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### **Creating and Sustaining a Learning Community in Arlington County**

Arlington County, in partnership with Virginia Tech (VT), has the opportunity to improve the county's quality of life and services while accelerating the county's efficiency and resiliency through the use of county data captured for administrative purposes. Combining Arlington County's community planning and management skills with VT's analytical and data science expertise, these data can be used to analyze, inform, and improve and gain efficiencies in current and future operations, practices, and policies. The goal for this partnership is to work with Arlington County to create a process that we call the Community Learning System (CLS) to support integrated county decision-making.

This CLS process and corresponding data infrastructure will allow Arlington County to better understand current conditions, to test alternative operational and policy scenarios, and to make timely, data-based decisions. To build the CLS, the partnership will start with individual projects that address immediate operational questions and chronic issues raised by Arlington County leadership.

### **Defining the Community Learning System (CLS)**

To provide the data driven evidence necessary for cities and metropolitan areas to build an equitable and sustainable social transformation, the SDAL is proposing to create a Community Learning System (CLS). The CLS is a framework for understanding the causal powers of change. **The CLS will provide a process for Arlington County to leverage their distinct data assets and incorporate the community's collective knowledge to tackle the question "What works, for whom, and in what context?"** CLS development is based on direct engagement with community leaders and the use of existing data sources resulting in a system able to adapt to the unique contextual constraints across programs and departments. Building out a CLS for Arlington County will create in a process that is transferable and adaptable to other cities and metropolitan areas.

SDAL's integrated systems approach to community learning:

- **integrate the community's collective knowledge** with usable insights gained from data science and statistical learning to provide civic leaders with the information needed to develop mechanisms for action that meet the goals of the community within their contextual constraints;
- **review and measure the action chain** to gain a better understanding of what works, what doesn't, and why, by understanding the associations between issues, the timing of problems, and how the data sources link together;
- **redirect actions and resources** when warranted based on the information from a continuous systematic review.

*Invent the Future*

Arlington County wants to be responsive to their residents and provide an environment in which all residents can thrive; the CLS is a process to make this a reality. In the process of linking and fusing administrative data across programs and departments we will address questions through a holistic approach. The development of the CLS will provide a forum for dialogue and the opportunity to write the story of the community story through the use of the community's data.

### **Arlington County/VT Projects**

We plan to introduce and develop the Community Learning System through three interconnected projects (1) Introducing Analytics to County Leaders through Data Discovery Workshops, (2) Analyzing Police and Fire/EMS 911 Calls and Incidents for Community Trends, (3) Mapping Demographic and Social Changes in Arlington County. This will require interactions with Arlington County personnel, acquiring and wrangling the data, and conducting the analysis.

### **Data Discovery Workshops**

The first project involves developing a series of **Data Discovery Workshops** with county leaders at all levels. This will involve a series of workshops to expose leadership to the power of data analytics and identify some first crosscutting county issues that could benefit from analytics. The first workshop will introduce data analytics using examples with Arlington County data. At this workshop, the discussion will identify county issues, ideally, but not limited to those that cannot be answered within the data boundaries of one program or department. These issues will be put in priority order and the top 1-3 will be selected for the first round of CLS analyses. Subsequent meetings with these stakeholders will be held to refine the questions to identify, acquire, and repurpose the data to conduct the analyses. The process will repeat for at least 3 subsequent workshops. The meetings will start with insights gained through the lens of the data and intelligent statistical analysis to date, discussion of practice and policy implications, and identification of next set of questions to address.

### **Identifying Trends in Police and Fire/EMS 911 Calls and Incidents**

Working with Police and Fire/EMS 911 data (separately and together), VT SDAL will identify and analyze the types of emergency 911 calls and response data available, with the goal of gaining better insight into critical scenarios and situational awareness. The first step will be to meet with the Police and Fire/EMS personnel to discuss their questions and interests. Our CLS approach will be designed to directly address their questions and to provide new insights gained from linking the data across time and space into what has been and is occurring throughout the county. For example, the Police Department is challenged to keep pace with the 18 plus hour day, necessitating the deployment of resources evenly throughout the day, evening and nighttime, with heavy burdens in the night and weekend hours. New challenges for police services include events such as bar crawls, special events, and the continually expanding role they have in homeland security issues. The Fire/EMS Department is interested in learning about what additional insights might be gained through the use of social media, what happens to EMS patients in the long run, and to examine the distribution of critical 911 call versus those that might be served through other mechanisms. Examples of past work are available at:

<https://collaboration.vbi.vt.edu/display/FPSDSP/Our+Work+with+Arlington+County>

## **Mapping the Growth and Social Pattern of Arlington County for Today and Tomorrow**

Arlington County is considered an ideal place for people to live, learn, work and play. There are multiple housing options, good schools, business opportunities, and thriving arts, recreation, and nightlife. Using the CLS to integrate the findings emerging from the first two projects, additional data will be discovered repurposed to characterize the patterns of life in the county today and into the future. Some obvious sources include local housing, education, and health data. The goal is to examine and analyze how Arlington has changed over the last 10 years to gain insights for the next 10 years. This analysis will allow all departments (Police, Fire/EMS, Environmental Services, Public Health, Emergency Management, Education, and others) to better anticipate and plan for the types of resources and personnel needed over the next ten years.

These initial projects will provide a foundation for the CLS, creating a data infrastructure that provides a cohesive understanding of life in Arlington County.

### **Virginia Tech's Social and Decision Analytics Laboratory (SDAL)**

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 and to advance the data revolution toward addressing the social good. Our staff is a creative and diverse team of statisticians, economists, cognitive psychologists, and political scientists, and computational social scientists. We develop frameworks and methods to integrate all types of data, in the context of solving real-world problems, enhancing collaboration and driving innovation in our communities.

SDAL is one of the four laboratories in the Biocomplexity Institute of Virginia Tech. The Biocomplexity Institute is at the forefront of a scientific revolution, applying a deeply contextual approach to answering some of the most pressing challenges to human health and well being within our changing environment. The biocomplexity approach analyzes the interactions between components at the micro scale to produce significant changes on the macro scale. SDAL researchers embrace this approach in building data-based analytics to gain insights from molecules to policy.

### **Summary**

Virginia Tech, through its Biocomplexity Institute, Social and Decision Analytics Laboratory possesses a unique combination of capabilities and expertise in the fields of statistics, social, behavioral and economic sciences, computer science, simulation, data analytics, information technology policy, and resilience that will be essential to these efforts. The implementation of a Community Learning System in will support evidenced based analyses for decision- and policy-making, enabling capabilities to improve the livability, efficiency, and resiliency of Arlington County.

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# Creating and Sustaining a Learning Community in Arlington County

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## Vision

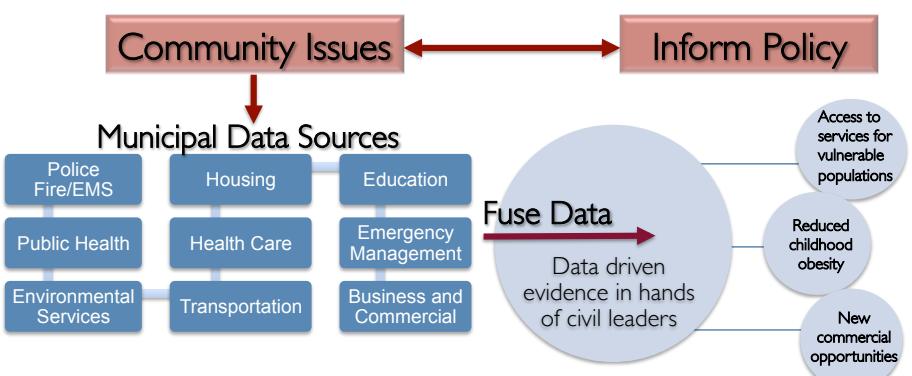
- Arlington County, in partnership with Virginia Tech (VT), has the opportunity to **improve the county's quality of life and services** while accelerating the county's efficiency and resiliency by **liberating and repurposing county data captured for administrative purposes**.

## Community Learning System

- Develop a process for Arlington County:
  - To leverage their data assets and incorporate the community's collective knowledge, and
  - To combine existing administrative data to answer "**What works, for whom, and in what context?**"

## What is the Problem or Need for this Research?

- Arlington County wants to be responsive to their residents and provide an environment in which all residents can thrive
- The Community Learning System is a process to make this a reality by linking and statistically fusing existing county data



## Key Ideas

### The Community Learning System

- integrates the community's collective knowledge** with usable insights gained from data science and statistical learning to provide civic leaders with the information needed to develop mechanisms for action to meet community goals;
- reviews and measures the action chain** to gain a better understanding of what works, what doesn't, and why;
- Redirects actions and resources** when warranted based on the information from a continuous systematic review.

The development of the Community Learning System will provide a forum for dialogue and the opportunity to write the story of the community story through the use of the community's data.

## Comparison to Alternative Approaches

- Alternative approaches are based on one-off data calls for immediate operational questions
- Alternative approaches frequently invoke new data collection
- Loss of data and use in holistic platform

## Introduce and Develop the Community Learning System Through Three Projects:

- Introducing Analytics to County Leaders through **Data Discovery Workshops**
- Analyzing** Police and Fire/EMS 911 Calls and Incidents for Community Trends
- Mapping Demographic and Social Changes in Arlington County for **Today and Tomorrow**

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Sallie Keller, Ph.D., is professor of statistics and director of the Social and Decision Analytics Laboratory within the Biocomplexity Institute of Virginia Tech. Formerly, she was professor of statistics at University of Waterloo and Academic Vice President and Provost. Previously, she was the director of the IDA Science and Technology Policy Institute in Washington, D.C. In addition, Dr. Keller was professor of statistics and the William and Stephanie Sick Dean of Engineering at Rice University. Her other appointments include head of the Statistical Sciences group at Los Alamos National Laboratory, professor and director of graduate studies in the Department of Statistics at Kansas State University, and statistics program director at the National Science Foundation. Dr. Keller has served as a member of the National Academy of Sciences Board on Mathematical Sciences and Their Applications, has chaired the Committee on Applied and Theoretical Statistics, and is currently a member of the Committee on National Statistics. Her areas of research are uncertainty quantification, computational and graphical statistics and related software and modeling techniques, and data access and confidentiality. She is a national associate of the National Academy of Sciences, fellow of the American Association for the Advancement of Science, elected member of the International Statistics Institute, and member of the JASON advisory group. She is also a Fellow and past president of the American Statistical Association. She holds a Ph.D. in statistics from the Iowa State University of Science and Technology.

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Stephanie Shipp, Ph.D., is the deputy director and research professor at the Social and Decision Analytics Laboratory (SDAL) at the Biocomplexity Institute of Virginia Tech. Dr. Shipp's work spans topics related to innovation and competitiveness with recent emphasis on creation of smart cities, use of big data to advance policy, social network analysis and evaluation of education grant programs, advanced manufacturing, the role of federal laboratories, and funding of high-risk/high-reward research. From 2007 to 2013, she was a senior researcher at the Science and Technology Policy Institute, where she led studies on advanced manufacturing, innovation and competitiveness, technology transfer at federal laboratories, big data, evaluation of public health programs, and evaluation of education programs. As a member of the federal Senior Executive Service from 2001 to 2008, Dr. Shipp was the director of the Economic Assessment Office in the Advanced Technology Program at the National Institute of Standards and Technology. Previously, she led economic and statistical programs at the Census Bureau, the Bureau of Labor Statistics, and the Federal Reserve Board. She is a fellow of the American Statistical Association (ASA) and has held several leadership positions within ASA. She was a member of the international advisory board for *Verket För Innovationsystem* (VINNOVA), Sweden's innovation agency. She led an expert panel to evaluate the Swedish Research Council's Linnaeus Grants in 2012 and in 2014. She has a Ph.D. in economics from The George Washington University.