Deploying New Tools for the Fight Against Disease Outbreaks.

INTRODUCTION
Protecting people from diseases and other threats to the public health is one of the most important jobs that government performs. When outbreaks occur and threaten the public, doctors, scientists and researchers need to react quickly to analyze the situation, suggest ways to control and stop the spread of the disease, and ultimately save lives.

CHALLENGE
Those public health professionals were put to the test during an outbreak of HIV that began to spread through rural communities in Indiana, with 181 confirmed cases of infection occurring there since early 2015. The state invited a federal agency team to analyze the ongoing patterns of the outbreak and to help find ways to stop its spread.

In the Indiana outbreak, there was a lot of data to be analyzed including HIV outbreak clusters, geographic factors, epidemiological patterns and drug resistance data, among others. Hidden within those general datasets were even more variables for analysts to consider as potential causal factors for the unprecedented rate of HIV transmission. Those variables included factors like transmission through sexual encounters, the role of commercial sex workers, use of shared needles, and other data points that are not easily tied together and analyzed. And, this was further complicated by having that information come from many different sources including internal data, data from the field, and publicly available information.

SOLUTION
When outbreaks occur and threaten the public, doctors, scientists and researchers need to react quickly to analyze the situation, suggest ways to control and stop the spread of the disease, and ultimately save lives.

RESULT
The use of Leidos’ CAADS™ program will also help the federal team to continue to achieve their most important goal, to shield people from the ravages of disease by mapping and analyzing its insidious spread – and ultimately, saving lives.
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**SOLUTION**

For the proof of concept, Leidos used data from a previous study to demonstrate the benefits of the CAADS™ platform. The Leidos team used CAADS™ to uncover important information and possible outbreak factors that had previously been undetected. It also was able to reduce analysis time by a factor of six, and improved interaction between data scientists and the officials being supported.

**RESULT**

The CAADS™ tools were able to be used completely internally by the federal team, so any personal information collected about the people infected with HIV in the region remained protected at all times. Leidos Data Scientist and Healthcare Analyst Stuart Urban provided blinded collaboration and support during the pilot program. He was able to provide that support without having to see the details of the data being analyzed.

Leidos was invited to participate in a proof of concept to see whether its Collaborative Advanced Analytics & Data Sharing (CAADS™) platform could meet that need. CAADS™ makes data science tools accessible via a single secure interface with minimal training and no coding skill required.

Users of Leidos’ CAADS™ platform enjoy a secure single, easy-to-use interface that integrates the capabilities of best in class analytics tools. CAADS™ provides an end-to-end solution for big data analytics, while giving users the flexibility to make use of the entire suite or just the parts of CAADS™ that best advances their analytics goals. For example, one part of CAADS™ is called Trifacta Wrangler. It can be used to extract, transform and integrate agency datasets with external data sets, without the need to write code. The Centrifuge component to CAADS™ is used to develop an interactive visualization of outbreaks, allowing users to work with networks and GIS data simultaneously. Meanwhile, the Alpine platform within CAADS™ provides advanced analytics tools. Alpine uses machine learning techniques like linear regression and decision trees in order to identify rules which can be used to optimize outbreak responses and improve healthcare-related surveillance activities. Uniquely, CAADS™ flexible data-centric architecture enables Leidos to add or substitute tools based on customer needs and advances in analytics.

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Building on the success of the proof of concept, the CAADS™ tools were deployed in a pilot program and directed at the Indiana outbreak. The results were noticed almost immediately by researchers.

Not only was CAADS™ saving time, it was also able to identify important information about the Indiana outbreak that might have potentially been overlooked. One researcher commented, for example, that they were able to use Trifacta to identify a missing record and two others which should have been rejected based on unrealistic outliers. All three records had already been cleaned using other tools. Using CAADS™ in that case helped to build a cleaner, more accurate data set.

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The agency was able to use CAADS™ to more deeply understand and map the spread of HIV during the outbreak in Indiana, based on risk behaviors and modes of transmission. It was able to produce several recommendations based on that information to help slow the rise in HIV infections in the region. In the future, agency researchers hope to use the platform to gain insights into effective interventions to reduce, and eventually eliminate, HIV outbreaks in an environment where social media and the growth in intravenous drug use are contributing to accelerated transmission.

Moving forward, the CAADS™ platform could assist U.S. and international health agencies in controlling and ultimately stopping the spread of not only HIV, but also of other disease outbreaks and public health events such as the Zika virus, hepatitis, various superbugs and yet-unknown future threats. CAADS™ not only helps to speed up response times, but provides powerful analytical tools to the subject matter experts, scientists, agency executives, doctors and researchers who will respond to future public health emergencies, regardless of their level of computer or programming experience.

The use of the Leidos CAADS™ program will also help the government continue to achieve its most important goal: to shield people from the ravages of disease by mapping and analyzing its insidious spread – and ultimately, saving lives.