Resultant | MANAGEMENT PERFORMANCEHUB

Applying Advanced Analytics to a Pervasive and Growing Issue: The Data-Driven Addiction Prevention and Recovery Project

SETTING THE STAGE

Nearly one in twelve Indiana residents experiences substance use disorder (SUD). Death by drug overdose in Indiana has increased over 500% since 1999 and doubled in the past decade alone. Hoosiers are now more likely to die from a drug overdose than from a car accident. And as the COVID-19 pandemic has drawn attention and resources, resurgences in drug use and overdose have taken an even greater toll. The difficulty of accessing mental health care, made worse by the toll of the pandemic, has exacerbated the problem nationwide.

In Indiana, combating SUD has been a focus for Management Performance Hub (MPH) through its Drug Data Working Group (DDWG), a collective venture among several state agencies that serve the SUD population. They engaged with Resultant in 2019 to enhance their capabilities in addressing the problem.

MPH and Resultant created the Data-Driven Addiction Prevention and Recovery (DDAPR) Project to leverage advanced analytics techniques, informed by subject matter expertise, to facilitate data-driven decisions in Indiana services, programs, and policies. DDAPR exists to ensure the state has the infrastructure, people, and methodologies it needs to utilize the entire breadth of pertinent data from all of the agencies that serve SUD populations. Compiling and analyzing data from the many arms of the SUD experience—including law enforcement, education, health care, and so on—expands the state's potential for not just treating but preventing addiction. Ensuring the data collection and sharing so essential for this progress depends on careful oversight of the complex project that brings together broad perspectives into insight.

DDAPR's extensive reach allows for use cases that reveal insight at the individual and population levels, enabling agencies to explore creative means of reducing SUD's insidious hold on Hoosiers.

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THE PROBLEM

Substance use disorder is a sprawling problem that touches a range of populations and reflects various issues and challenges within society, and it never stands still. Because it's highly stigmatized, drawing data-based conclusions and developing programs from those insights is especially important to achieving real change. Further, SUD depends on such a complicated mix of factors that addressing it requires constant evaluation, which can be made possible only through the ability to leverage top-tier technology tools and data from a broad spectrum of sources.

Serving Indiana's SUD population is an ever-shifting challenge that requires nimble, data-informed programs and policies. Building the tools that bring together disparate data across agencies is a hurdle all on its own, and it's one made more complex by the variation in regulatory and data oversight from agency to agency.

In its first year, DDAPR's challenge was to build the foundation that would draw together resources, build the tools that would effectively utilize them, put the right team in place, and thereby set the foundation that would ready Indiana to address SUD now and enable the state to pivot as circumstances and stakeholders change. Early findings required engineering resources and data architecture in four categories: data pipeline construction, data warehouse maintenance, infrastructure support, and technology support.

Successful integration will enable the DDAPR team to continue work in micro analysis, macro analysis, and business analysis toward effective outcomes of addiction prevention and recovery. MPH and Resultant worked to create a model that provides the necessary 10,000-foot view to refine the way programs address SUD. Bringing the conceptual model into its most effective shape demanded a constant and evolving steam of data and tools, which means that DDAPR's earliest stage required meticulous care and creative solutions that would be adaptable to dataset acquisition and feature engineering.

THE APPROACH

Resultant's approach begins with people: the members of the DDAPR team, the citizens in need of its help, and the state policymakers looking for answers. Step 1 was to create a project team that blended Resultant and MPH resources. Neither party was interested in a traditional consultative approach that happened outside of the client's view. A collaborative, iterative process utilizing MPH's project management, data science, and data architecture resources as well as the expertise of the Resultant team would ensure that the solution aligned with the people, processes, and technology already in place and as the project evolved.

Collaboration encompassed agencies outside of MPH as well. The needs of the people who operate a methadone clinic, for example, are different from those who run drug courts and homeless shelters, or any of the myriad other services related to addiction. Discovering the needs of those stakeholders helps ensure DDAPR brings its intended value to the people who use it and especially to the citizens who are affected by SUD. A critical part of our approach is to involve these stakeholders at important stages of the project so we can meet them where they are, building a tool that truly serves them and giving them what they need to utilize it. We worked through several iterations with MPH and state agencies, refining as the project progressed based on that essential feedback.

The project involved several layers of experience and expertise:

– **Data Analysis:** Data science and machine learning techniques enable the state to conduct research, validate (or invalidate) stakeholder assumptions, and provide data-driven insights

– **Data Architecture:** Consistent, efficient structures for accessing data meet data scientist and other stakeholder requirements, and make the data store clean, efficient, and traceable from data source to end product. We will evaluate the benefits and risks of any new or unknown technologies to determine whether they further the project and how they will fit the system.

– **Business Analysis:** Building effective solutions depends upon the insight and expertise to refine project methodology, develop use cases, and absorb feedback from stakeholders. Partnered with the data analysis team, our business analysis team conducts conceptual research, documentation, visualization, and requirements-gathering for analytical work products.

– **Communication:** Projects go awry when communication lags. Our team diligently facilitates MPH communications, including sharing the team's insights, internal and external networking, marshalling support, and influencing state policy through evidence-based research.

– **Project Management:** We support project initiatives by ensuring consistent delivery of high-quality work on budget and on time while minimizing risks.

ADDRESSING SUD: THE DDAPR TOOLS

Understanding risk factors for individuals at any point in their SUD journey requires micro analysis that focuses primarily on citizen stakeholders. Ongoing micro analysis builds consistently reliable predictions, incorporates additional datasets into the model, and reveals insight for agency stakeholders. A risk-prediction tool will provide targeted information and resources for internal or external use.

Macro analysis focuses on an ever-evolving conceptual model that accurately displays the opioid ecosystem. Organized vertically by domains (demographics, influences, health, lifestyle, and pathway) and horizontally by connections between nodes within the domains, this research framework allows analysts and agency stakeholders to map the behaviors of populations across features of the SUD ecosystem.

THE OUTCOME

Without a successful foundation, MPH would struggle to address SUD now and would lack the resources to shift as needs evolved. Our partnership successfully developed the strong data and technology tools and processes that will enable SUD programs to effect change as DDAPR evolves. Indiana's already robust data analytics infrastructure had continued to solidify MPH as national leader in data transparency, and it has brought a state government greater flexibility and responsiveness to changes in the SUD environment. Indiana will be able to adapt when key components shift and old assumptions are disproven so that agencies may truly and effectively serve those affected by SUD.

In year one, this project produced several foundational outcomes:

- Organization, cleansing, redefinition, and merging of datasets within the Drug Data Warehouse into topic-based data structures for ease of analysis and sharing

- A conceptual model of the opioid crisis that describes the potential paths, touchpoints, and required data elements to produce an accurate and complete picture of the SUD ecosystem, including delivery of the model in Tableau dashboard form to MPH

- Graph database technology to link datasets, GPU-enabled servers for more robust computing, and other technology and infrastructure upgrades to conduct advanced analytic techniques

- A landscape analysis canvassing similar efforts conducted by national and international bodies to inform use cases and research directions and to establish future research partnerships for the agency

- An overdose-death risk prediction model as part of the micro analysis workstream

- Processes so that technologies added to the long-term environment have documentation and knowledge transfer events, ensuring that MPH staff can continue to support the technology beyond the scope of this contract

THE IMPACT

Data analytics efforts like DDAPR are critical for finding creative, efficient solutions to problems and removing the stigma that has for too long surrounded SUD. Through DDAPR, Indiana can live up to its commitment to using data-driven decision making to create effective policies and ensure the best possible outcomes.

DDAPR has a robust foundation and is well-situated to further its reach preventing addiction, informing Indiana policies and programs, and helping affected Hoosiers navigate their own difficult paths within SUD. As DDAPR progresses, Indiana will reach its goal of reducing the number of addicted Indiana citizens.