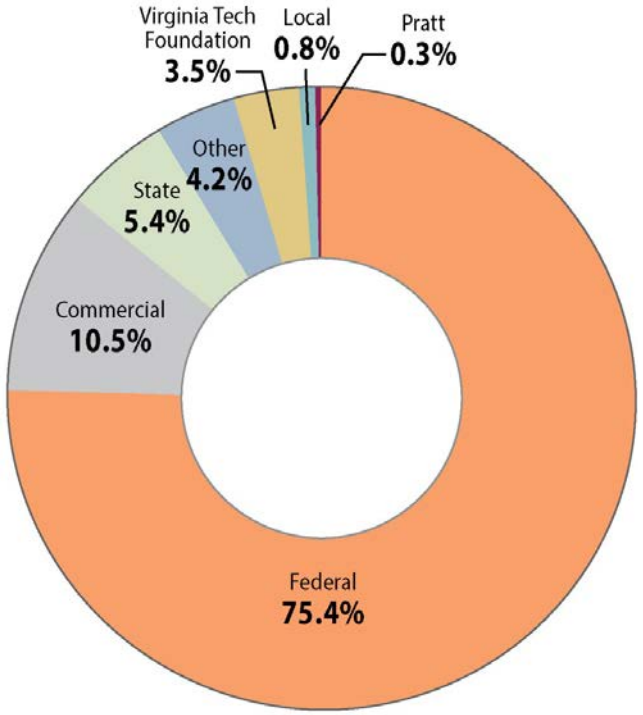
http://www.usnews.com/education/best-global-universities/

The Importance of Sponsored Programs

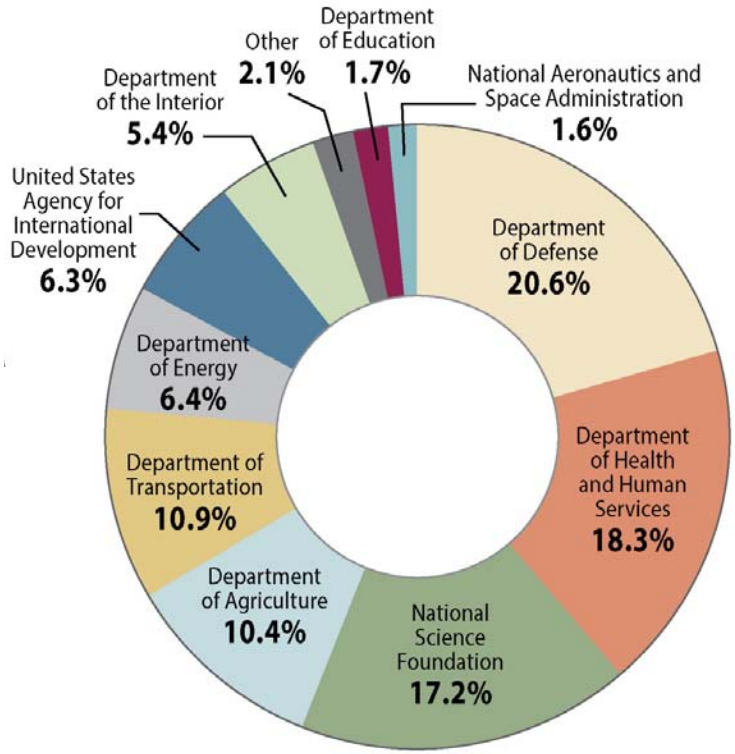
Extramural funding supports:

- Graduate student stipend and tuition
- Faculty and post-doctoral scholar salary
- Undergraduate scholars
- Technical and administrative staff
- Computational and experimental services
- Materials and supplies
- Travel and publication costs
- Equipment and facilities - purchase and maintenance

Sponsored Program Portfolio



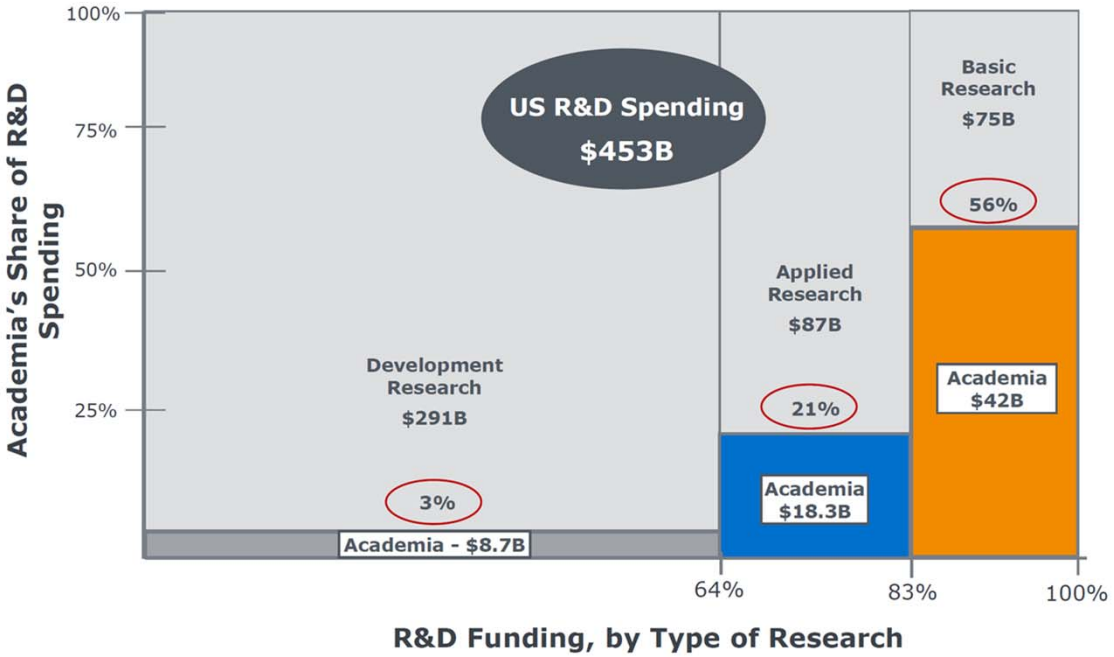
Total from all sources: **$284M**



Total from federal sources: **$214M**

Opportunities to Diversify our Portfolio

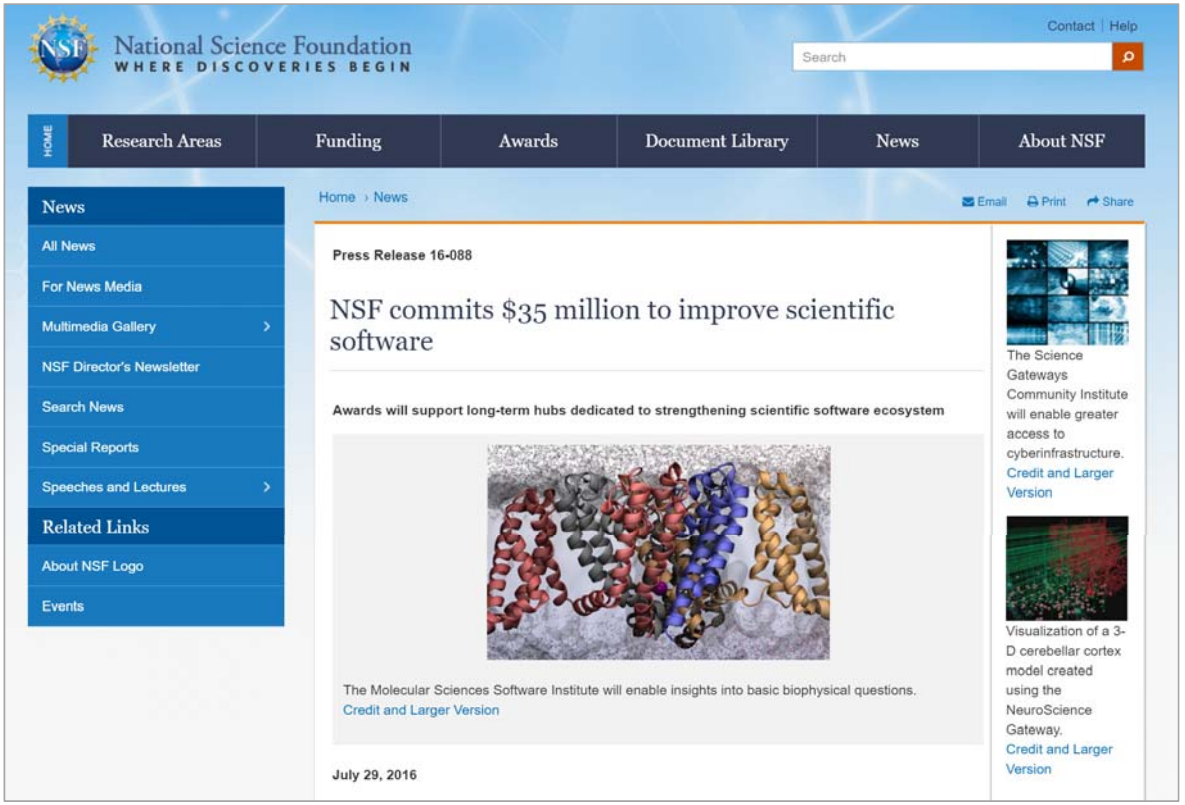
Federal Funding, by performer



Other sources:

- Industry
- University-industry-government
- Foundations
- Private donors

Celebrate one of our Recent Successes



Daniel Crawford, Professor of Chemistry at Virginia Tech, will lead the $19.4 M NSF-funded Molecular Sciences Software Institute with partners Iowa State University, Rice University, Rutgers University, Stanford University, Stony Brook University, University of California Berkeley, and University of Southern California

Daniel Crawford, professor of chemistry at Virginia Tech, will head the new Molecular Sciences Software Institute.

Creating the Science of All Data

VT Board of Visitors: Research Committee
August 28, 2016

Sallie Keller
Professor of Statistics & Director
Virginia Tech Biocomplexity Institute
https://www.bi.vt.edu/sdal
SDAL Social & Decision Analytics Laboratory

Biocomplexity Institute of Virginia Tech

- The study of life and environment as a complex system
- Understanding biology in the context of ecosystems and human-created systems
- Transdisciplinary team science

"From molecules to policy"

Problem-Driven Science

Our information biology approach is putting research to work in the real world, breaking down barriers between science and policy.

Social and Decision Analytics Lab

The Social and Decision Analytics Laboratory brings together statisticians and social and behavioral scientists to embrace today's data revolution, developing evidence-based research and quantitative methods to inform policy decision-making.

- Science of *ALL* Data
- Community Analytics
  - Education and Labor Force Analytics
  - Health Measurement Analytics
  - Industrial Innovation Analytics
- Information Diffusion Analytics

Research Partners & Cooperative Agreements

Local / State Government

Arlington County
Virginia Department of Emergency Management

Federal Statistical Agencies

Housing and Urban Development
National Science Foundation
National Center for Science and Engineering Statistics
U.S. Census Bureau

Department of Defense

U.S. Army Research Institute
Defense Manpower Data Center
Defense Advanced Research Project Agency

Industry

MITRE Corporation
Proctor & Gamble

Foundations

Robert Wood Johnson
Laura and John Arnold

Bring the ALL data revolution to communities

State, Federal, Local – Civilian and Defense

Realizing the vision – data integration from molecules to policy

Designed Data

Administrative Data

Opportunity Data

Procedural Data

Social and behavioral data flows

Infrastructure

- Condition
- Operations
- Resilience
- Sustainability

Environment

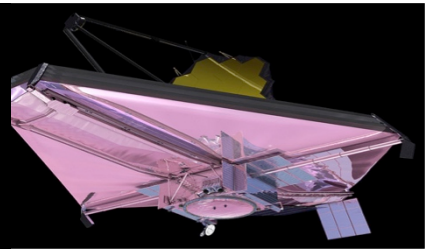
- Climate
- Pollution
- Noise
- Flora/ Fauna

People

- Relationships
- Location
- Economic Condition
- Communication
- Activities
- Health

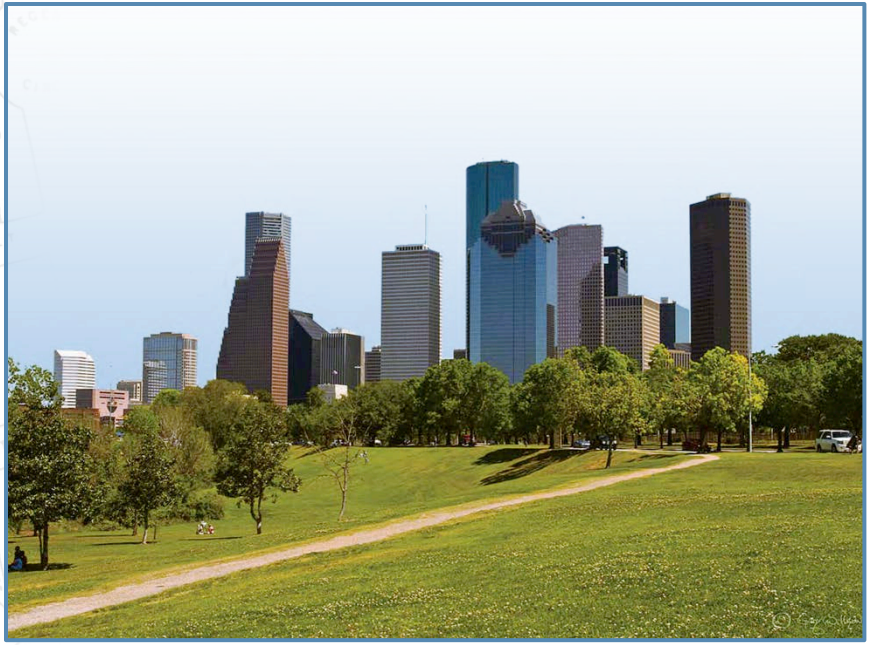
ALL Data-The new lens for social observing



- Data collected faster, while individuals are in the act of behaving in real life situation
- Adapt methods to make the best use of these data
- New data streams produce new discoveries but should not be allowed to degrade the scientific approach

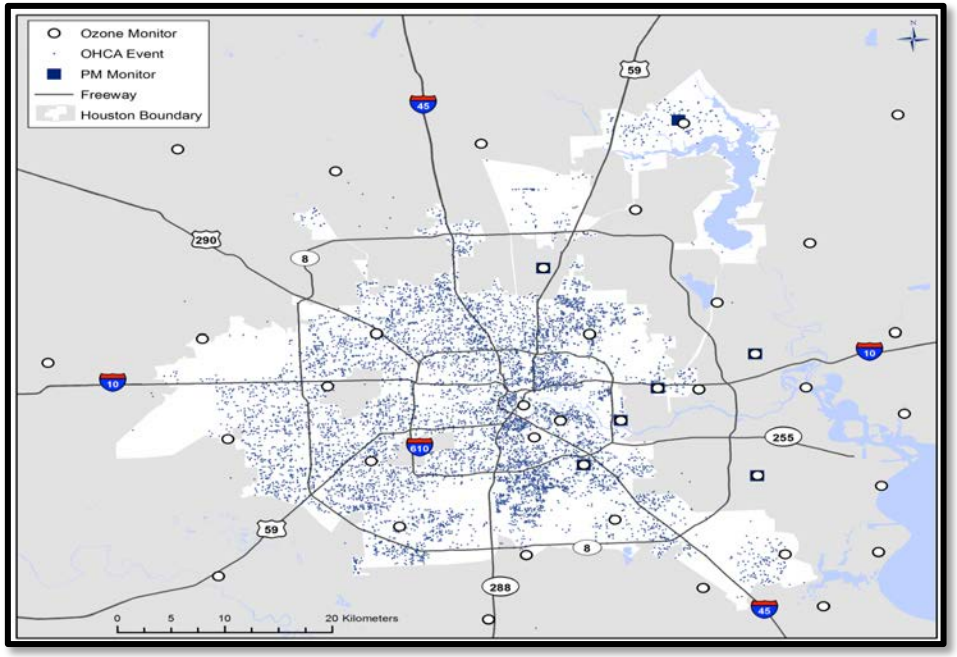
Example: Modeling population dynamics



Partnership with Houston, TX

Houston EMS study for individual risk
Out-of-hospital cardiac arrest

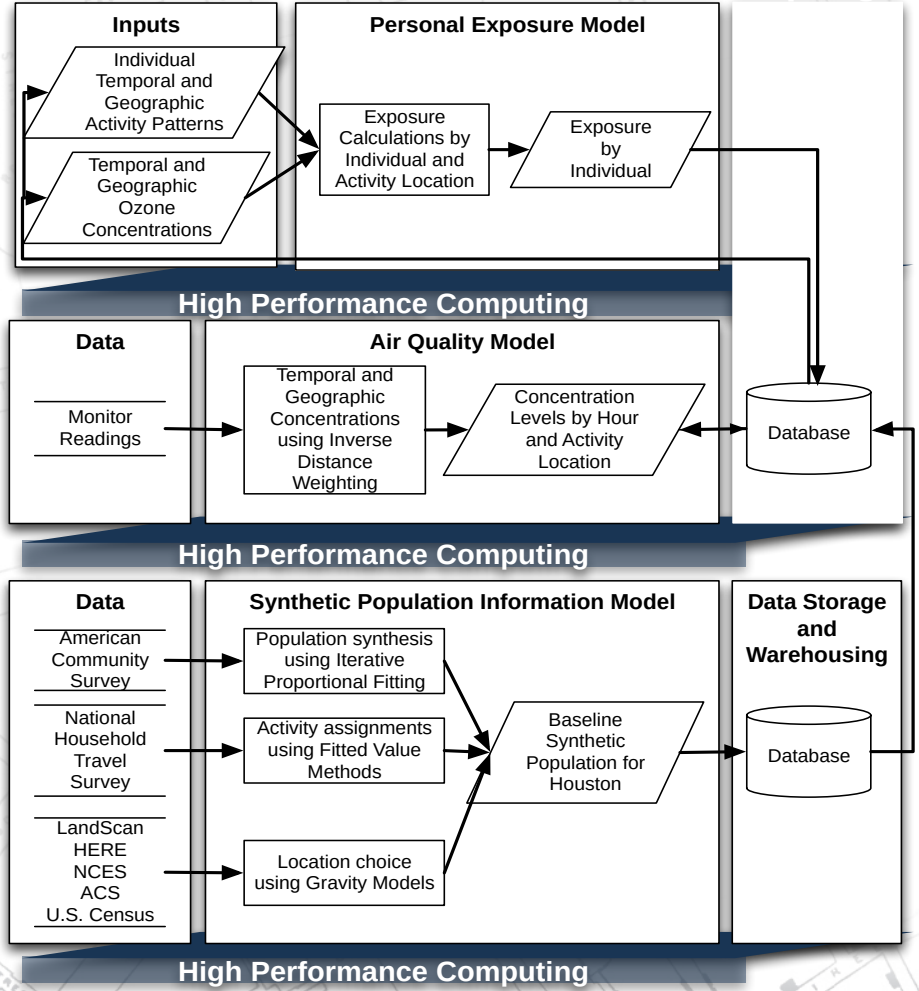
- Pathophysiological link between out-of-hospital cardiac arrest and ozone
- 12,000 EMS cases, 7 years
- 20 ppbv ozone increase in previous 1 to 3 hours of event associated with a 4.4% increased risk
- What about population health?



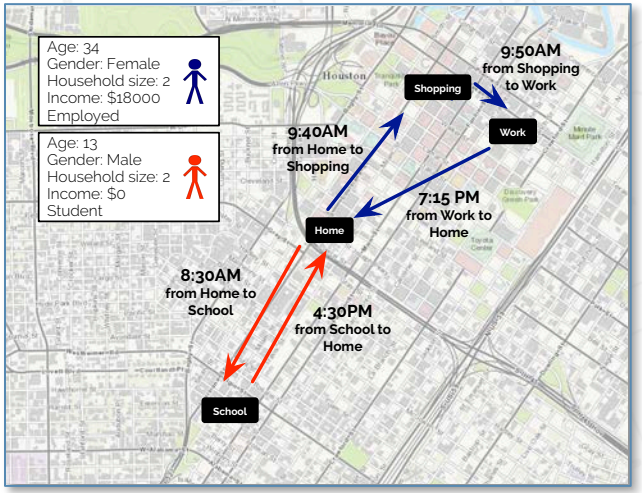
American Heart Association
Learn and Live

Ensor, et al., Circulation, Volume 127(11):1192-1199

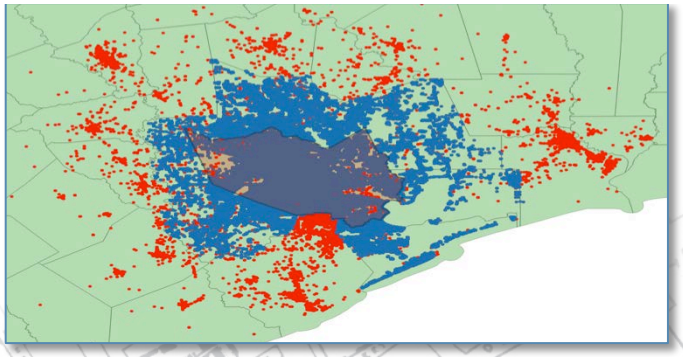
In-Silico Platform for Environmental Coupling



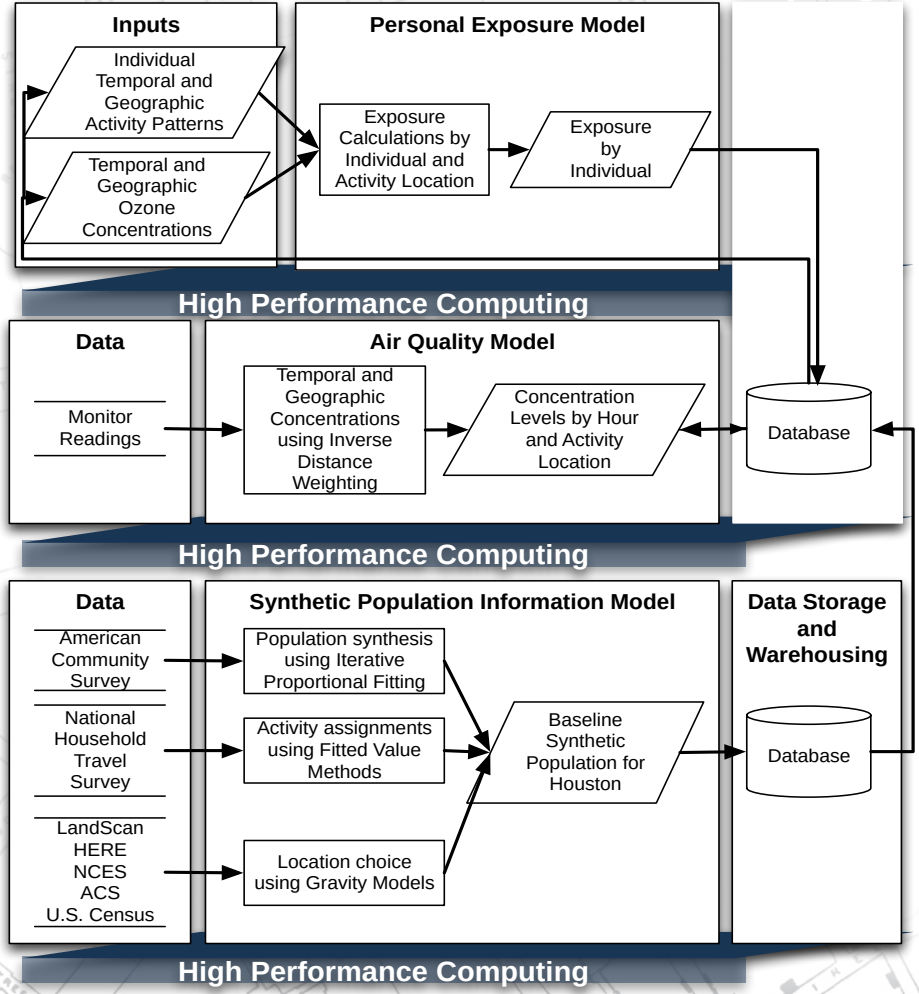
Build out synthetic population



4.9M people, 1.8M Households, 1.2M Locations

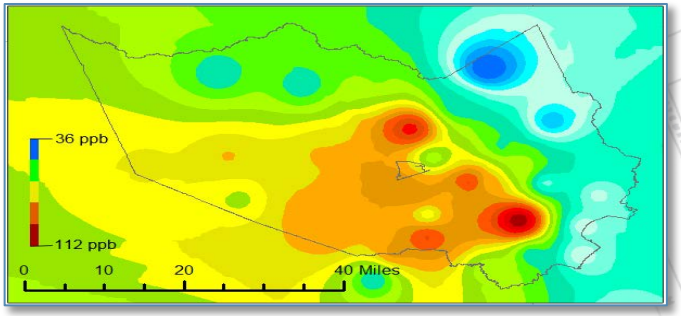


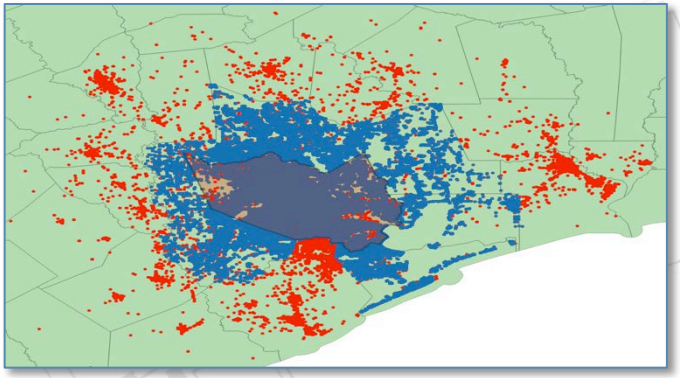
In-Silico Platform for Environmental Coupling



Couple ozone air quality to synthetic population in time and space

10:00 am, August 26, 2008





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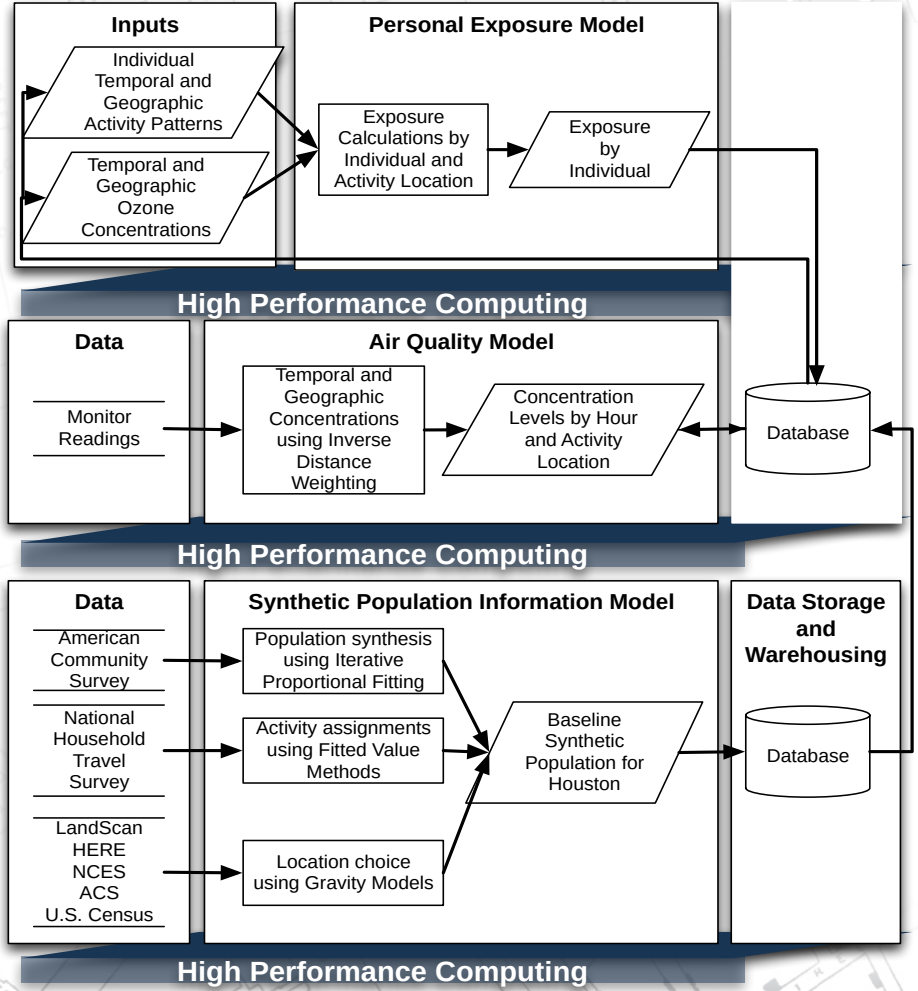
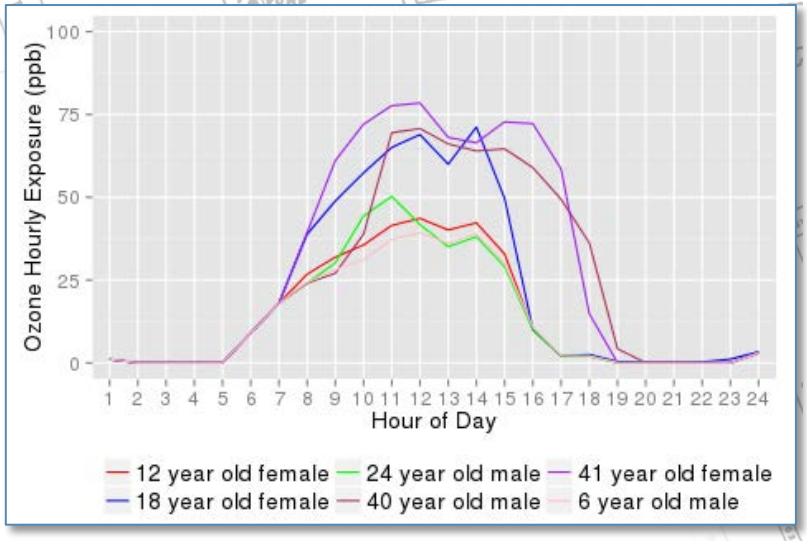


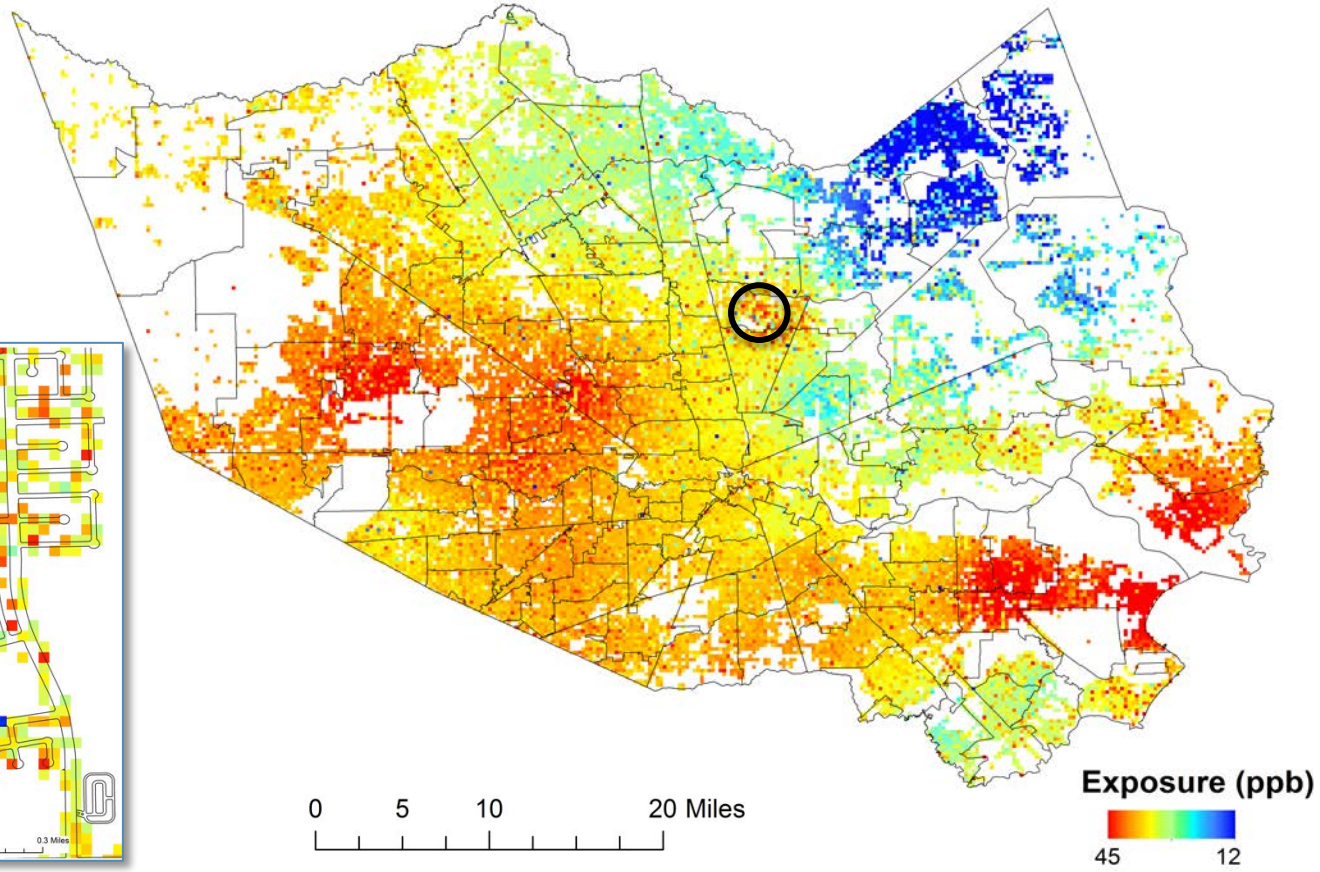


Results:

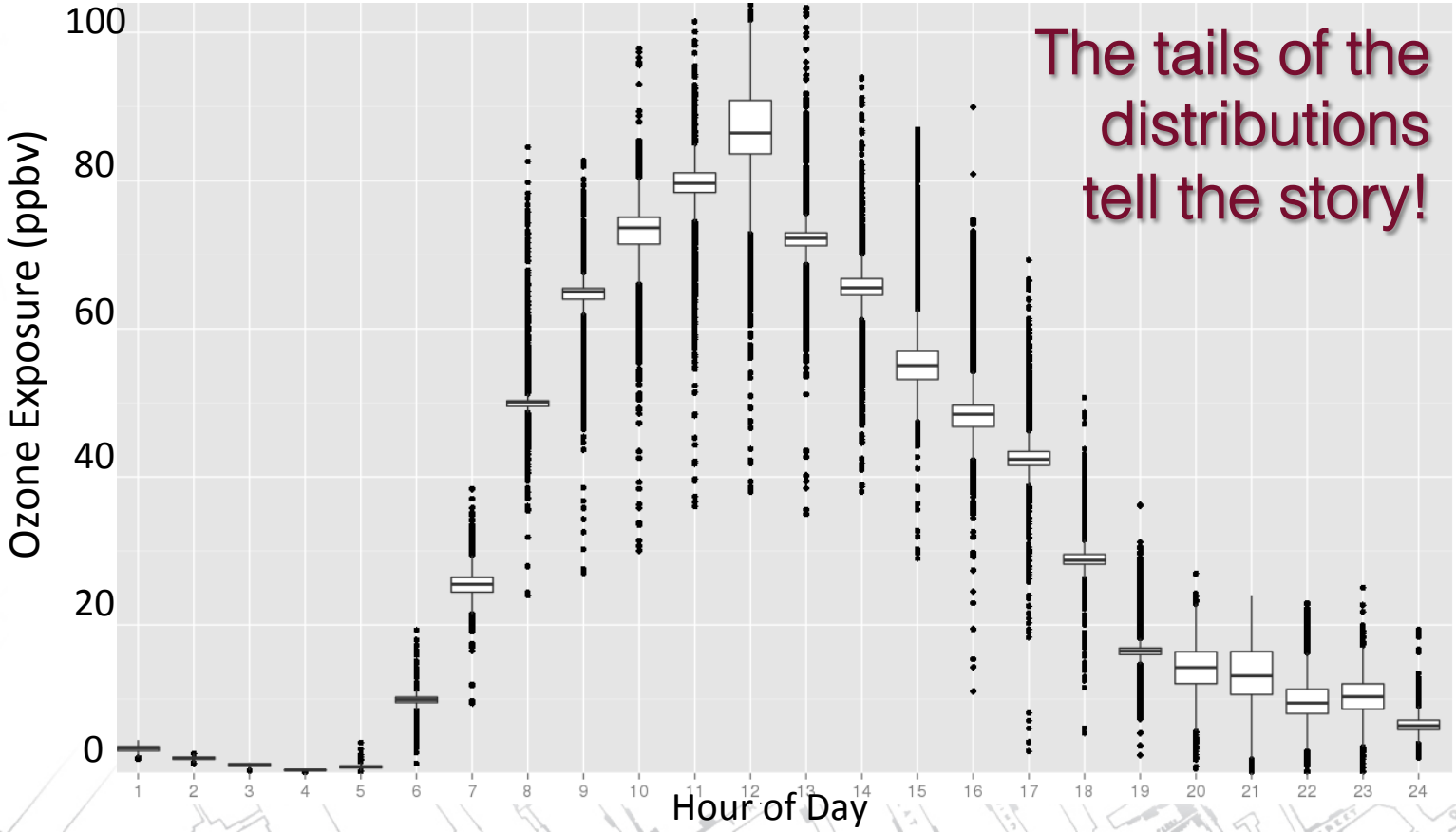
- Trace individual exposures of each synthetic individual throughout the day
- Mash up with social determinants
- Use platform to study policy implications

Aggregate Exposure levels

Unexpected heterogeneity within neighborhoods



Hourly exposure as population moves throughout the city



Laura and John Arnold Foundation

Bringing Evidence-Based Decision Making to Local Communities through Community Learning

- Four month $150K planning grant
- Partnership with VA Cooperative Extension
- Iowa State strategic alliance

Community Learning

- Bring data in service of communities to create resilient communities
- Must be through the lens of the community
- Provide the pathway to enable a community to become a ***data driven learning community***

Initiative Vision

Bring the **All Data** revolution to local governments through **community learning**

Build a **local sustainable** community learning **culture**

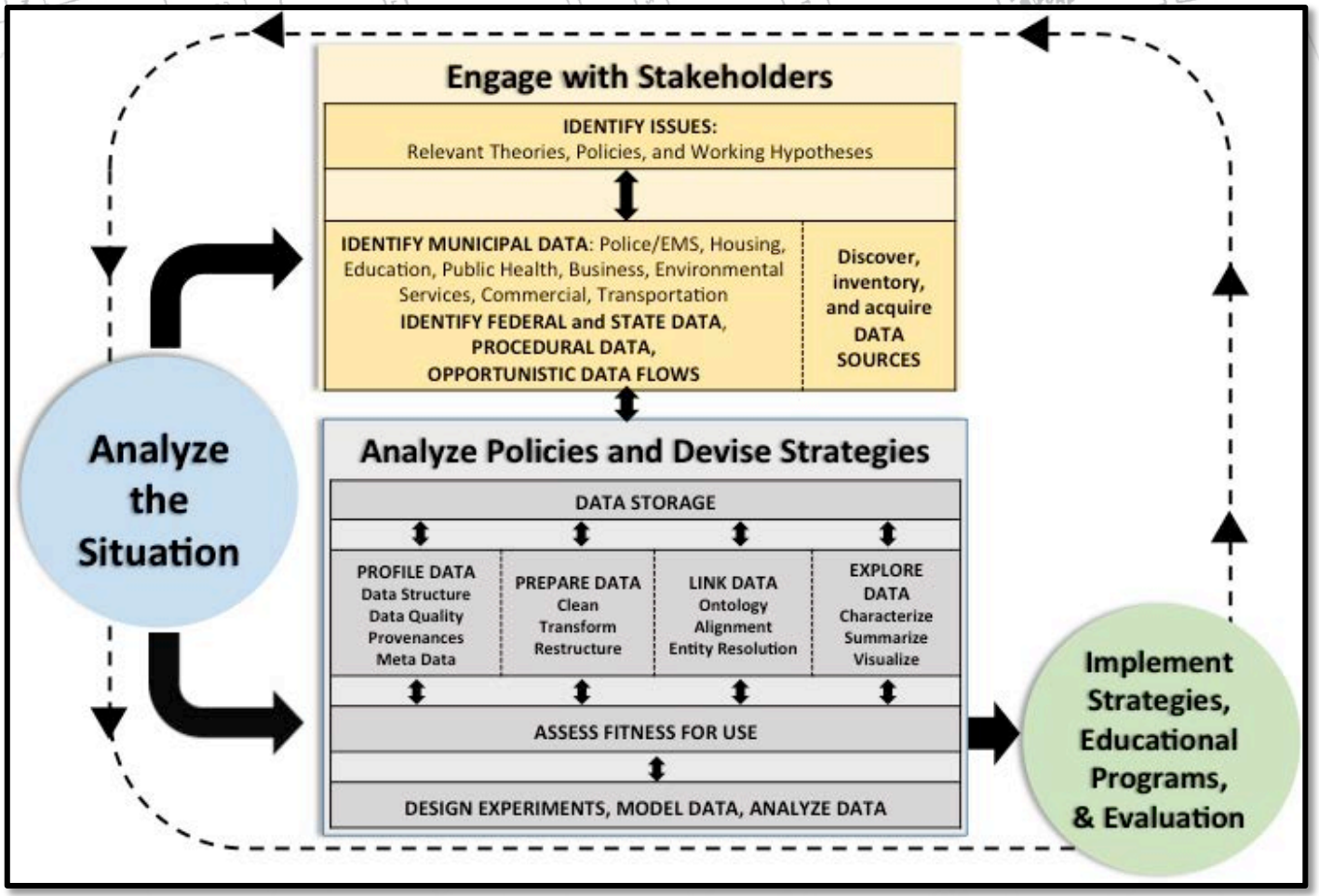
Create a **national initiative** around community learning to form the **foundation for evidence-based** policy and community decision making through the **integration of local, state, and federal data**

What is community learning?

Community Learning is a cycle

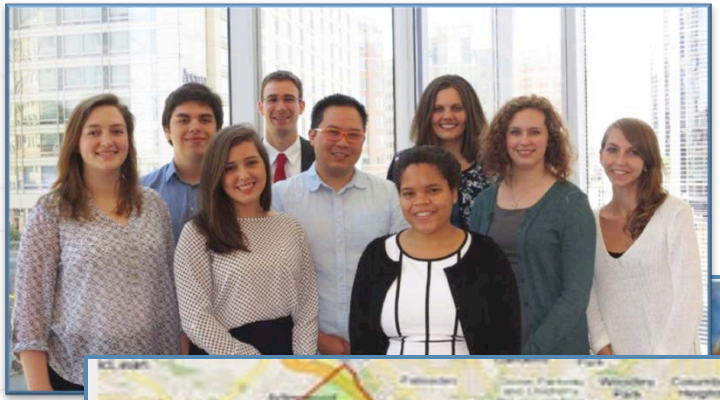
- Engage and expose local leaders to *data driven learning*
- Work with local leaders to define critical questions and issues facing their community
- Identify and wrangle the data sources
- Use statistical and geospatial learning along with the communities' collective knowledge to inform policy decisions
- Develop, deploy, and evaluate intervention strategies and education programs based on experimental design principles

Continuous and adaptive data driven learning infrastructure



Data Driven Community Learning Cycle

Community Learning demonstration Partnership with Arlington County

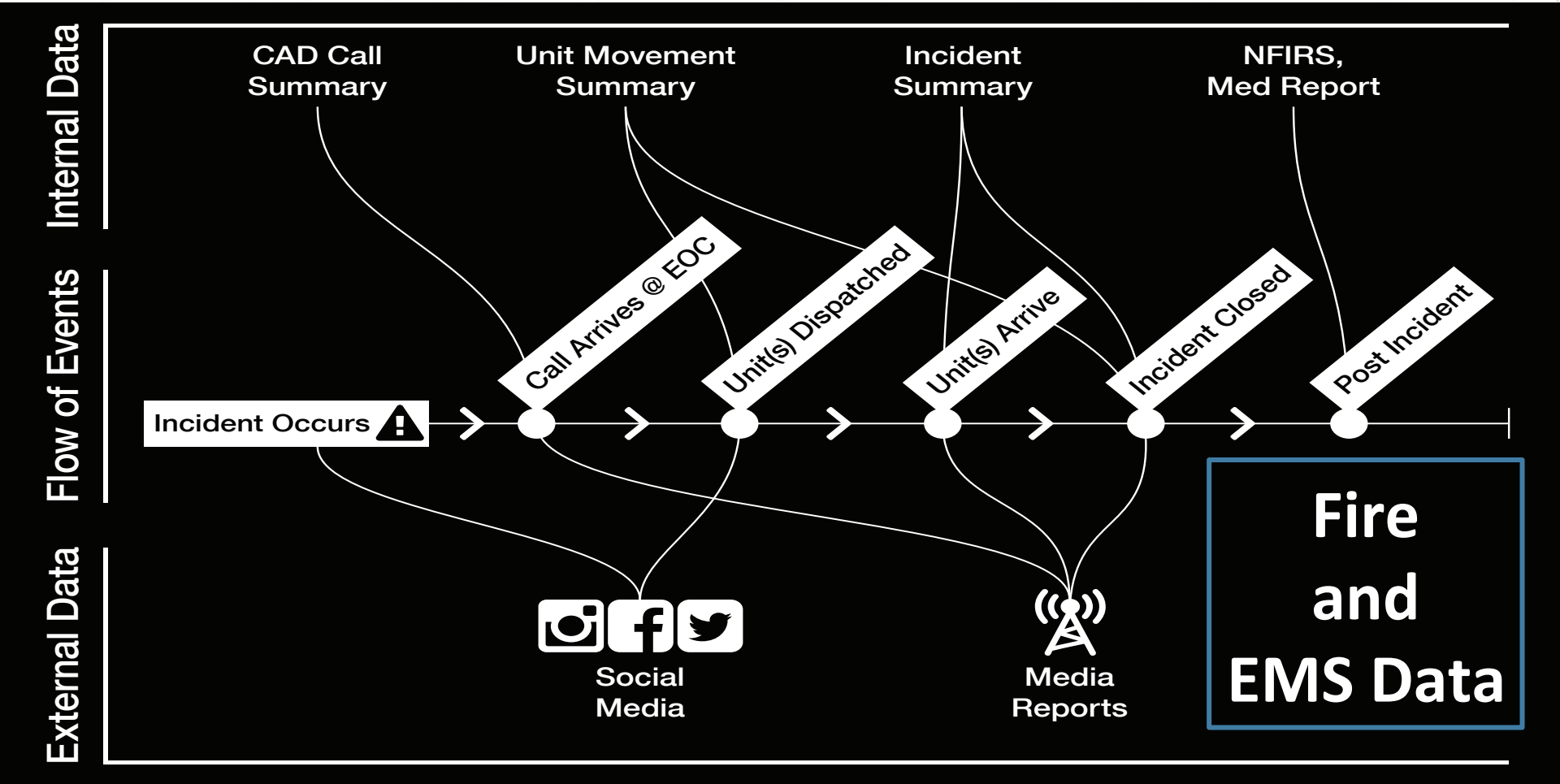


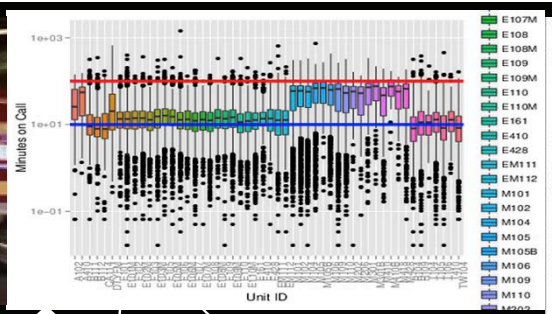
Improve quality of life and services while accelerating county's efficiency and resiliency

Develop situational awareness

METROLAB NETWORK

Data source taxonomy of 911 incidents





Flow of Ever

External Data

Incident Occurs

Call Arrives @ EOC

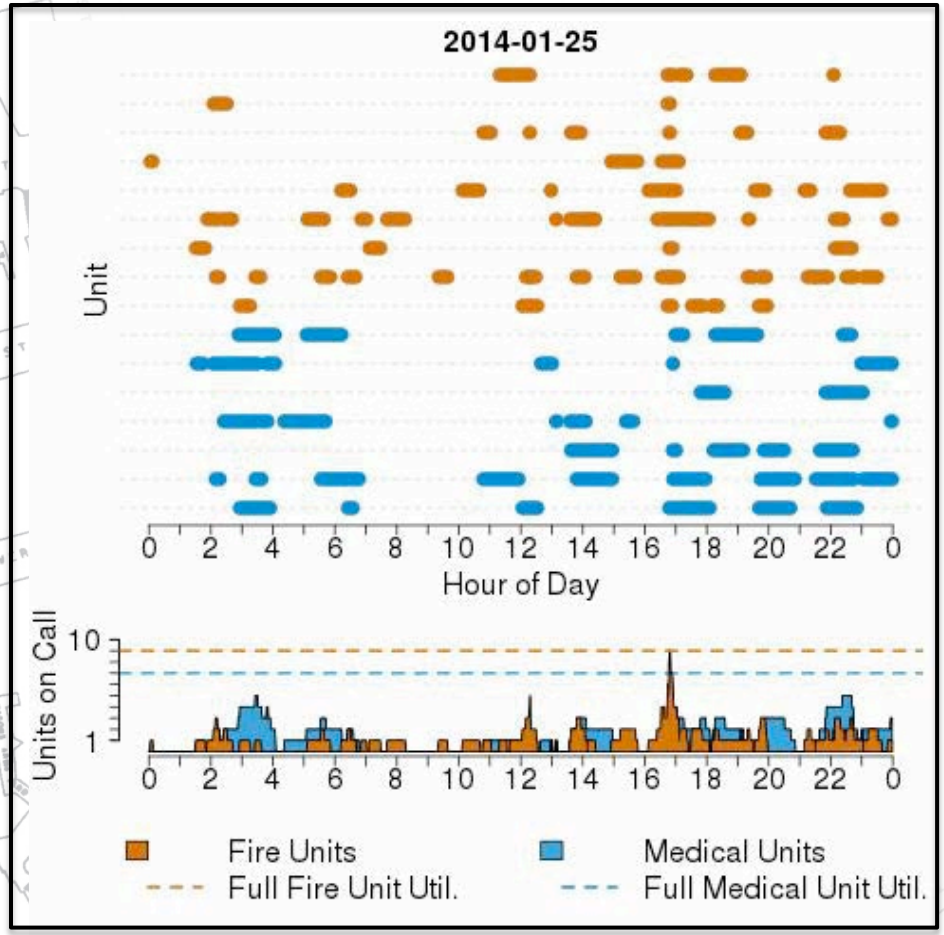
Unit(s) Dispatched

Unit(s) Arrive

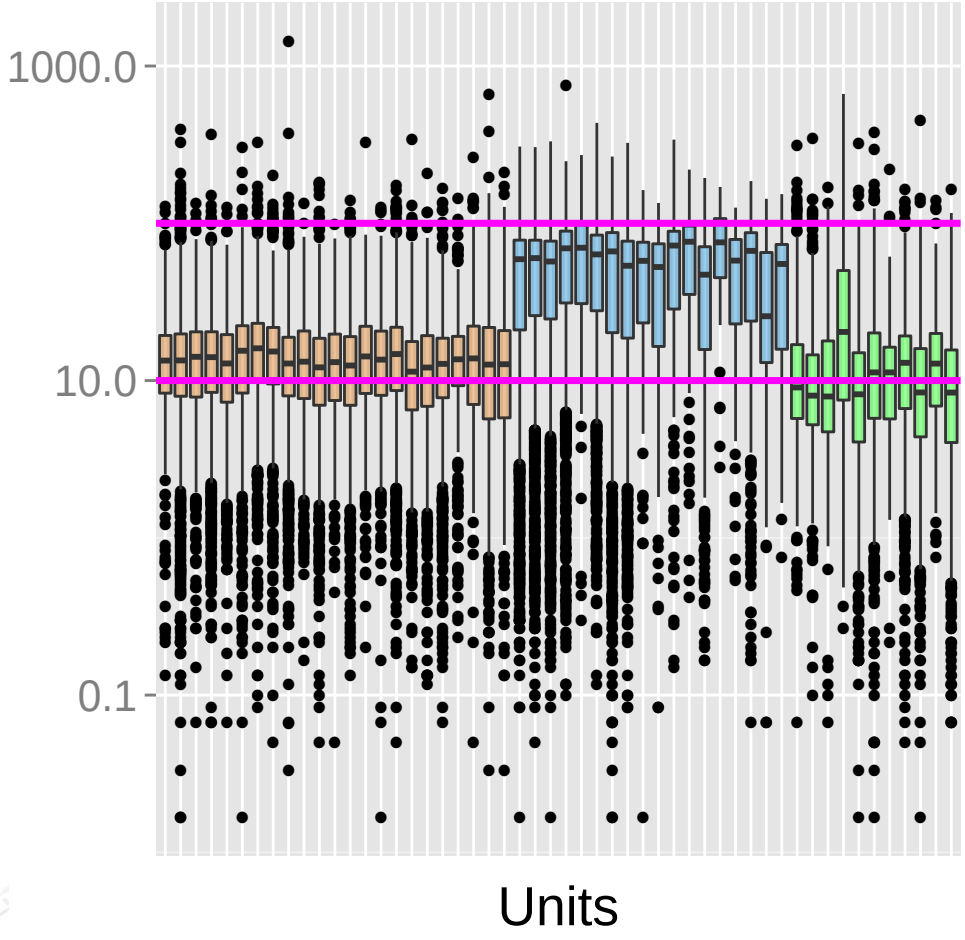
Incident Closed

Post Incident

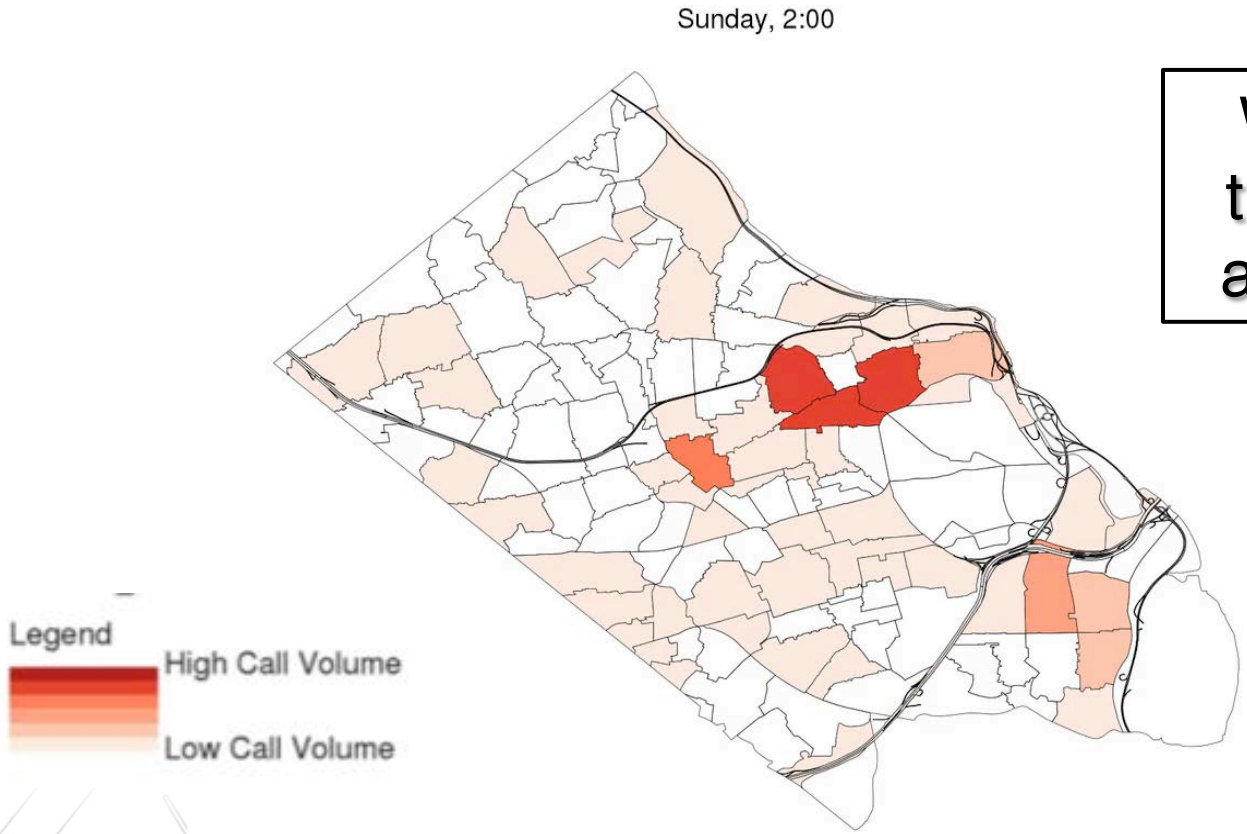
Linking Time Across Incidents



Minutes on Call



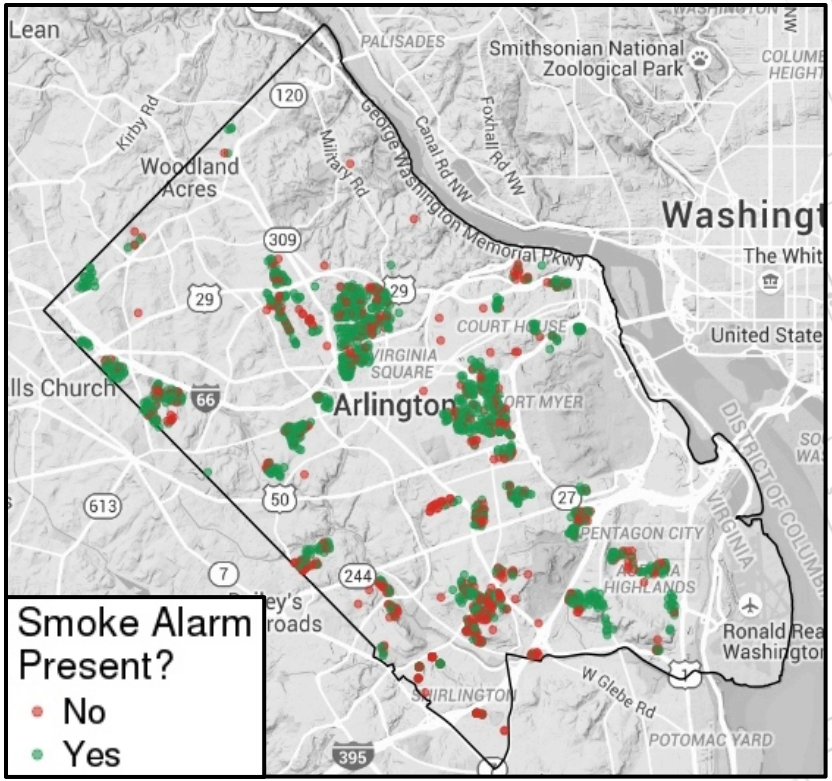
The rhythm of the city



What do you think the data are telling us?

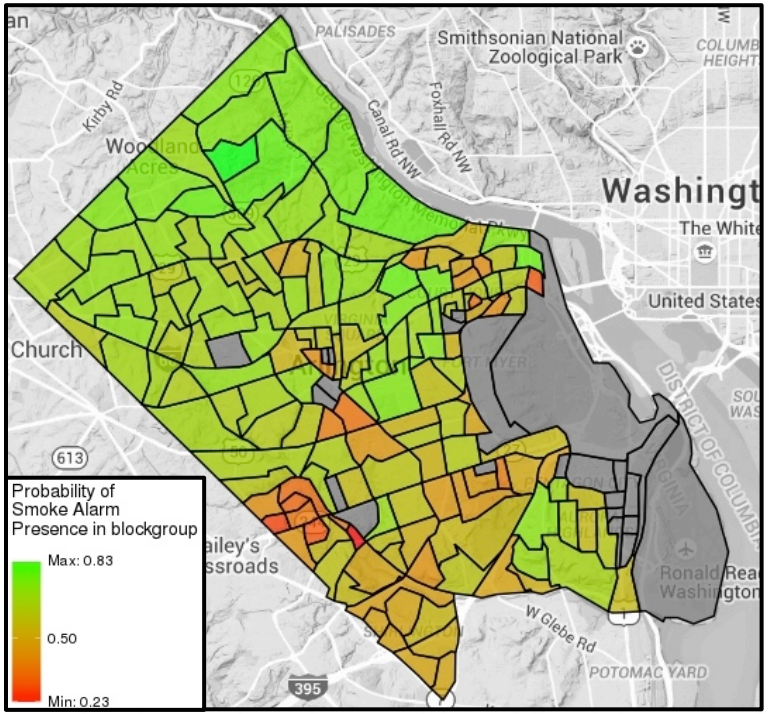
Arlington Operation FireSafe

- Goal – to increase the number of residences in Arlington with smoke alarms
- Build predictive model to identify homes most in need of an alarm
- Data Sources:
  - Operation FireSafe: Arlington County Fired Department visit 1733 homes, 32% did not have fire alarm
  - Housing data such as house value, size, age, number of bedrooms, and ownership, for 60,343 housing units in Arlington County

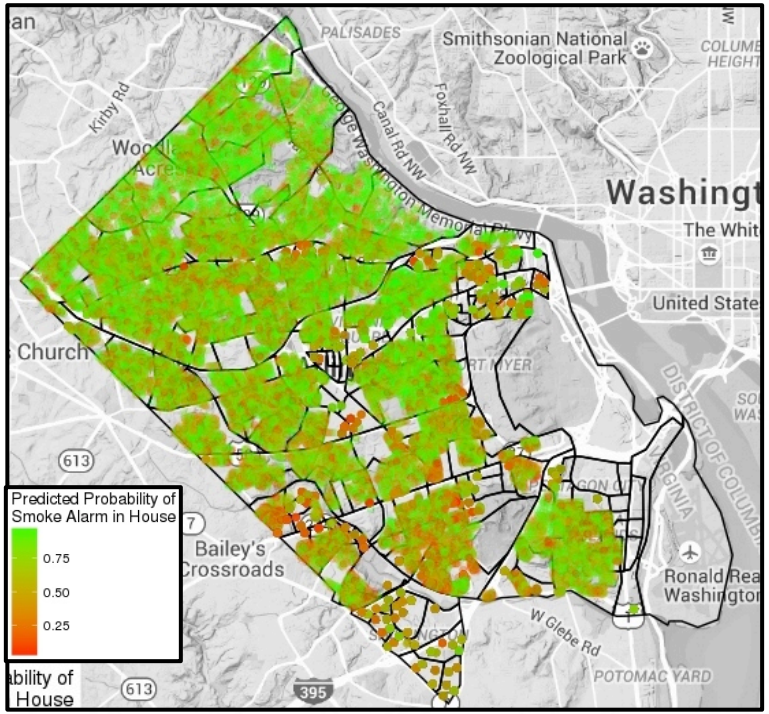


Probability of Having a Smoke Alarm

Bayesian logistic regression model with conditionally autoregressive spatial effects



Census Block Level Predictions



Housing Unit Level Predictions

Assuming we are wildly successful, what will we have achieved in 10 years?

Communities are more resilient

There is a renewed partnership between our communities and Land Grant Universities

A sustainable movement has emerged