First-ever public database of nationwide opioid transactions

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The weight of the opioid crisis is heavy.

From 2006 to 2019, more than 100 metric tons of prescription opioid pain relievers—roughly the weight of a loaded Boeing 757-200 aircraft—were dispensed to individuals across Indiana. Widespread opioid use is leading to devastating socioeconomic and health challenges, but organizations and policymakers working to fix the problem have not had a clear picture of opioid manufacture and travel.

Now, a public database is filling in those details through a user-friendly interface developed at the University of Notre Dame. This platform enables public access to more than 10 years of national controlled substance transaction information. This data structure makes querying easier and faster, providing transactional data on 14 different opioids including fentanyl, hydrocodone and oxycodone.

The database stores the Automation of Reports and Consolidated Orders System (ARCOS), a collection of more than 550 million detailed opioid transactions that were submitted to the Drug Enforcement Administration by manufacturers and distributors of controlled substances from 2006 to 2019.

"Understanding the root of the drug crisis is crucial for medical professionals, researchers and policymakers to mitigate its impact effectively," said William Evans, the Keough-Hesburgh Professor of Economics and co-founder of the Wilson Sheehan Lab for Economic

Opportunities (LEO). "This is critical as this crisis has been particularly devastating for certain groups such as those who have been left behind in the economy. With this data, we now have unbelievable detail about the origins of this crisis, and we hope that this information can be part of developing solutions."

The ARCOS data became available through Paul Farrell Jr., a 1994 Notre Dame alumnus and co-lead attorney in the National Prescription Opiate Litigation. Although Farrell and his team at Farrell & Fuller had made the secured data publicly available on their firm's site, the data set was very difficult to work with given its size.

Wanting to make this data more accessible to researchers, policymakers and health professionals, Farrell and the case's expert witness met with researchers from LEO and Notre Dame's Lucy Family Institute for Data and Society. Together, they created a plan for transferring the data to the University and gained a deeper understanding of the data.

Researchers from across campus collaborated with Farrell to develop a website where the records could be stored for public use. Evans and Ethan Leiber, the Gilbert F. Schaefer Associate Professor and director of graduate studies in the Department of Economics, partnered with the Lucy Family Institute's Applied Analytics and Emerging Technology Lab (AETL) to facilitate the design and development of the new platform, ARCOS.nd.edu.

The website offers customizable queries that trace the journey of individual prescription opioid purchases, from the state and county of manufacture to distribution within communities where they are dispensed.

Michael Kennel, lead software solutions architect with AETL, developed the user-friendly interface for ARCOS. He hopes that access to the data

on ARCOS.nd.edu will provide insights into understanding the rise of opioid misuse in America.

"The opioid crisis has claimed millions of lives. To change that, researchers need an easier way to obtain and analyze the data behind the crisis," Kennel said.

Nitesh Chawla, founding director of the Lucy Family Institute and the Frank M. Freimann Professor of Computer Science and Engineering, noted that the project's goal to provide user-oriented access to substance abuse transaction data aligns with Notre Dame's goal of pursuing research that provides discoveries to enhance human well-being. He described the opioid epidemic as "one of society's wicked problems."

"Addressing this challenge is central to the mission of the Lucy Family Institute and is aligned with the University's strategic framework," Chawla said. "The data itself is not going to save a life, but the results from our collective research using the data can provide impactful data innovations that promote the prosperity of humanity. We are grateful for this collaboration with LEO, as it truly is a story of domain-informed, data-driven research for societal impact."

This effort also informs a larger data platform initiative that AETL is launching this year, which "aims to scale impact by reducing barriers to access data and leverage advanced machine-learning resources," said Rick Johnson, managing director of AETL.

The ARCOS website will expand as more information is collected to include additional years. In anticipation of this, the AETL team is continuing to optimize the user experience by developing enhanced query tools and file export options. Kennel explained that "at AETL, the apps that we build may not necessarily have an immediate impact on someone's life, but we're enabling people to do things that will have that

kind of lasting impact."

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