





BIG DATA: Government's Next Frontier?

Some government agencies have implemented big-data initiatives that target certain populations. From evaluating the risk of recidivism among prison parolees—helping parole officers better target their interventions—to helping colleges identify potential dropouts well before they actually drop out, these initiatives benefit the people they target while helping the organizations achieve efficiencies otherwise unavailable.

Everywhere we turn these days, we bump up against “big data.” It’s in the news, sometimes in ominous-sounding contexts. It’s on our computer screens every time a website suggests items we might like because of something we’ve purchased before. It’s on our smartphones when we get a tweet from our bank notifying us of “possible fraudulent activity.” Big data, data mining, predictive analytics, data analytics—all of these terms refer to the same idea: that people or companies with the right access, analytical tools, and training can comb through large repositories of information to find patterns that can help them predict outcomes and make informed decisions.

In the context of shrinking government budgets, the public sector is also starting to turn to big data to help get the job done. Carolyn Bourdeaux, associate professor of public management and policy at the Andrew Young School of Policy Studies at Georgia State University in Atlanta, has a particular interest in the subject. “Big data is one of the first breakthroughs I’ve seen in a long time, with government able to achieve some real efficiencies,” she said. “I really believe it’s the new frontier in new government services.”

Bourdeaux pointed to two big data initiatives in Georgia that have shown great promise:

- In 2003, the Georgia State Board of Pardons and Paroles rolled out the nation’s first big data approach to assessing a parolee’s risk to reoffend, allowing the board to manage a growing number of parolees with a shrinking number of parole officers.
- Meanwhile, Georgia State University (GSU) piloted a handful of big data projects in the mid-2000s based on student information and saw its graduation rate increase by about 35 percentage points in the past decade.

Big data gets out of jail

Sometimes big data move beyond efficiency gains and help point to brighter futures for people and society. Consider the case of Darryl Jones, a first-time felony offender. Arrested in 2011 for a simple unarmed burglary of an unoccupied residence, the 24-year-old was sentenced to five years in prison. He joined about 55,000 other inmates already in Georgia—fifth in the nation for number



010001001111
010001001111

Source: National Institute of Corrections

19%

How much Georgia's incarceration rate exceeds the national rate (403 per 100,000)

479

Per 100,000 of Georgia's population in prison (as of 2010)

of sentenced prisoners. But Jones's status as a first-time offender, along with other factors, gives him a pretty good chance at parole. Entering the parole system would benefit not only Jones but also the prison system and the state's taxpayers.

In 2011, it cost about \$51 a day to maintain a single prison bed, according to the Department of Corrections. Supervising a parolee, at about \$2.90 a day, is significantly less expensive. This is where the Georgia State Board of Pardons and Paroles (parole board) comes in. "The parole board in Georgia is a safety valve for the prison population," said John Prevost. Prevost, now retired, worked for the parole board and co-led the big data project to automate the process of assessing parolees' risk to commit more crimes—or their "risk to reoffend."

Unfortunately, research shows that about 30 percent of parolees will commit another crime or otherwise break the terms of their parole and return to prison. Because of the financial and social costs that are incurred when this happens, the parole board must predict as accurately as possible each parolee's risk. For many years, parole officers relied on a paper-based tool still used by many parole boards nationwide to systematically evaluate the risk. The process was burdensome and costly, said Prevost, and involved some subjectivity on the part of the parole officers. The officer would use the score derived from filling out the instrument's forms to readjust the parolee's level of supervision, if necessary.

The parole board had a major breakthrough in 1998 when it computerized its case management system. Parole officers began using laptops to enter data related to parolee performance and parolee-officer interaction. They continued to use the pen-and-paper method for case assessments, but were starting to amass a wealth of real-time data on thousands of parolees.

In 2001, the parole board and the Department of Corrections formed a workgroup to find an application for this data (and prisoner data) that would take some of the burden of evaluating the risk off the parole officers so they could better spend their time on supervising their cases. The project was co-led by Prevost and Tammy Meredith, a criminologist and data analytics specialist. The work group, which also included criminal justice researchers, parole officers, statisticians, and IT specialists, analyzed 6,000 cases that were completed in 2001. "We looked at everything about a parolee," Meredith explained: demographics, arrest history, prison history, failed and passed drug tests—everything the prisoner/parolee has

done from the point right before he or she entered the system. The workgroup eventually uncovered 45 risk factors that helped predict a parolee's likelihood to commit another crime. Some factors were static—such as age at first offense and gender—and others were dynamic—such as attitude and behavior during supervision or employment. From this information, the group created a set of algorithms that, when run against live data, would predict a parolee's risk.

Prevost said that possibly the most important function of risk instruments is to identify those offenders who, like Jones, do not need close supervision. Criminology research has found that the over-supervision of low-risk parolees is linked to a lower supervision completion rate. "For example, if we place low-risk parolees in programs that their risk levels indicate they do not need, we are exposing them to high-risk parolees," Prevost said. "One of the highest associations with criminality is a person's associates."

Two years after the work group began, in 2003, the Georgia State Board of Pardons and Paroles launched the Georgia Parolee Risk Assessment tool, the first automated tool in the country. Every night, the main computer would crunch the numbers and reevaluate risk for every parolee in the system. If a parolee's score rose over a certain threshold, the system automatically sent a notification to the case officer, who would then use this information—or not—to make changes in supervising the parolee.

But the project wasn't done. In 2005, the parole board was awarded a National Institute of Justice grant to conduct a more in-depth analysis, and the work group resumed analyzing the data. This time, they researched 38,000 completed parolee cases and looked at more factors. They wanted to determine whether certain parole officer responses to parolee behaviors got better outcomes than others. If a parolee fails a drug test, for example, the supervising parole officer can respond in one of several ways: do nothing, issue a verbal reprimand, swear out a warrant and have the parolee arrested—which often results in parole revocation—or refer the parolee right away to assessment and treatment.



Source: Chronicle of Higher Education

The work group found evidence that any completed treatment program—whether it is drug treatment, educational, mental health, or even cognitive skills—reduces a parolee’s risk to fall back. The work group also uncovered 200 data elements connected to a parolee’s likelihood (or reduced likelihood) of committing a new crime. The work group launched the new instrument—the Parolee Automated Risk Instrument—Generation 2, or PARI-2, in 2010.

Although the PARI-2 is the only automated parolee risk instrument in the country, “there’s nothing magical about it,” assured Prevost. “It’s the same kind of prediction done in many other fields but has not been often applied in the corrections field.” He attributes this dearth to the basic human assumption that we can size people up. “We let our emotions get in the way,” he said, “and we want to make a gut decision. But there’s been quite a bit of research that instruments are far more accurate.”

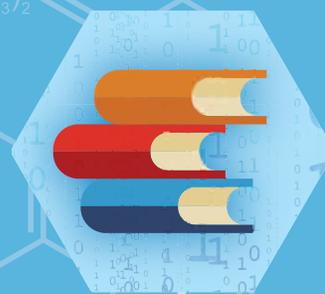
Big data goes to school

Another case of a big win for big data: higher education. On the Saturday after her first week of class at GSU, freshman Maria Gonzales received an e-mail notifying her that she’d been dropped from her classes. Maria, a first-generation college student from a low-income family, was just \$400 shy of paying her tuition and fees for the semester, so the university was required to drop her. But by Monday morning, Maria was back in class as a registered student. She didn’t sell her car or rob a bank. Instead, she received a bridge grant from the university to cover the rest of her fees and keep her in class. Maria was the beneficiary of big data.

Over the past few years, GSU, a large public university in downtown Atlanta, has launched several programs, including a handful of big data pilots, designed to help students stay in school, explained Tim Renick, a professor and associate provost. In many ways, GSU is a typical urban public research institution. For one, it serves a diverse student population. Of a total of 32,000 undergraduates, 40 percent are first-generation students, 51 percent are on Pell grants, 60 percent are nonwhite, and 33 percent come from families with incomes of under \$30,000.

But in one very important way, the school is not typical. At a time when many public colleges and universities are being criticized for their dismal graduation rates—only about 30 percent—over the past decade, GSU has brought its rate up significantly, from a little more than 32 percent in 2005 to around 67 percent in 2013. “We are in the top five for the most rapid increase in our graduation rate,” Renick said. “Our goal is to bring it up another 3 percentage points this fall.” He credits in large part an early-alert program the school has implemented.

“We have become one of only three schools in the country to have a large academic and advisement tracking system that very much relies on big data,” he said. That system is designed to intervene before a problem occurs. Every night, the school’s



31%
National four-year graduation rate for public institutions (of students starting in 2004)

24%
Four-year graduation rate for Georgia public institutions (of students starting in 2004)

computer system mines student financial data, looking for students who are at risk for dropping out for financial reasons.

The Panther Retention Grant program was piloted in the fall of 2011. Armed with a single donation from the university president and information from the data, Renick and others began calling some of the students who were dropped from the roster for financial reasons. “That first fall, we were able to help more than 40 students,” said Renick. “Some students actually hung up on us because they thought it was a joke.” The program has grown exponentially in the short time since the pilot. Last year, the program brought more than 1,700 students like Maria back to school, awarding them grants averaging less than \$1,000 each. “We’ve had large numbers of donations because people find the story compelling,” said Renick.

Not only are financial challenges uncovered, the school’s computer system also combs the data to flag students who are on track to drop out for academic reasons. “We took seven years of Georgia State student data—including over 2 million grades—and used those to develop analytics to indicate what students did that put them at risk for not graduating,” Renick explained. The school found that students who receive Ds or Fs in particular courses have an increased likelihood for dropping out. The computer program automatically notifies school advisers about those students. An adviser then contacts the student to set up a plan of action—either a tutoring arrangement with a student

Continued on page 34

In other words, countries with greater austerity had disappointing growth. In a follow-up paper this year, the IMF's Olivier Blanchard and Daniel Leigh expanded on the earlier methodology and concluded:

[T]here is no single multiplier for all times and all countries. Multipliers can be higher or lower across time and across economies. In some cases, confidence effects may partly offset direct effects. As economies recover, and economies exit the liquidity trap, multipliers are likely to return to their precrisis levels. Nevertheless, it seems safe for the time being, when thinking about fiscal consolidation, to assume higher multipliers than before the crisis.

Some economists dispute the IMF's empirical results of multiplier understatement, saying that the countries included in the study can bias the results in a significant way. For example, Germany and Greece are outliers relative to the rest of the euro zone—Germany has lower debt and higher growth and Greece, the opposite, relative to the euro zone. Removing one or the other can dramatically affect the multiplier calculation. However, even studies skeptical of multiplier understatement can agree that higher multipliers exist for economies in recession.

Given the recent tide of economic research casting doubt on the wisdom of implementing austerity in a weak or recessionary economy, the debate now turns to politics. In 2013, the United States began implementing a large amount of fiscal austerity, in the form of spending cuts (from the sequester) and payroll tax increases (part of the fiscal cliff). The Congressional Budget Office estimates that fiscal austerity will reduce real GDP growth in 2013 by around 1.5 percentage points. And this prediction does not factor in possible fiscal disturbances that could occur later in the year given the need for congressional authorization to raise the debt ceiling and avoid a government shutdown. While the U.S. deficit has been falling recently, and thus debt levels are moving lower, fierce political polarization on the issue remains. In Europe, there is intense debate both in the UK and the euro zone about the wisdom of austerity policies, with public protests against further cuts to social services. The lack of any substantive economic recovery in the euro zone is making the austerity debate all the more intense. In both the United States and Europe, this issue is not going away. ■

This article was written by Andrew Flowers, a senior economic research analyst in the Atlanta Fed's research department.

Continued from page 25

who has performed well in the class or advice that the student might want to consider another major. That advice is also based on predictive analytics, giving the adviser more concrete information on what course of study the student is likely to perform well in than a gut feeling on the adviser's part.

Renick noted that large public universities like GSU are receiving much criticism these days—about wasted dollars and about failing the very students they are designed to serve. He credits this criticism for GSU's success in part because it has "lit a fire" for the university to tackle some of these issues. "We believe that it's not acceptable to take student tuition dollars and not provide them a clear path to success."

Welcome good news

The term "big data" in the context of government can evoke images of "Big Brother," especially given the recent news about the surveillance program of the U.S. National Security Agency. However, in most instances, laws are already in place to protect individual privacy. For example, "there is a federal law, FERPA [the

Family Educational Rights Privacy Act of 1974], that restricts the university from releasing student information to anyone outside the university but the student," Renick said. Even parents are forbidden from obtaining their offspring's information—including grades. As long as these safeguards are upheld, the potential of such programs to make government more efficient and bring about changes that benefit individuals far outweighs the risks. "There are dozens and dozens of government services that could benefit from big data," Bourdeaux said. And thanks to big data already in action, Georgia residents like Darryl and Maria are better off. ■

This article was written by Nancy Condon, an associate editor for EconSouth.