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# The Promise of Data-Driven Policymaking

*The federal government is only scratching the surface in its use of information technologies to collect, analyze, and use data in innovative ways.*

**D**uring the past decade, advances in information technology have ignited a revolution in decisionmaking, from business to sports to policing. Previously, decisions in these areas had been heavily influenced by factors other than empirical evidence, including personal experience or observation, instinct, hype, and dogma or belief. The ability to collect and analyze large amounts of data, however, has allowed decisionmakers to cut through these potential distortions to discover what really works.

In the corporate sector, a wide variety of data-driven approaches are now in place to boost profits, including systems to improve performance and reliability, evaluate the success of advertising campaigns, and determine optimal price. Marriot International, for example, has created a program called Total Hotel Optimization that uses data to shape customer promotions and set prices on rooms, conference

facilities, and catering.

In Major League Baseball, the scouting departments of some of the most successful teams are stocked with statistical experts who crunch numbers to determine which players to draft and sign. As described in Michael Lewis's *Moneyball*, Oakland A's General Manager Billy Beane relied on statistical analysis to build one of baseball's most winning teams while maintaining one of the lowest payrolls.

Data-driven policing took hold in the mid-1990s when the New York City Police Department put in place a computerized system, called CompStat, to track and map crime by neighborhood, allowing the department to more effectively deploy its resources. Under this system, which has been replicated in dozens of cities, the city's murder rate plummeted almost 70%, well above national averages.

A similar revolution in government decisionmaking is waiting to be unleashed. Policymaking, as it currently stands, can be like driving through a dense fog in the middle of the night. Large data gaps make it difficult to see problems clearly



and chart a course forward. In education, for example, we lack basic classroom data that could be used to deploy highly effective teachers where they are needed most. In health care, we are unable to systematically draw comparisons across providers to identify the most effective approaches and most needed investments. And in the environmental arena, basic data on air and water pollution as well as chemical exposures are often unavailable, impairing our ability to prevent public harm.

In a paper-based world, the requisite information was virtually impossible to generate. The costs and administrative burden associated with data collection and analysis were simply too steep. As the corporate sector is demonstrating, however, these barriers have now been substantially reduced. New information technologies make possible—and affordable—a series of monitoring opportunities, data exchanges, analytical inquiries, policy evaluations, and performance comparisons that would have been impossible even a few years ago.

By more effectively harnessing these technologies, government can begin to close data gaps that have long impeded effective policymaking. As problems are illuminated, policymaking can become more targeted, with attention appropriately and efficiently directed; more tailored, so that responses fit divergent needs; more nimble, able to adjust quickly to changing circumstances; and more experimental, with real-time testing of how problems respond to different strategies. Building such a data-driven government will require sustained leadership and investment, but it is now within our reach.

**F**rom the greenhouse gas emissions causing climate change to the particulates linked to rising childhood asthma, many of today's most vexing environmental problems cannot be seen. Likewise, without good data, it is difficult to tease out the multiple elements that turn failing schools into successful ones or identify the factors that cause some hospitals to outperform others. New technologies for data collection, analy-

sis, and dissemination provide the opportunity to make the invisible visible, the intangible tangible, and the complex manageable.

Previously, data had to be reported on paper to government and then entered by hand into a database. This slow and painstaking process severely constrained data collection and forced decisionmakers to diagnose problems based on an incomplete picture drawn from sometimes years-old and error-ridden data. Today, however, government no longer faces the same imperative to pick and choose what information to collect, thanks to breathtaking advances in information-gathering technologies.

Sensor and satellite technologies provide the ability to collect data remotely—24/7, with no data entry necessary—on almost anything in the physical environment, including air and water quality, the health of ecosystems, traffic flow, and the condition of critical infrastructure, such as roads and bridges. For other types of data, including health care records and student test scores, electronic reporting and management systems can seamlessly and instantaneously transfer and aggregate data and check for errors. These technologies are still underused but if effectively harnessed could be used to build a robust information infrastructure for more precise problem spotlighting.

The ability to quickly process information also enables more responsive government. Currently, government often responds only after public harm—illness, death, and other hardships or crises—is manifest. Real-time data collection, on the other hand, empowers government officials to spot problems in time to take preventive action. In a report on the possibility of a terrorist attack on drinking water supplies, for example, the Government Accountability Office noted that experts it consulted “most strongly supported developing real-time monitoring technologies to quickly detect contaminants in treated drinking water on its way to consumers.”

Knowing that a problem exists is frequently not enough, of course. It may also be necessary to know the problem's nature and shape to effectively develop solutions. What factors contribute to the problem, including how factors inter-



**IN 2003, THE BUSH ADMINISTRATION LAUNCHED A NEW TOOL— THE PERFORMANCE ASSESSMENT RATING TOOL (PART)—TO EVALUATE THE PERFORMANCE OF INDIVIDUAL PROGRAMS IN ALL FEDERAL AGENCIES. BUT PART REVIEWS ARE OPEN TO A GREAT DEAL OF SUBJECTIVE INTERPRETATION AND POTENTIALLY POLITICAL MANIPULATION.**

act with each other and their relative importance? What people or communities are most affected? And what is the trend over time, including projections of future severity?

Answering these questions requires careful analysis, again with the help of new information technologies. Relational database and data-warehousing systems allow multiple data sets to be queried at once, providing the opportunity to break down the data silos that are now the rule in federal government. For example, we could fuse pollution data, such as annual toxic releases, with public health data, such as cancer-related deaths, and census data. Such integration would facilitate research to uncover what sort of pollution is causing what sort of health effects in what sort of population.

There are also analytical tools that go beyond simple queries to generate deeper understanding. Geographic information systems (GISs) provide the ability to map and visually overlay multiple data sets. Data-mining systems apply automated algorithms to extract patterns, draw correlations, disentangle issues of causation, and predict future results. Within moments, these tools can generate new knowledge that might take years to uncover manually.

As data are collected and analyzed, they can be shared with the public, opening up the policymaking process. Much more still needs to be done, but government Web sites are starting to provide searchable databases, GISs, and other analytical tools. The public can request databases on CD-ROM, so that data can be reconfigured, repackaged, or merged with other data. Data disseminated electronically empower a broad array of actors—including the press, political oppo-

nents of the governing party, academics, nongovernmental organizations, the private sector, and concerned citizens—to uncover problems, develop innovative solutions, and demand results.

Indeed, baseball's move toward data-driven decision-making was initiated not by teams but by fans using their personal computers to crunch statistics and develop a deeper understanding of the game. Billy Beane latched on to and applied these fans' ideas. Likewise, those outside government can be a huge asset for policymaking, if given the tools to conduct their own analyses.

The federal government is now only scratching the surface in its use of new technologies to collect, analyze, and disseminate data. Antiquated paper-based recordkeeping still pervades U.S. health care, for example, and industrial facilities still hand-report pollution data, often as estimates of pollution, not precise measurements. Moreover, data sets are almost never fused across federal agencies or even within agencies, and only sometimes are they made searchable through the Internet. As new technologies are put to greater use, a far clearer picture of our problems will emerge, opening the door to more targeted, tailored, and precise policymaking.

In the absence of good data, policymaking frequently relies on intuition, past experience, or expertise, all of which have serious drawbacks. A considerable body of research has demonstrated how emotion, issue framing, cascade effects, and other biases cloud policy judgments. Data allow for cool analysis that can help overcome these biases and achieve better policy results.



**A BROADER VISION IS NEEDED TO MODERNIZE AND REVOLUTIONIZE THE FEDERAL GOVERNMENT. TOO OFTEN, TECHNOLOGY DEPLOYMENT, DATA GENERATION, POLICY DEVELOPMENT, AND PERFORMANCE MEASUREMENT ARE PURSUED ALMOST AS SEPARATE ENTERPRISES, WITH LITTLE THOUGHT GIVEN TO HOW THEY CONNECT TO AND SUPPORT EACH OTHER.**

Of course, this is not to say that data can provide all the answers. Even as we close data gaps with new technologies, there will always be some issues that are difficult or even impossible to capture quantitatively. Thoughtful analysis and human judgment are required to interpret available data and take account of factors that may not be reflected in the numbers. In addition, values are essential to inform policy choices and will continue, appropriately, to be the subject of political debate.

As gaps in knowledge are closed, however, the zone in which political judgment plays out narrows, facilitating consensus and smarter policymaking. In particular, more refined data allow policymakers to develop responses that are targeted at the most important problems or causal factors, calibrated for disparate impacts, and tailored to meet individualized needs.

Policymaking begins with the setting of priorities. Policymakers may identify an array of problems that should be addressed, but because of resource constraints they may be forced to pick and choose. Often, these choices are made haphazardly. Government does a poor job of justifying and delineating priorities for both regulation and the budget. Why is a regulation being undertaken over other possibilities? Why is the budgetary pie divided the way it is? Data can be used to compare problems by relative severity to more efficiently and equitably allocate attention and resources.

Finding ways to package and unlock raw data is essential to drawing such comparisons. This might be as simple as providing quantitative tables that highlight key information. The National Highway Traffic Safety Administra-

tion (NHTSA) does a good job of organizing data on auto fatalities and injuries by state. But it might provide even greater clarity. The city of Charlotte, North Carolina, for example, has developed neighborhood “quality of life” rankings, updated every two years, based on 20 indicators measuring conditions in 173 “neighborhood statistical areas.” These indicators are used to identify and target fragile neighborhoods for revitalization.

Specific problems can be similarly dissected to enable targeted policymaking. A problem may have a number of different causes of varying importance, or factors may interact with each other to mitigate or aggravate a problem. The health consequences of one pollutant, for instance, may be aggravated by another pollutant. Knowing this information allows policymakers to focus efforts on key causal factors.

The shape of a problem and the response required also may shift according to a host of background variables, including differences in geography, local infrastructure, demographic makeup, and even individual people. With refined data and analysis, policies can be directed at those most at risk and tailored to fit individual needs or circumstances. The United Kingdom, for example, is moving to personalize learning by providing teachers with a data-rich picture of each student’s needs, strengths, and interests. This knowledge, assembled through new information technology, can be applied so that students are taught in ways that work best for them. Fine-grained data allow policymakers to manage diversity and respond to individualized needs rather than forcing conformity to a uniform approach or standard.



Even with the best data, policymaking is not an exact science and will rarely be done precisely right the first time. Just as leading companies follow the mantra of continuous improvement, good governance requires a process of ongoing trial and error. Once an initiative is implemented, we need to continuously monitor and measure how it is working and make adjustments for better results.

The federal government took a step in this direction with the Government Performance and Results Act (GPRA) of 1993, which requires each federal agency to regularly set goals by which performance is to be measured. Done well, such goal-setting can clarify choices about how to direct attention and resources, communicate expectations and instill a sense of purpose, and stimulate problem-solving and experimentation to find what works. Frequently, however, agencies focus on outputs (activities performed to achieve a goal) or, worse yet, inputs (such as money spent) rather than outcomes that measure actual real-world improvements.

Outputs and inputs are not unimportant, but it is vital to understand how they interact with outcomes to find the most effective and efficient approaches. The measurement of outputs and inputs in isolation may cause government personnel to focus on the performing of tasks that have little to do with real-world results.

Even when there is commitment to develop outcome-focused goals and measures, there can be significant hurdles. Sometimes it is not clear which metrics to use and how to isolate the influence of a policy from the influence of other factors. If oversimplified or misdirected, performance measurement can create warped perceptions and distorted incentives. Some doctors have reportedly begun to turn away gravely ill patients, for example, to boost their personal fatality ratings provided by the federal government. Careful deliberation is required to ensure that metrics accurately reflect program performance and promote desired outcomes. As issues evolve, new metrics will need to be developed and indicators reconfigured.

In 2003, the Bush administration launched a new tool—

the Performance Assessment Rating Tool (PART)—to evaluate the performance of individual programs in all federal agencies, ostensibly to inform the president's budget decisions. But PART reviews, conducted by the White House Office of Management and Budget, are open to a great deal of subjective interpretation and potentially political manipulation. The Federal Emergency Management Agency's disaster response and recovery programs, for instance, were scored as "adequate" shortly after gross deficiencies were exposed in the response to Hurricane Katrina.

To be successful, performance evaluation must be transparent, free of political manipulation, and based on credible and easily understood data. With reliable performance data in hand, it is then possible to make necessary adjustments to government programs. Policies that are producing good results should be extended and expanded. Those that are not should be rethought, with resources redeployed.

Key in this is government's ability to incorporate performance data into the decisionmaking process. Even after federal agencies issue their annual GPRA reports, policymakers seldom take notice or make use of the data. In contrast, under Baltimore's successful CitiStat system (put in place by then-Mayor Martin O'Malley in 2000 and replicated by at least 11 other U.S. cities) heads of city departments report to City Hall every other week to present updated performance data and answer questions from high-level officials in the mayor's office, sometimes including the mayor.

The frequency of review sessions keeps city leadership focused on the numbers, so that problems are quickly spotted and addressed. CitiStat is credited with saving Baltimore \$350 million since its inception while dramatically improving city programs and services. (The city guarantees, for example, that a pothole will be repaired within 48 hours after receiving a public complaint.) As Maryland's new governor, O'Malley is now implementing this approach on the state level, as is Washington Governor Christine Gregoire.

The ability to track and apply performance data could deliver enormous benefits at the federal level as well. Build-



ing this capacity would not only enhance government's ability to refine policies and adjust to changing circumstances; it would also allow federal agencies to replace one-size-fits-all rules or standards with flexible approaches that encourage policy competition.

Those responsible for implementation, such as state and local governments, industrial facilities, and schools, could be empowered to develop their own solutions so long as real-world objectives are met. Focusing on results, rather than required tasks, encourages experimentation and innovation while allowing policies to be tailored to local circumstances.

Federal agencies can then promote collective learning by evaluating relative performance among peers and spotlighting the most effective strategies that should be expanded, as well as ineffective strategies that should be avoided. NHTSA, for example, has promoted collective learning among states as one of its primary strategies to increase seatbelt usage. In one case, NHTSA urged and worked with states to replicate North Carolina's "Click It or Ticket" program, which had achieved significant gains by stepping up the enforcement of seatbelt laws, with particular attention aimed at teens and young adults.

Ranking performance against a relevant peer group provides a particularly strong incentive to address weaknesses and adopt top-performing solutions. No state wants to be identified as a laggard, and all desire recognition for outperforming peers. Performance benchmarking, now done only sporadically, can be used to jump-start a race to the top without any federal command and control.

The idea that government should base its decisions on data, evidence, and rational analysis is not new, of course. What's new is the opportunity created by information technologies to crystallize problems and highlight effective solutions. This opportunity, however, is still waiting to be seized. Policymaking persists much as it always has, even as technology has raced ahead and decisionmaking is transformed in the corporate sector and other realms.

A broader vision is needed to modernize and revolutionize the federal government. Too often, the various steps discussed above—technology deployment, data generation, policy development, and performance measurement—are pursued almost as separate enterprises, with little thought

given to how they connect to and support each other. Bringing these components into a coherent whole is essential to implement data-driven policymaking.

The first order of business in this effort is building a robust information infrastructure. Government decisionmaking currently suffers from persistent data gaps, the lack of systematic analysis, and poor information management and dissemination. Accordingly, information needs must be methodically identified and then addressed through a government-wide strategy to procure and deploy new technologies.

This also should be accompanied by changes in the policymaking process, so that decisionmakers are positioned to capitalize on the information generated. In particular, this means creating systems, such as Baltimore's CitiStat program, or enhancing existing systems, such as GPRA, to ensure that policymakers regularly consult data to guide decisions and drive real-world results.

Less tangible but equally important is the need to change the way we think about policymaking. Refined data permit more targeted, tailored, and experimental policymaking. Success depends on recognizing these opportunities and devising new approaches to take advantage of them.

Finally, a movement toward data-driven policymaking cannot happen without political leadership. At the federal level, the president and Congress must step up. Getting the dozens of different departments and agencies that make up the federal government to embrace this approach and harmonize efforts where responsibilities overlap will require significant planning, coordination, oversight, and, perhaps most crucially, investment, so that core agency functions are enhanced and not disrupted.

As we break down these barriers, however, we will begin to reap the benefits of a data-driven government that is more effective, efficient, open, and accountable. Let the revolution begin.

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# The CitiStat Model



*How Data-Driven Government Can  
Increase Efficiency & Effectiveness*

Teresita Perez and Reece Rushing  
April 2007





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# **THE CITISTAT MODEL**

How Data-Driven  
Government Can Increase  
Efficiency & Effectiveness

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Center for American Progress

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*The authors wish to thank the staffs of Gov. Martin O'Malley of Maryland and Gov. Christine Gregoire of Washington for their assistance in preparing this report. The photos in this report are courtesy of CitiStat. The photo on the cover shows O'Malley at the podium in the CitiStat meeting room.*



## Introduction

When Martin O'Malley took over as Baltimore mayor in December 1999, the city government suffered from rampant absenteeism. In the Department of Public Works, for example, one in seven employees failed to report to work every day on average.<sup>1</sup> This absenteeism required other employees to pick up the slack, which produced high overtime costs and a huge burden on the city's finances.

O'Malley decided to tackle this problem by implementing a data-tracking and management tool called CitiStat. This program enabled the mayor's office to monitor overtime and sick leave in real-time, providing ammunition to crack down on chronic absenteeism. In CitiStat's first year of implementation the city saved \$13.2 million—\$6 million in overtime pay alone.<sup>2</sup> Outside of the police department, overtime fell by 40 percent within the program's first three years,<sup>3</sup> and absenteeism plummeted by as much as 50 percent in some agencies.<sup>4</sup>

Baltimore now uses the data-driven CitiStat system to manage all city programs and services. Information is gathered on an array of performance indicators, including response times for things like pothole abatement, trash collection, and snow removal, as well as the prevalence of problems such as illegal dumping, vacant buildings, and sewage overflows. This information is analyzed with the assistance of computerized databases and geographic mapping to zero in on areas of underperformance. Managers from each city department then meet with the mayor's office every two weeks to answer questions about their results.

This approach has produced dramatic improvements in city services and efficiency, with savings of \$350 million since its inception.<sup>5</sup> As a result of this success, at least 11 other U.S. cities have adopted the CitiStat approach, with Washington, D.C., under new Mayor Adrian Fenty, the latest addition to this list. Although O'Malley was recently elected governor of Maryland, his successor, Mayor Sheila Dixon, continues to employ CitiStat.<sup>6</sup>

As Maryland's new governor, O'Malley is now beginning to apply the CitiStat approach to state government. This brings hope that Maryland will set an example for other states, as Baltimore has for other cities.

Washington state has already adopted a CitiStat-inspired system. Gov. Christine Gregoire implemented the Government Management Accountability and Performance initiative, or GMAP, after her staff visited Baltimore and attended a CitiStat meeting. Like CitiStat, GMAP demands systematic analysis of data and regular review sessions with agency heads to assess performance. GMAP, however, employs thematic review—as opposed to departmental review—around specific issues, such as “vulnerable children and adults,” to promote collective problem-solving and cross-departmental collaboration.



*CitiStat has curbed absenteeism, reduced overtime pay, and dramatically improved city services and efficiency, with savings of \$350 million since its inception.*

This focus on the numbers, not surprisingly, has produced dramatic improvements in government performance. Gregoire has relied on GMAP to, among other things, improve responsiveness to reports of child abuse, facilitate faster decisions on environmental permits, and reduce highway fatalities.

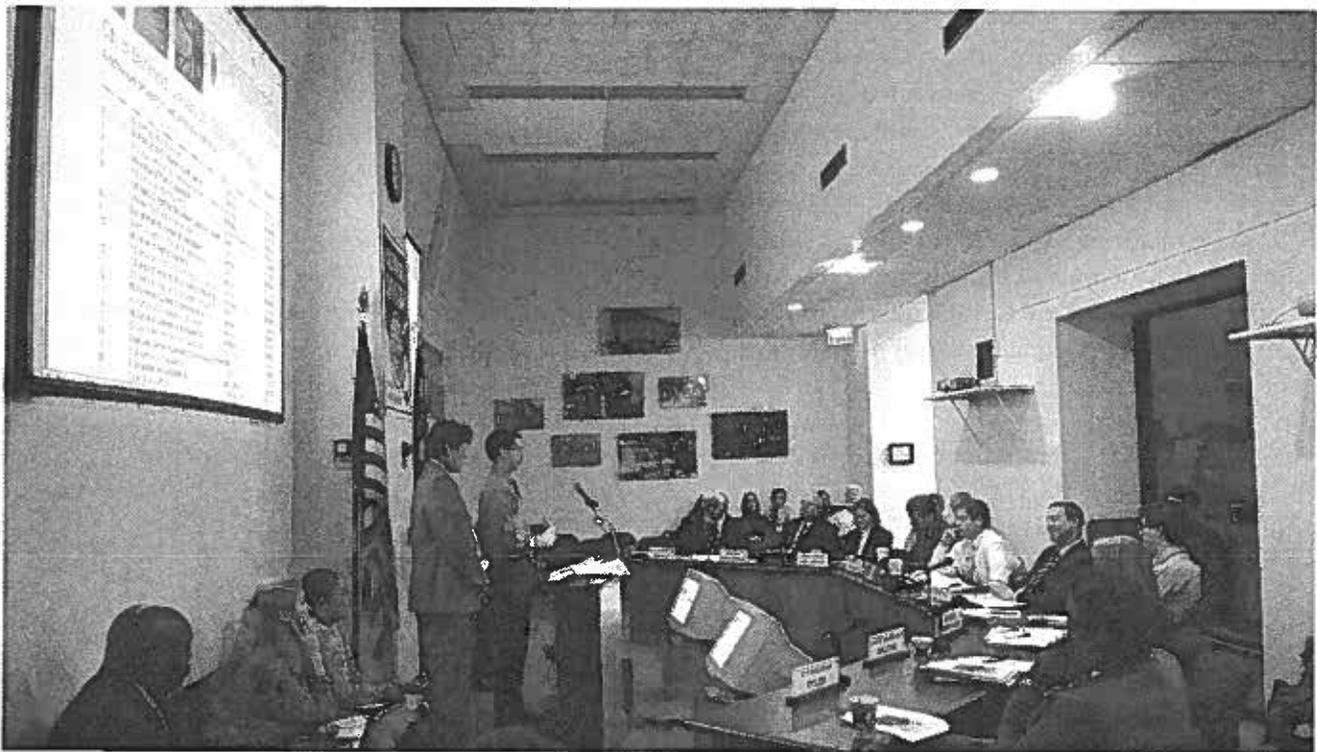
These gains (as well as those achieved by CitiStat) have required little extra expense. Both GMAP and CitiStat use affordable, off-the-shelf software and rely on a small staff to analyze data and oversee departmental implementation. The GMAP staff numbers nine analysts, while CitiStat has never had more than eight full-time staff.<sup>7</sup>

Nor have these programs been especially complex to implement. Gregoire and O'Malley launched their programs almost immediately after taking office. In both cases, departments and agencies were already collecting data sufficient to get started

(though additional data have been collected as the programs have matured). GMAP and CitiStat simply unlocked this information and put it to use for decision-making.

This never would have happened, however, without commitment at the top. Gregoire and O'Malley placed top deputies in charge of presiding over review sessions, while sometimes attending sessions themselves. This hands-on attention has signaled to managers of agencies and departments that data must drive their decision-making—and that they will be held accountable for results. The insight here is that data alone will not change behavior and improve performance. Rather, good data must be coupled with committed leadership.

A CitiStat session is shown above. Then Baltimore Mayor Martin O'Malley, sworn in as governor of Maryland in January, is at the center of the table facing the podium.



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## What is CitiStat?

CitiStat is a data-driven management system designed to monitor and improve the performance of city departments in real-time. Implemented in Baltimore in 2000 by then Mayor Martin O'Malley, CitiStat uses basic, inexpensive computer software to track a myriad of government performance indicators. Managers of each city department report to City Hall every two weeks to present their performance data and answer questions from the mayor's office. The mayor's office uses this data to identify underperformance and press for improvements.

## Origins

CitiStat is based on a policing system, called CompStat, adopted by the New York City Police Department during the 1990s. This system, still in place today, tracks and maps data on virtually all categories of crime—from murder to theft to drug trafficking. By attending to the numbers and carefully monitoring performance, the department is able to zero in on problem areas, spot trends, and allocate its limited resources more efficiently.

Police are deployed based on the latest patterns of criminal activity with the goal of anticipating and preventing crime. From 1993–1998, the city's murder rate plummeted 67 percent and reported robberies declined 54 percent,<sup>9</sup> well ahead of national averages.<sup>9</sup> The system has since been replicated in dozens of cities throughout the country.

Soon after his election, O'Malley worked with Jack Maple, former NYPD deputy police commissioner for crime-control strategies, to replicate CompStat for the Baltimore Police Department. O'Malley quickly decided the CompStat approach would be useful in managing other city departments.

After hiring a small staff and housing them in City Hall, CitiStat was launched. CitiStat grew from covering one department when it launched in June 2000 (the Bureau of Solid Waste within Public Works) to 16 departments in 2002. Initially, officials focused on data they already collected, in particular payroll and personnel data to address excessive absenteeism and overtime.

As CitiStat progressed, however, the mayor's office asked city departments to collect additional data to assess performance of key responsibilities. Currently, CitiStat requires all city departments to gather information continuously on a variety of indicators, such as response time to public complaints.

## The CitiStat System

Leaders of each city department report to City Hall on a biweekly basis to discuss performance data gathered under CitiStat and answer questions from high-level officials in the mayor's office, including the first deputy mayor, who usually presided over the meetings under O'Malley, and sometimes even the mayor. Prior to meetings, departments submit data collected over the previous two weeks to the CitiStat office, which then assesses departmental performance on a wide range of issues and tries to identify trends. CitiStat staff graphically illuminate data through charts and maps that are displayed on large screens in the CitiStat meeting room (see photo on page 6).

If the information presented reveals underperformance, the department head faces tough questioning and is asked to come up with solutions. At the next CitiStat meeting, two weeks later, there is sure to be follow-up to see if action has been taken and the numbers are headed in the right direction.

Much of the performance data used for CitiStat comes from a centralized 311



non-emergency complaint and response number—modeled after the 911 number for emergency calls. Chicago first implemented this sort of call center in 1999 and many other cities have since adopted the approach. Baltimore is unique, however, in the way it has linked data generated by call-ins to everyday management.

Each caller's complaint or request is entered into a database and referred to the responsible city department for action. These data empower the mayor and the CitiStat staff to monitor the responsiveness of city departments, press for improvements in service delivery, and understand and prioritize issues of concern to Baltimore residents.

### Costs

For all its success, the CitiStat program cost the city very little to implement. CitiStat uses basic Microsoft Office programs—such as PowerPoint for presentations and Excel to gather data—as well as geographic information system, or GIS, mapping software from ESRI's ArcView unit, which costs less than \$1,000. Because Baltimore city departments already had most of the necessary software on their desktop computers, there was only a very small investment to purchase additional software.

In addition to software, the city hired a small CitiStat staff and renovated City Hall to create the new CitiStat meeting room. In total, the program cost Baltimore \$285,000 to set up<sup>10</sup> and carries annual costs of about \$400,000, most spent on staff salaries.<sup>11</sup> Needless to say, this investment pales next to the several hundred million dollars it has saved the city.

### The Benefits of CitiStat

When O'Malley became mayor of Baltimore, the city faced an array of seemingly

intractable problems, from huge budget deficits to an unresponsive government bureaucracy to a crime rate well above national averages.<sup>12</sup> Under the CitiStat system, however, Baltimore has taken tremendous strides.

The city has been able to eliminate perpetual budget deficits while improving service delivery and lowering property taxes to their lowest point in 30 years. O'Malley credits CitiStat with saving the city \$350 million since its inception.

The city achieved large savings, for example, through its efforts to limit absenteeism. Absenteeism causes government responsiveness and productivity to suffer while requiring other employees to work longer hours to pick up the slack, driving up overtime pay. Prior to CitiStat, absenteeism was a chronic problem for the city. But CitiStat enabled managers to more carefully monitor attendance and zero in on abuse. With this scrutiny, employee attendance increased and overtime pay decreased, saving the city \$6 million in CitiStat's first year.<sup>13</sup>

At the same time, bringing government employees back to work has helped improve and expedite the delivery of government services. During CitiStat's first year of operation, Baltimore accelerated trash collection, snow removal, and response times to public requests and complaints.

Pothole abatement represents one of CitiStat's most well-recognized success stories. The city previously did not track pothole repairs, and residents constantly complained about the time it took to fill potholes. Now, when residents find a pothole they can report it through the city's 311 non-emergency number and track its repair time. With this ability to track service response time, the city is able

*During CitiStat's first year of operation, Baltimore accelerated trash collection, snow removal, and response times to public requests and complaints, dramatically speeding pothole abatement.*



to guarantee that potholes will be repaired within 48 hours of notification.

As a result, pothole complaints have decreased considerably; 97 percent of all potholes are filled within 48 hours of notification. Such visible results have boosted public confidence in city government.

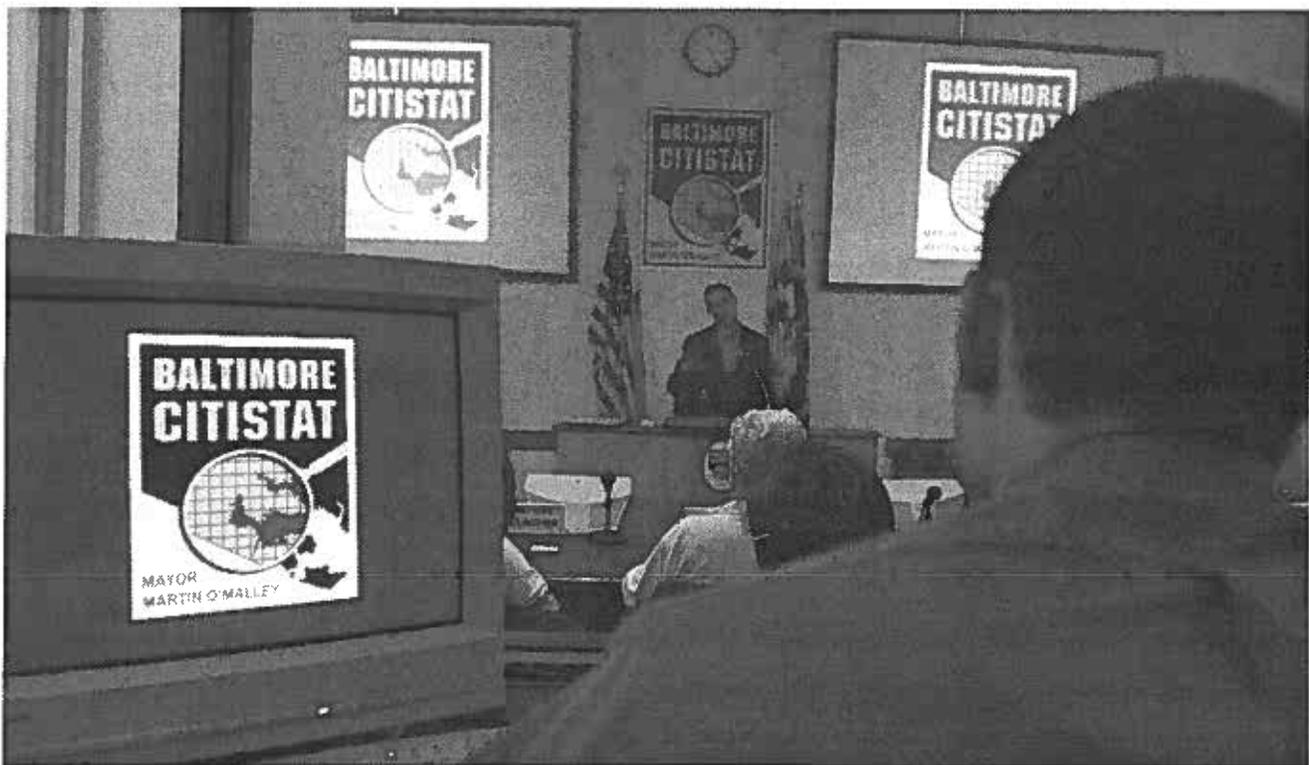
CitiStat also helped Baltimore reduce its spiraling crime rate. Even as crime rates in other U.S. cities declined in the 1990s, Baltimore's remained high. When Baltimore launched CitiStat in 2000, it had the second-highest violent crime rate among the nation's 30 largest cities. The city lowered its crime rate by 14 percent during CitiStat's first year, and from 1999 to 2003, violent crime fell nearly 40 percent—the largest decline among the nation's major cities—according to data reported by the Federal Bureau of Investigation and cited by O'Malley.<sup>14</sup>

## Replicating CitiStat

Representatives of all levels of government from across the country and even from overseas regularly visit Baltimore to learn about the program from CitiStat staff and observe CitiStat review sessions. At least 11 cities in the United States and two abroad have already implemented programs based on CitiStat: Atlanta, GA; Buffalo, NY; Chattanooga, TN; Cleveland, OH; Pittsburgh, PA; Providence, RI; San Francisco, CA; Somerville, MA; St. Louis, MO; Syracuse, NY; Washington, D.C.; Parazin, Serbia; and Indjija, Serbia.

## Applying CitiStat at the State Level

As Maryland's new governor, O'Malley has begun to implement his data-driven approach at the state level. Like CitiStat, all state agencies will be expected to compile



This photo is taken from the CitiStat control room where charts, maps and images are projected onto two large screens in the meeting room. O'Malley is at the podium.



data for regular review by the governor's office to drive management and policy decisions. These data will then be disseminated to the public through the Internet, providing greater transparency and accountability.

Maryland, however, is not the only state to adopt the CitiStat model. The state of Washington launched its own CitiStat-inspired program in June 2005 and has started to reap the benefits—including improved response to complaints of child abuse, reduced traffic congestion, and faster environmental reviews of construction permits, among other benefits. This experience shows that the CitiStat model is feasible at the state level.

Washington's success has sparked interest from the state governments of Utah, Colorado, Pennsylvania, Indiana, and Iowa. If Maryland's program likewise proves effective—and the track record suggests that it will—other states are likely to follow suit, just as other cities have replicated CitiStat. This suggests a data-driven future for state government, with Maryland and Washington as primary models.

### Maryland's First Steps

O'Malley recently signed legislation into law to implement StateStat, the state-level version of CitiStat, to monitor the performance of state agencies. StateStat meetings are already being held with the Department of Public Safety and Correctional Services and the Department of Juvenile Services. During his campaign, O'Malley pledged to integrate all other agencies within six months, including the Maryland State Police, the Department of Education, and the Department of Transportation.<sup>15</sup> Like CitiStat, the governor's StateStat office will review performance data from state agencies every two weeks.

This effort will begin by organizing and analyzing existing data. But O'Malley is also moving to build a more robust information infrastructure that will allow for an even clearer picture of problems and more focused solutions.

In education, for example, O'Malley plans to carry out a survey every two years called the "Teacher Working Conditions Survey" to quickly identify and address areas of need pertaining to the "quality of school leadership, administrative support, professional development, and facility conditions."<sup>16</sup>

Survey data will be used to zero in on problem areas, evaluate the effectiveness of education initiatives, track progress over time, identify and expand successful strategies, and efficiently and expeditiously direct resources based on need. The ultimate goal is to build supportive work environments that will enable Maryland to attract and retain quality teachers.

Similarly, in February 2007, O'Malley issued an executive order creating BayStat, a new tool to enhance information on the Chesapeake Bay,<sup>17</sup> which the Chesapeake Bay Foundation rates as "Dangerously Out of Balance."<sup>18</sup> BayStat will be used to track the health of the bay, develop strategies that produce measurable results, and coordinate the state's response. Already, the governor has started holding BayStat meetings with the multiple agencies involved in bay-related efforts.

More ambitious data-collection efforts like these will take resources and investment to set up, requiring buy-in from the state legislature and state agencies. Such buy-in can be achieved by demonstrating tangible results using existing data. This is what happened in Baltimore, and this is what is happening in Washington state, where

*As Maryland's new governor, O'Malley is moving to build a more robust information infrastructure that will allow for a clearer picture of problems and more focused solutions.*



early successes are paving the way for expansion of the state's program.

### The Washington Approach

After her staff visited Baltimore and attended a CitiStat meeting, Washington state Governor Christine Gregoire launched the Government Management Accountability and Performance system. Like CitiStat, GMAP is based on systematic collection and review of data, employing readily available software and technology as well as regular meetings with agency managers. But instead of the department-by-department approach used by CitiStat (and planned for StateStat), GMAP employs thematic review around priority issues—such as economic vitality, health, and transportation—that involve the efforts of multiple agencies.

Gregoire first applied GMAP to address the needs of vulnerable children and adults. The first GMAP meeting, held in June 2005, included several departments responsible for serving these at-risk populations, including the Children's Administration and the Aging and Disability Services Administration (both within the Department of Social and Health Services), as well as the Department of Veterans' Affairs. Since the first GMAP meeting, there have been sessions on five other priority issues:

- **Economic vitality**, with the participation of the Employment Security Department, the Department of Labor and Industries, the Department of Revenue, and the Department of Community, Trade and Economic Development
- **Government efficiency**, with the Department of Information Systems, the General Administration Department, the Office of Financial Management Risk

Management, the Department of Personnel and the Department of Printing

- **Health**, with the participation of the Department of Health, the Department of Social and Health Services Medical Assistance Administration, and the Health Care Authority
- **Safety**, with the involvement of the Department of Corrections, the Washington State Patrol, the Department of Social and Health Services, the Department of Licensing, the Washington Traffic Safety Commission, and the Department of Labor and Industries
- **Transportation**, with the collaboration of the Department of Transportation and the Washington State Patrol.

GMAP started with only four people on staff, but over the past year has grown to 13, allowing GMAP to expand its scope. Nine full-time equivalents, or FTEs in management parlance, work on GMAP, while four others are responsible for related initiatives such as performance auditing. Currently, the GMAP staff plans to launch another initiative on education (from early learning to higher education) and eventually include all state departments in the GMAP review process.

The state has created a training program to facilitate the transition to this more data-intensive approach. The GMAP office hired a management consultant to work with the Washington Department of Personnel to coordinate training and development aimed at building capacity within state agencies to adapt the program. The DOP currently offers such courses as "Data Collection," "Using Charts and Graphs to Communicate Performance Data," and "How to Measure What We Do."

*Like CitiStat, Washington state's GMAP system is based on systematic data collection and review. But instead of a department-by-department approach, GMAP employs cross-agency thematic review around priority issues.*



Just like CitiStat, the GMAP office does not collect data itself, but rather compiles the information collected by different agencies. Departments submit their data to the GMAP staff prior to reporting meetings; staff then analyze the data and create graphical and visual aids. Meetings are held every other week and last about an hour.

Gregoire is present at the meetings, as is the governor's staff and key government officials, including the director of financial management, the director of information systems, and the director of personnel. The panel asks tough questions about the information presented, but also serves as a resource for the different departments. If a department has a technological need, for example, the director of information systems is there to help find a solution. At the same time, the meetings are structured so as to foster cooperation among the different departments present.

The issues being addressed cannot be solved by any one department, so there is a need for departments to share information and come up with solutions jointly. Later this year, the state plans to implement a "dashboard" program that allows government officials to quickly access real-time data across agencies and publicly disseminate GMAP data online.

### Washington Success Stories

GMAP has helped Washington improve government services and increase efficiency. Gregoire, for example, relied on GMAP to push the Department of Social and Health Services, or DSHS, to cut the amount of time it took to respond to complaints of child abuse and neglect in the foster care system. In March 2005, Governor Gregoire required social workers to personally visit

residences where there had been reports of child abuse or neglect within 24 hours in emergency cases and 72 hours in non-emergencies. At a recent governor's GMAP forum, DSHS reported timely response rates throughout the entire state had increased from less than 40 percent in non-emergency cases to over 90 percent for both emergency and non-emergency cases.<sup>19</sup>

Responsiveness has improved in other areas as well. GMAP analysis, for instance, found that issuance of permits for environmentally sensitive construction projects can take a year or more, largely because many permit applications are not complete when they are submitted. Such applications demand considerable time and effort before they can be officially reviewed.

Gregoire instructed the state departments of Ecology and Fish & Wildlife to work with the U.S. Army Corps of Engineers and the state Office of Regulatory Assistance to reduce the number of incomplete applications and thus reduce the total time required to evaluate whether permits should be issued. Among other strategies, the state is improving communication about the permit process and developing an online application to help applicants provide the right information at the beginning of the process.<sup>20</sup>

Gregoire is also using GMAP to facilitate cross-departmental collaboration to alleviate traffic jams. Approximately 50 percent of traffic congestion is non-recurring, caused by incidents such as disabled vehicles, debris, and collisions. Such incidents cause significant slowdowns, especially during peak commuting times, presenting a major challenge to the state's Department of Transportation and the Washington State Patrol.

*Washington's GMAP system has improved response to complaints of child abuse, reduced traffic congestion, and produced faster environmental reviews of construction permits, among other benefits.*



GMAP is being used to improve coordination and cooperation between these two departments as well as local governments, track performance, and target problem areas. As a result, roads are being cleared more quickly and congestion is being reduced.

## Lessons for Implementing the CitiStat Approach

State and local governments thinking about implementing the CitiStat approach first need to understand the key elements that have made it successful. Above all, success depends on commitment and engagement from top political leadership. Political leaders must continually review and apply data to identify areas in need of improvement, drive institutional change, and achieve goals for government performance. Crucially, the CitiStat approach creates a regular process that forces such constant review, ensuring that data are linked to everyday decision-making.

Success also depends on building the capacity for data-driven government, beginning with human capacity. There should be dedicated staff that oversee implementation and provide independent analysis of performance data gathered by agencies and departments. At the same time, government personnel must be provided technology and statistical training to meet the new demands of data collection and analysis.

In addition, the CitiStat approach requires a robust information infrastructure. Data gaps must be filled to provide a clear picture of performance, while data collection and management must be standardized and integrated to facilitate analysis. Robust data and analysis of course allow for more effective policymaking. But public dissemination of this information through the Internet can also increase government transparency

and accountability, providing additional incentive for improved performance.

These key lessons of the CitiStat approach are discussed further below.

### Commitment from Political Leadership

The CitiStat approach has been successful first and foremost because of commitment at the top. O'Malley set the tone, for example, by personally attending many CitiStat sessions, assigning his first deputy mayor to preside over the sessions, and demanding that department heads personally present information about their operations every two weeks.

Such commitment sends a message to agency and department heads, as well as lower-level personnel, about the importance of gathering and using data to drive performance. They know the mayor is paying attention and will hold them accountable for results.

With commitment at the top, data will begin to permeate decision-making and guide actions from department managers on down.

### Dedicated Staff for Planning and Oversight

Washington's GMAP program started with four staffers and grew to nine over the course of a year. Such dedicated staff is essential for a number of reasons. First, there must be oversight and coordination to ensure that data collection is complete and consistent from department to department. Second, there must be independent analysis to make sure problems are brought to the attention of top leadership. And third, there must be expectations set to challenge departments to do better.

*Above all, success depends on commitment and engagement from top political leadership. Political leaders must continually review and apply data to identify areas in need of improvement, drive institutional change, and achieve goals for government performance.*



## Training

Government personnel may lack necessary skills to apply data to policy and management decisions, especially at the time of initial implementation. Training is therefore critical to build this capacity. This includes statistical training, so employees are able to effectively analyze data, as well as technical training—from very basic data entry to GIS to more sophisticated data mining, depending on the employee. Washington’s emphasis on training, described above, contributed to the smooth roll-out of its program.

*The CitiStat approach places emphasis on continuous, real-time data collection and review, allowing for corrective action before problems mushroom.*

## Continuous Review of Data

Federal agencies, and many state and local governments, perform only periodic reviews of performance data. These reviews, however, may not catch a problem until significant damage is already done. The CitiStat approach, by contrast, places emphasis on continuous, real-time data collection and review.

This approach allows government to immediately spot problems and take corrective action before they mushroom and become unmanageable. Under O’Malley, Baltimore stayed out of the red—after years of budget deficits—only because of the meticulous tracking of expenditures, enabling city officials to immediately identify and address wasteful practices.

## Linking Data to Government Decision-making

Data are not worth collecting if not linked to decision-making. The CitiStat approach links data to government decision-making in two primary ways. First, it creates a process that ensures top officials and managers regularly consult and apply data for policy and management decisions. Every

two weeks, department heads meet with top officials in the mayor’s or governor’s office to review data.

Second, data are packaged in ways that make problems and performance easy to evaluate. Charts and graphs showing trends are presented at each CitiStat meeting, as well as maps showing geographic distributions. Such presentations, regularly reviewed, empower decision-makers to understand the issues at hand and take quick, decisive action.

## Filling Data Gaps

The CitiStat approach seeks to quantify as many aspects of government performance as possible. Government officials, however, are likely to encounter data gaps that impede evaluation, especially during initial implementation. These data gaps must be identified and systematically addressed; otherwise, problems and underperformance may be missed and allowed to persist. Filling data gaps may require additional expenditures, but this should be viewed as an investment that will pay off over the long run. Baltimore’s 311 number, for example, provided an important new data-gathering tool for monitoring city problems and government responsiveness. The data generated have enabled city officials to institute reforms that have produced far more effective and efficient government.

## Integrated Data Collection and Management

Agencies in state and local government may gather and manage data in a variety of different, frequently incompatible formats. To allow for more sophisticated analysis, data collection and management needs to be standardized and integrated. Washington state, in particular, faced this challenge because of its initiative’s inter-



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*The CitiStat approach makes the budget more manageable, ensures that resources are well directed, enables quick adjustments, and improves responsiveness. Simply put, the CitiStat approach delivers government that works.*

departmental nature. The answer might involve providing a simple entry format that government workers can use on a daily basis to input and update information, as happened under CitiStat. Or it may require employing technological solutions to integrate existing databases and information. Washington, for one, is implementing a new technology to allow government officials to access real-time data across agencies.

### **Setting and Meeting Goals**

In implementing the CitiStat approach, it is important to set clear achievable goals that will build trust and confidence in data-driven management. For Baltimore, this meant targeting absenteeism, overtime pay, and the time it takes for departments to respond to public requests or complaints. Accomplishing such goals can bring positive recognition, like Baltimore's 48-hour pothole guarantee, galvanize support both

within and outside government, and pave the way for other initiatives.

### **Public Disclosure of Data**

Public support will grow if government activities and performance are transparent and accessible. The first way to do this is to provide the public online access to information collected. Baltimore, for example, currently makes all CitiStat data available through its Web site, including charts, graphs, and maps. Placing such data in a narrative context can further enhance public understanding of government performance and draw attention to improvements. With enhanced public understanding comes greater accountability for government agencies and departments. Such information empowers the public to press for improvements where poor performance is demonstrated, which in turn can assist government leaders in driving entrenched agencies and departments to change.



## Conclusion

The CitiStat approach is a proven data-driven model of government that is starting to spread. At least 11 American cities and now two states have put it into practice. This trend is likely to continue as the successes of these cities and states become better known.

Indeed, the CitiStat approach has produced dramatic results virtually everywhere it's been tried. This paper details these achievements in Baltimore and the state of Washington. But the story is the same in other places with CitiStat-like programs.

New information technologies provide the building blocks for this success. Before these advances, data collection and analysis were frequently too time consuming and expensive to undertake. But today, data are far more easily assembled, manipulated, transferred, and disseminated, making the CitiStat approach both feasible and affordable. Baltimore, for example, began its program on a shoestring of less than \$300,000.

The ability to collect and analyze large amounts of data has brought greater precision to government. Decision-makers are better able to monitor trends over time, plot geographic distributions, and examine cause and effect. Problems or underperformance that previously might have been missed are now brought to the surface and exposed for scrutiny.

The CitiStat process, in which data reviews are conducted every two weeks, ensures that such information will reach key decisionmakers and that corrective action will be promptly taken. Disclosure of data through the Internet, moreover, empowers the public to participate in this process and hold leaders accountable for improvements.

The end result is more effective and efficient decision-making. The budget becomes more manageable as waste is identified and trimmed. Resources are focused and directed where they are needed most. Adjustments are quickly made according to changing circumstances. And responsiveness improves as agencies and departments strive to improve their numbers.

Simply put, the CitiStat approach delivers government that works.



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# Center for American Progress



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# Governing by the Numbers



*The Promise of Data-Driven Policymaking  
in the Information Age*

Daniel C. Esty  
and  
Reece Rushing





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# Robust data collection illuminate problems and more nimble, tailor

- Public dissemination of data and metrics on policy results, so those outside government can hold public officials accountable for their performance.

Unfortunately, across most federal policy areas, this model cannot be fully and confidently applied because of significant gaps in data. In education, for example, we lack basic classroom data that could be used to deploy highly effective teachers where they are needed most. In health care, we are unable to systematically draw comparisons across providers to identify and expand the most effective treatments. And in the environmental arena, basic data on air and water pollution as well as chemical exposures are often unavailable, impairing our ability to prevent public harm.

## Key Recommendations

- Close gaps in knowledge by harnessing new technologies to collect, analyze and disseminate key data.
- Focus on results by setting quantitative, outcome-focused goals, measuring policy performance, and comparing results among peers.
- Develop systems to ensure data are used to guide policy priorities and solutions.

In a paper-based world, this sort of information was virtually impossible to generate. The costs and administrative burden associated with data collection and analysis were simply too steep. Today, however, these costs are falling dramatically due to advances in information technologies.<sup>3</sup> Data are now far easier and cheaper to gather, store, analyze and disseminate. Moving information from one place to another is instantaneous and virtually free. These advances make possible a whole series of monitoring opportunities, data exchanges, comparisons, and analytical inquiries that would have been impossible even a few years ago.

Leading corporations such as General Electric Co., Marriott International Inc., and Capital One Services Inc. have seized on new technologies to transform the way they make decisions. Data and metrics are used to manage inventories, assess and improve product quality, measure the success of marketing strategies, set optimal prices, and identify priorities for capital allocation.

A similar revolution in government is waiting to be unleashed. Indeed, a number of pioneering local and state governments are showing the way. The city of Charlotte, N.C., for example, has developed metrics to identify and target fragile neigh-



# and analysis promises to enable policymaking that is, and experimental.

neighborhoods for revitalization. In Baltimore, the mayor's office continuously monitors performance data from city departments to improve service delivery and achieve budget savings. At the state level, Washington has developed a data-driven system for priority setting and results-focused budgeting, while Virginia and Iowa set ambitious, quantifiable goals to hold state officials accountable for results.

The missing ingredients at the federal level are political commitment, funding, and a coherent strategy for moving forward. There are three broad areas that must be addressed to build a more data-driven and empirical approach to governance.

First, we need to close critical gaps in our knowledge by harnessing new technology and investing in data collection, analysis and dissemination. In the absence of robust, high-quality data, life and death problems may go undetected, cause and effect correlations may be missed, and comparisons from place to place may be misleading.

Second, we need to focus on results by setting quantitative, outcome-focused goals, rigorously measuring policy performance, and comparing results among peers, in particular state and local governments. As it currently stands, goal-setting is frequently focused on tasks rather than results, while

performance measurement suffers from political manipulation and a lack of meaningful data, impairing comparative analysis.

Third, we need to develop systems to ensure that data are used to guide policy priorities and solutions. Even if we had all the necessary data, we would still lack the expertise, decisionmaking processes, and commitment from top leadership (including the president and Congress) to adopt data-driven decisionmaking.

Taking these steps will require significant effort and investment, but the payoff is potentially enormous. Debates over policy frequently get hung up on problem assessment. If we are unsure of the facts, we don't move on to solutions. In the meantime, the public is left to suffer the consequences—children stranded in failing schools; communities exposed to cancer-causing chemicals; patients denied life-saving treatments.

Robust data collection and analysis promises to illuminate problems and reduce uncertainty by revealing severity, geographic concentration, trends, and causation. This knowledge, publicly disseminated, can sharpen debate over policy choices, facilitate political consensus, and provide leverage over entrenched special interests that may stand in the way of addressing a particular problem.<sup>4</sup>



Having a clear picture of our problems also enhances our policy options. Policymaking can become more nimble, able to quickly adjust to changing circumstances, more tailored, so that responses fit divergent needs, and more experimental, testing how problems respond to different strategies.

These benefits can only be realized, however, if we recognize and avoid the potential downsides of data-driven decisionmaking. Wrong conclusions and policy decisions may emerge in the absence of thoughtful analysis—especially when critical issues or determinants of results are inescapably difficult to measure quantitatively. Analysis will always be necessary to interpret available data, take account of factors that may not be reflected in the numbers, and clarify underlying assumptions.

In addition, performance measurement, if oversimplified or misdirected, can create warped perceptions and distorted incentives. Without proper “checks and balances,” those being measured can “game” the numbers in ways that undermine policy objectives. Hospitals evaluated solely on death rates, for example, may choose not to treat the sickest patients with the greatest chance of dying. Metrics need to be carefully selected to ensure that they present an accurate picture of key issues and promote desired outcomes.

Finally, data might be used in ways that intrude on personal information, such as medical records, or to support inappropriate policies, such as racial profiling. Protections are therefore needed to ensure data are not misused.

This paper provides a starting point for thinking about data-driven decisionmaking as a new approach to governing. It describes the major elements that need to be implemented at the federal level,<sup>5</sup> explains the potential advantages of this approach, and points out possible downsides that must be overcome. We give particular attention to

education, health care and the environment for illustrative purposes. However, data-driven decisionmaking can be applied to meet the full range of challenges facing the country, from homeland security to food safety to energy alternatives to financial fraud. At its heart, this proposal is about building an effective, efficient government that is responsive to the needs of its people.

## WHAT NUMBERS PROMISE FOR POLICYMAKING

It should be recognized upfront that data-driven policymaking cannot provide all the answers to the challenges of good governance. Data, by itself, will not reveal the optimal policy choice. Nor will data alone tell us what problems to focus on or how to direct resources. Policy decisions always depend on a combination of facts, analysis, judgment, and values.

In baseball and business—two areas that have successfully employed data-driven decisionmaking—goals are clear and easily measured. In baseball, the goal is to score more runs than your opponent. In business, the goal is to maximize profits. Goals in policymaking are less straightforward and often open to debate. What’s more important, a tax cut or health care? What responsibility does the federal government have in educating the nation’s children? What level of health risk are we willing to tolerate from industrial pollution?

Data cannot answer these questions. Data can, however, be applied in service of our values to inform policymaking. By harnessing new technology and investing in data collection and analysis, decisionmakers can position themselves to spot problems faster, identify and test a range of policy options, learn from collective experience, target limited resources, and quickly refine and tailor policy interventions. The challenge is seizing this opportunity.



## *A Data Revolution*

Advances in information technology have brought about a revolution in decision-making from sports to business to policing. Historically, decisionmaking in these areas has been heavily influenced by factors other than empirical evidence, including personal experience or observation, instinct, hype, and dogma or belief. The ability to collect and analyze large amounts of data, however, allows decisionmakers to cut through these potential distortions to discover what really works. Indeed, those who have made the best use of data have consistently outperformed their more data-challenged peers.

Michael Lewis's best seller *Moneyball* tells the story of Billy Beane, the general manager of the Oakland Athletics, who pioneered baseball's move toward data-driven performance evaluation and player selection.<sup>6</sup> Baseball scouts have long traveled the far reaches of the country to watch prospects in action. Beane, however, feared that such direct observation might cloud his judgment. Instead, he committed to making decisions guided almost entirely by stats.

Stats, of course, are hardly new to baseball. For decades, Major League Baseball has recorded batting averages, home runs, Runs Batted In (RBIs), and stolen bases. Beane, however, became convinced that these traditional metrics did not fully capture a player's worth. Nor was it clear which stats mattered most and which were undervalued by the market—especially crucial for the Oakland A's, one of baseball's poorest teams. Hiring a team of statistical experts, Beane set out to develop a data-driven system that would give the A's an edge over rivals that could afford to spend exorbitant amounts on star players.<sup>7</sup>

The results have been astonishing. Over the 2001-2006 seasons, only the New York Yankees—the team with baseball's largest payroll—have won more games. The A's have been by far baseball's most efficient operation during this time, producing an average of 96 wins for an average of \$2 million spent per player. The Yankees, meanwhile, have produced an average of 99 wins while spending an average of \$5.73 million per player.

The Oakland A's  
data-driven approach  
to player evaluation has  
produced winning baseball  
at an affordable cost.



Other teams, not surprisingly, have started emulating Beane's commitment to statistical analysis. In 2004, the Boston Red Sox broke an 87-year-old "curse" and won the World Series with a team constructed by Theo Epstein, who had adopted Beane's data-driven approach. Even teams in other sports, including basketball and football, have taken notice. Before the 2004 season, the National Basketball Association's Seattle Sonics, for example, hired a statistical expert to assist with scouting and game planning.<sup>8</sup> That year, the Sonics finished with a record of 52-30, a 15-game improvement from the previous year.

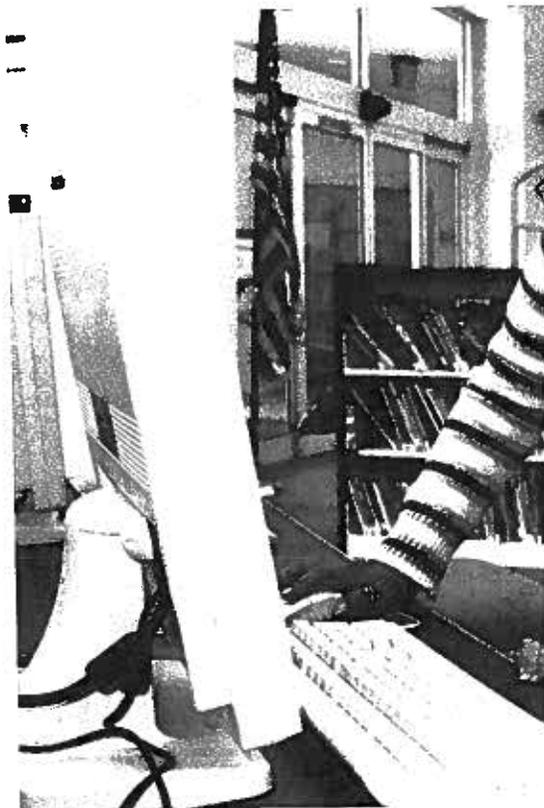
In the business world, there likewise has been growing emphasis placed on data to guide decisionmaking. In 1986, Motorola Inc. introduced a data-driven approach to monitor product defects called "Six Sigma" that enabled the company to achieve almost perfect quality and reliability.<sup>9</sup> Within five years, Six Sigma improvements had saved the company more than \$2 billion in production costs (by 2004, savings topped more than \$15 billion).

This success got the attention of Jack Welch, then CEO of General Electric Co. In 1995, Welch put in place an ambitious Six Sigma program that sought to elevate statistical analysis as GE's primary management tool. Managers were trained to use information management systems and advanced number-crunching to squeeze costs out of production processes in ways that generated hundreds of billions of dollars of value for company shareholders. The Six Sigma approach has now spread across corporate America.

A host of other data-driven approaches recently have been developed to improve profitability, including systems to determine optimal price and evaluate the success of advertising campaigns and other interventions. Marriott International, for example, has created a Total Hotel Optimization program that uses data to shape customer

promotions and set prices on rooms, conference facilities and catering, while credit-card company Capital One conducts 30,000 experiments a year to determine what interest rates, incentives and marketing approaches work best to attract customers.<sup>10</sup>

Data-driven policing took hold in 1994 when the New York City Police Department put in place a computerized system, called CompStat, to track and map crime by neighborhood. Precinct and borough commanders reviewed this geographic data and targeted their patrolmen on problem areas. By attending to the numbers and carefully tracking performance, the department was able to deploy its limited resources more effectively. From 1993 to 1998, the city's murder rate plummeted 67 percent and reported robberies declined 54 percent,<sup>11</sup> well ahead of national averages.<sup>12</sup> This system of data-driven policing, which is still in place today, has since been replicated in dozens of cities throughout the country.





Information technologies are also used to solve specific crimes. In 2003, Boston adopted a sophisticated data system that integrates a range of information, so that police can search arrest records and incident reports and uncover possible leads, such as former addresses and weapons purchased.<sup>13</sup> Information that once took days to gather can now be retrieved instantly, while connections that might have been missed are now easily spotted.

These examples show the potential to dramatically improve performance by using data to guide decisions. Although each case is different, the common thread is commitment at the top; because of leadership and insistence on modernization, data now permeates everything these organizations do. This same sort of commitment will be necessary for data-driven policymaking to take hold.

*Some school districts have developed data-driven systems to customize teaching to fit the needs of individual students.*



### *Government's First Steps*

Though government is lagging in areas such as education, health care and the environment, there have been recent promising developments that suggest a data-driven future. For example, the No Child Left Behind Act of 2001 mandates regular student testing to identify and improve low-achieving schools (with results reported by subgroups of blacks, Hispanics, whites, and students who are low-income, English language learners, and disabled). While concerns have been raised over the law's funding and accountability mechanisms, there is little disagreement over the need for better data on school and teacher performance.

A number of school districts have gone beyond the requirements of No Child Left Behind to produce more fine-grained assessments that seek to measure the "value added" by each school in improving student performance—isolating the school's influence on student achievement by accounting for variability in student starting points. Seattle, for example, measures improvements achieved by individual students from year to year; schools are evaluated based on how quickly test scores improve.<sup>14</sup> Such data make it easy to spot where gains are most dramatic and thus to identify successful policies and classroom strategies.

Other school districts, meanwhile, have built systems to monitor student progress throughout the year and make continuous improvements.<sup>15</sup> In Palatine, Ill., for example, educators are able to query, through a secure Internet location, an Education Data Warehouse that provides data covering 349 variables, including all test scores. These data can be disaggregated from the district level to the school to the class or subgroup to the individual student. The district has used this information to design a successful literacy program—more than 90 percent



of its students read at or above grade level by second grade—while teachers, through electronic testing and assessment, are able to know immediately whether their lessons were successful and which students need extra help.

Other policy areas also stand to benefit from an increased commitment to collect and analyze data. In the environmental arena, where large data gaps have impaired data-driven decisionmaking, breakthrough technologies from global-scale observation to nanotechnologies are giving policymakers a whole new set of tools that will make it much easier to understand problems and advance innovative policy solutions. Satellite-based remote sensing, for example, can track fish catches; ion beams can detect the levels of various vehicle pollutants; and wireless sensors now provide the ability to take real-time environmental measurements of almost anything, anyplace we choose.

The National Ecological Observatory Network, or NEON, a project funded by the National Science Foundation, will soon implement a nationwide system to track environmental health, drawing on cutting-edge information-gathering technologies. This network promises to add sophistication and precision to our understanding of the physical environment, potentially helping government officials tackle a range of policy challenges, from ensuring healthy air to preventing drinking water contamination to protecting endangered species.

In health care, meanwhile, political leaders across the spectrum—most prominently Hillary Clinton and Newt Gingrich<sup>16</sup>—have pressed for investments to digitize our antiquated paper-dominated health-care system to enhance quality of care and eliminate inefficiencies. Research shows a new health information-technology infrastructure would significantly improve quality of care and reduce errors, potentially slicing drug prescrib-

ing mistakes in half,<sup>17</sup> while producing savings in national health-care expenditures, up to \$78 billion a year according to one study.<sup>18</sup>

The Department of Veterans Affairs is often credited for showing the way in this regard. In the mid-1990s, the VA overhauled its health-care system to implement new information technology, integrate services, and require performance measurement and reporting. This overhaul has produced dramatic improvements in disease prevention, outpatient care of chronic diseases, and inpatient care.<sup>19</sup>

Nonetheless, while various federal agencies as well as some city and state governments have moved toward a more data-driven approach to decisionmaking, in no policy arena has the full potential of governing by the numbers been realized, and many gaps and limitations persist.

In the case of education, each state implements its own testing regime under No Child Left Behind, or NCLB. This makes direct comparisons from state to state impossible, hindering the ability of states to learn from each other. As a result, top-performing approaches might not be identified and replicated. Moreover, testing data collected under NCLB are limited to grades 3-8 and once in high school. While some school districts have adopted more fine-grained assessments, most lack key data about student, teacher and school performance. Nor do most have the statistical expertise or technological capacity to make full use of new data.

For the environment, the nationwide tracking system NEON, mentioned above, is not expected to be operational for at least another year, assuming full funding, and in any case, it would not solve all our environmental data needs. Even with a much better fix on ambient conditions, environmental decisionmakers would still lack accurate, real-time data on specific sources of pollu-



*The decision over which prescription drug plan to choose can be confusing, especially in the absence of good data.*

tion, such as industrial facilities, as well as data on the health and ecological consequences of environmental contamination. This information is needed to determine how best to target resources and tailor interventions. There is also no guarantee the data collected by NEON—the purpose of which is information gathering—will be effectively linked to the policymaking process.

In health care, the political consensus over the need for state-of-the-art information management systems has not yet been translated into effective action. Private-sector service providers, from which most Americans receive their health care, currently lack incentives to convert their operations and enhance quality of care. Computerized health systems require significant

upfront investment, but the financial return to the provider may not be realized for some years down the road, if at all.<sup>20</sup> Overhauling the existing incentive structure to encourage this investment is, to say the least, a difficult challenge to overcome.

In any case, better health-care IT is just the first step toward data-driven policymaking. We still must ensure that we are collecting the right information, that this information is being used to guide decisions, and that it is being shared with the public. The health-care arena is deficient in all of these areas.

Consider the new Medicare prescription drug plan. The program includes no mechanism to evaluate the effectiveness of drugs being prescribed, which is necessary



to evaluate whether seniors are receiving quality care and whether taxpayers are getting their money's worth. The various drug plans that seniors may choose are required to report on access to prescription drugs, administrative effectiveness, cost control mechanisms, enrollee satisfaction and other measures. But it does not appear these data are being used by the Centers for Medicare and Medicaid Services, or CMS, to review bids and make contracting decisions for future program years. CMS has also been slow to publicly release initial data on plan or program performance. This information could be of immediate use to Medicare enrollees seeking to choose or change drug plans, and to Congress and other observers interested in improving the program.

Similar challenges exist across other policy areas. There have been some positive steps, but large data gaps remain and policymaking persists as it did before the digital revolution. Part of the problem is the specialized way government tends to think about policy problems. Members of Congress are assigned to committees where they typically focus on a particular set of issues and executive branch agencies, while agencies are concerned with meeting their statutorily prescribed functions. New initiatives grow out of these narrow silos. Data-driven policymaking, on the other hand, is not just about education or health care or the environment. It is about building connections across policy arenas to modernize and transform our government. This monumental task requires an overarching vision and broad political commitment.

### *Technology's Role*

The idea that government should base its decisions on data, evidence, and rational analysis is not new, of course. Data have always been used to inform government decisionmaking. What's new is the oppor-

tunity created by information technologies. The sort of data-driven decisionmaking proposed in this paper requires robust, high-quality data that are collected in real-time, integrated across disciplines, analyzed for new knowledge, and disseminated to the public.

Until recently, these demands could not be met. Because information collection was burdensome, government had to pick and choose what to collect, leaving large holes in our knowledge base. Data had to be reported by paper to government, and then entered by hand into a database. A database could not be integrated with other databases, nor could it be easily analyzed. In addition, manual reporting and data entry produced frequent errors and took considerable time. Years might go by before decisionmakers saw the data, while the public often never did.

Computing advances, however, make data-driven decisionmaking possible and increasingly low cost. Data gathering no longer requires paper reporting. Sensor and satellite technology provide the ability to collect data remotely—in real-time, with no reporting necessary—on almost anything in the physical environment, including air and water quality, the health of ecosystems, traffic flow, and the condition of critical infrastructure, such as roads and bridges. For other types of data, such as health-care records and student test scores, electronic reporting and management systems can seamlessly and instantaneously transfer and aggregate data and check for errors. These tools dramatically reduce the costs associated with information collection—minimizing the imperative to pick and choose what data to collect—while greatly enhancing data quality.

New technologies also allow us to overlay or fuse different datasets with one another for more sophisticated analysis. Relational database and data warehousing systems



allow multiple datasets to be queried at once. For example, if we wanted to check for evidence of influence peddling, we might fuse databases on federal contracting, lobbying, and campaign finance. For any federal contractor, we could quickly find lawmakers the company gave money to and lobbied. There are also analytical tools that go beyond simple queries to generate deeper understanding. In particular, data mining systems apply automated algorithms to extract patterns, draw correlations and predict future results, while Geographic Information Systems provide the ability to map and visually overlay multiple datasets. Within moments, these tools can generate new knowledge that might take years to uncover manually.

The final piece of the puzzle is public disclosure. Before the Internet, data collected by the government could only be viewed at a government agency or research library. Now much of these data can be viewed through a home computer. Many agency Websites provide searchable databases, geographic mapping and other tools, so those outside government can perform their own analysis. The public can also request databases from the government on CD-ROM, so that data can be reconfigured, repackaged, or merged with other data.

Nonetheless, despite these advances, government still has much to do to build the IT infrastructure necessary to support data-driven decisionmaking. A national system to monitor the environment through sensors and satellites has not yet been implemented. Much environmental data are still reported by industry to government, frequently through paper filings, and sometimes as estimates of pollution, not precise measurements.<sup>21</sup>

There also has been little effort to fuse datasets across domains. Databases are seldom integrated across agencies or even within agencies, impairing more complex analysis to find cause-and-effect relationships. And many datasets are still not searchable or downloadable through government Websites, while those that are searchable generally provide limited variables to query. The public frequently has to submit Freedom of Information Act requests for what should be easily obtained datasets.

The good news is that the technology now exists to fix these problems. Political leaders, however, must be willing to invest in data collection, analysis and dissemination.

The idea that government should base its decisions on data is not new. What's new is the opportunity created by information technologies.



# Data-driven decisionmaking empowers us to focus on our biggest problems, efficiently and equitably allocate resources, and design policies that are appropriately targeted and produce desired results.

## *Vision for the Future*

As we take advantage of new technologies to close data gaps and share information, we gain a clearer picture of our problems, which, in turn, enables more effective and efficient policymaking.

This begins with determining priorities. No one is likely to argue with the premise that government should give greatest attention to our biggest problems. However, there has always been a great deal of dispute over what constitute our biggest problems. Differences frequently flow from competing political loyalties, ideologies, and values. But they can also flow from a lack of good data and uncertainties, which plague many policy realms. Data can clarify the facts and allow decisionmakers to evaluate the relative importance of the various problems we confront, so that attention and resources can be more equitably and efficiently allocated.

Addressing data gaps would also bring greater precision in devising specific policies. Because of pervasive data gaps, some of which are discussed above, government frequently is unable to reliably diagnose problems. We may lack data on the interplay of factors contributing to a problem, for example, or differences in needs and circumstances from place to place or even person to person. Such information could be used to target policies at key variables and develop customized solutions. A school with information on each student's strengths, weaknesses and learning style, for example, can tailor lessons to fit individual needs.

Of paramount importance is getting data in time to make a difference. The sort of evidence government acts on is often based on after-the-fact damage—illness, death, and other hardship or crises. In contrast, real-time data collection and review would enable government to spot and address problems before they mushroom. Consider, for example, the



benefits for ensuring safe drinking water. Following severe weather, water supplies are sometimes contaminated by runoff or sewage overflows, but if contamination is detected in real-time, health officials can immediately alert affected communities and take action to purify the water, potentially heading off an outbreak of infectious disease.

It is also important to know if governmental interventions are successful. Policymakers generally lack reliable data on the impact of policy choices. The absence of performance measurement not only impairs government's ability to refine policies and adjust to changing circumstances, but it also may lead federal agencies—which set rules and standards for state and local governments, contractors and grantees, and private-sector entities—to mandate one-size-fits-all approaches.

If agencies are able to track results, a degree of “policy competition” can be unleashed.<sup>22</sup> State and local governments can be empowered to develop their own solutions so long as real-world objectives are met. Putting the focus on results, rather than required tasks, encourages experimentation, allows policies to be tailored to local circumstances, and promotes innovation.

By then evaluating relative performance among various actors, agencies can spotlight the most effective strategies and encourage others to replicate them. As noted at the beginning of this paper, the National Highway Traffic Safety Administration has used this approach to promote collective learning among states, which in turn has produced steep reductions in accident fatality rates. Other policy areas could similarly benefit from such performance benchmarking.

Finally, making all of this data available to the public would bring new openness and accountability to government. Policymaking is

frequently an insider's game, in which special interests exert disproportionate influence. This lack of outside participation makes distorted decisions and corruption more likely. Data, if effectively packaged and disseminated, can engage a broader audience in the policymaking process. With more eyes looking over relevant data, better solutions are likely to be brought forward and corruption would be more easily exposed.

Ultimately, the goal of data-driven decisionmaking is to deliver maximum returns from government programs. This approach empowers us to focus on our biggest problems, efficiently and equitably allocate resources, and design policies that are appropriately targeted and produce desired results. This goal is within our reach, but we need to implement the elements that support data-driven decisionmaking. From problem assessment to performance measurement to policy development, there is still much to do.

## ELEMENTS OF DATA-DRIVEN DECISIONMAKING

Data-driven government, at its most fundamental level, requires quantitative measurement of both problems and policy responses to inform decisionmaking. To get to this point, however, a number of steps are required.<sup>23</sup> Decisionmakers must define the problems they wish to address, invest in data collection and statistical analysis—harnessing information technologies—and publicly share data and conclusions. To promote effective policy solutions, these data should be used to measure progress on quantitative goals, compare performance among peer groups (for instance, from state to state), and guide policy refinements and everyday management decisions. These elements of data-driven policymaking are discussed further below.



### *Problem Definition*

Policymakers should be clear about issues they hope to understand and address, so that data collection and analysis are appropriately focused. At the outset, problem definition might be very general, stated as a simple goal or value, such as ensuring quality health care. Data gathering then begins to assess whether this goal is being met and if there are problems that need attention. As data are collected and understanding sharpened, problems should be reexamined and redefined.

Once a problem is identified and recognized as a policy priority, we can drill down to measure its severity and distribution, and take a closer look at cause and effect. In the environmental arena, for example, early policy incarnations of climate change focused solely on CO<sub>2</sub> emissions. Today, we recognize that an appropriate policy framework must track a series of greenhouse gases including methane, nitrous oxide, HFCs, PFCs and SF<sub>6</sub>. As the problem definition grows more precise, data collection can become more focused.

## Action Items to Build a Robust Data Infrastructure

- Define priority problems to focus data collection and analysis.
- Invest heavily in data collection and research, including synthesis of existing research.
- Integrate separate databases so that many different variables can be tested against each other.
- Commit to rigorous analysis of data to uncover, diagnose, and explain problems.
- Disseminate and package data for public consumption, in particular by providing Internet-based tools that enable data searches and analysis.

### *Data Gathering*

Data gathering comes in multiple forms. First, there is basic information collection, in which raw data is gathered and assembled. This includes: data reported to the government by a person or entity, as with census data or corporate financials; data collected by remote technology, such as satellites or environmental sensors; and data gathered by government personnel in performing oversight or enforcement functions. Second, there is research, in which a study is undertaken to generate new data or compile data from existing sources. Of particular importance for data-driven decisionmaking—and a frequent gap in data gathering—is the ability to synthesize the state of research from a range of studies, so that the best data are brought forward. Investments must be made in both of these areas for data-driven decisionmaking to get off the ground.

As noted earlier, in many cases, we simply lack the necessary information to have full confidence in data-driven decisionmaking. For example, we are unable to adequately track the health of our oceans despite their alarming deterioration. According to the U.S. Commission on Ocean Policy, “There is no national monitoring network in place to assess their status, track changes over time, help identify causes or impacts, or determine the success of management efforts”<sup>24</sup>—though new technology makes such monitoring far easier than ever before.

Researchers at the Massachusetts Institute of Technology, for instance, recently developed a remote sensor system that provides snapshots of the ocean over a 10,000-square-kilometer area at a time, enabling more precise measurements of fish populations.<sup>25</sup> Government should position itself both to promote and take advantage of this sort of technology.



We also need to renew our commitment to research. In recent years, Congress, at President Bush's request, has cut funding for research at a host of federal agencies, including the U.S. Geological Survey, the National Institute for Occupational Safety and Health, the Food and Drug Administration, and the National Marine Fisheries Service. The Bush administration's 2008 budget proposed to continue and deepen such cuts. In one of the more dramatic examples, the president proposed to zero out funding for a landmark study of environmental risk factors that influence childhood development and health. The study—which would track 100,000 children from the womb until age 21—promises to illuminate the triggers of asthma, autism, learning disabilities, and other developmental and health problems.

A sharper understanding of environmental risk factors would allow for more effective, targeted policymaking to improve the health of the nation's children—the primary goal—which in turn would produce cost savings many times greater than the cost of the study (about \$150 million a year). These savings include billions spent treating what should be preventable developmental and health problems. Data gathering should be seen as an investment that will pay off over the long run.

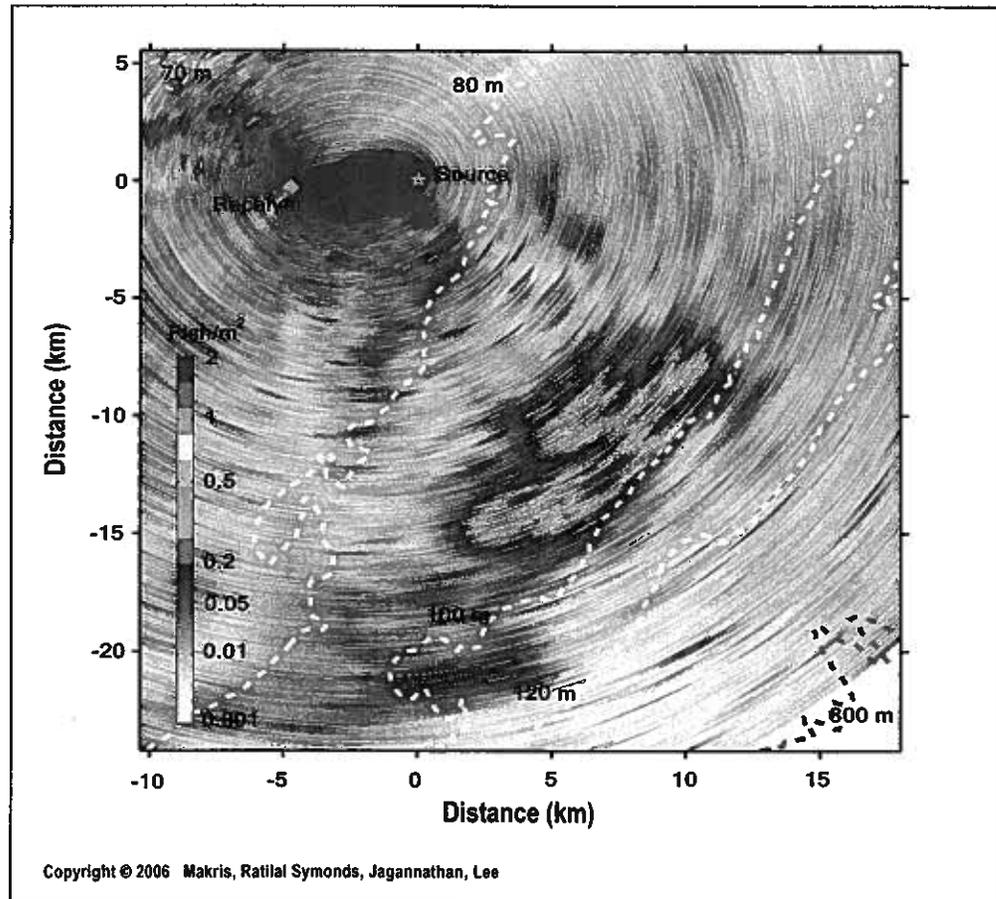
### Data Integration

One of the most significant barriers to effective problem assessment is the lack of data integration. As pointed out earlier, most government databases are not fused with one another, impairing our

ability to establish causation and evaluate the concentration and interaction of problems over geographic areas. For example, pollution data, such as annual toxic releases, are not linked to public health data, such as cancer-related deaths, or census data. This makes it more difficult to uncover what sort of pollution is causing what sort of health effects in what sort of population. Although data integration presents substantial challenges (including bureaucratic and jurisdictional issues), recent technological advances have opened new possibilities.

For instance, MAYA Design Inc., a research lab in Pittsburgh, developed the "Command Post of the Future" system that is being used by the U.S. military in Iraq for real-time situational

*Researchers at the Massachusetts Institute of Technology recently developed a remote sensor system that provides snapshots of the ocean's fish populations. This sonar image shows a fish shoal near the edge of the continental shelf, south of Long Island, N.Y.*





awareness.<sup>26</sup> This same technology is now being applied to build what MAYA calls the “Information Commons,” which moves beyond fixed data locations to allow seamless data sharing and integration, as well as easy conversion of data into geographic presentations.<sup>27</sup>

The Brookings Institution is using the Information Commons to help provide access to thousands of community-level datasets from government, nonprofit, and commercial sources.<sup>28</sup> Already, the Information Commons has fused datasets on transportation routes, toxic releases, census information, land parcels, and human services, among other datasets. Investment in this sort of integration is necessary for more precise problem assessment.<sup>29</sup>

### *Problem Assessment*

As data are collected and integrated, metrics must be analyzed to uncover, diagnose and explain problems that should be addressed. It is especially important to identify:

- Factors that contribute to a problem, including how those factors interact with each other and their relative importance;
- People or communities affected, in particular those who disproportionately bear the consequences;
- Trends over time—at what rate is a problem getting better or worse?—and projections for the future; and
- Sudden changes or anomalies that may require immediate response.

In some cases, conclusions will be obvious. In other cases, advanced statistical techniques (including correlation analysis, multivariate regression, and neural net analysis) will be useful to highlight causal relationships, critical similarities or differences in circumstances, and factors that drive outcomes.

## A Fragmented Data Gathering System

FedStats, the U.S. government’s Web portal to statistical information, lists more than 100 federal agencies with statistical programs.<sup>30</sup> Many agency programs closely relate to other agency programs. For example, more than a dozen separate agencies generate data related to the environment.

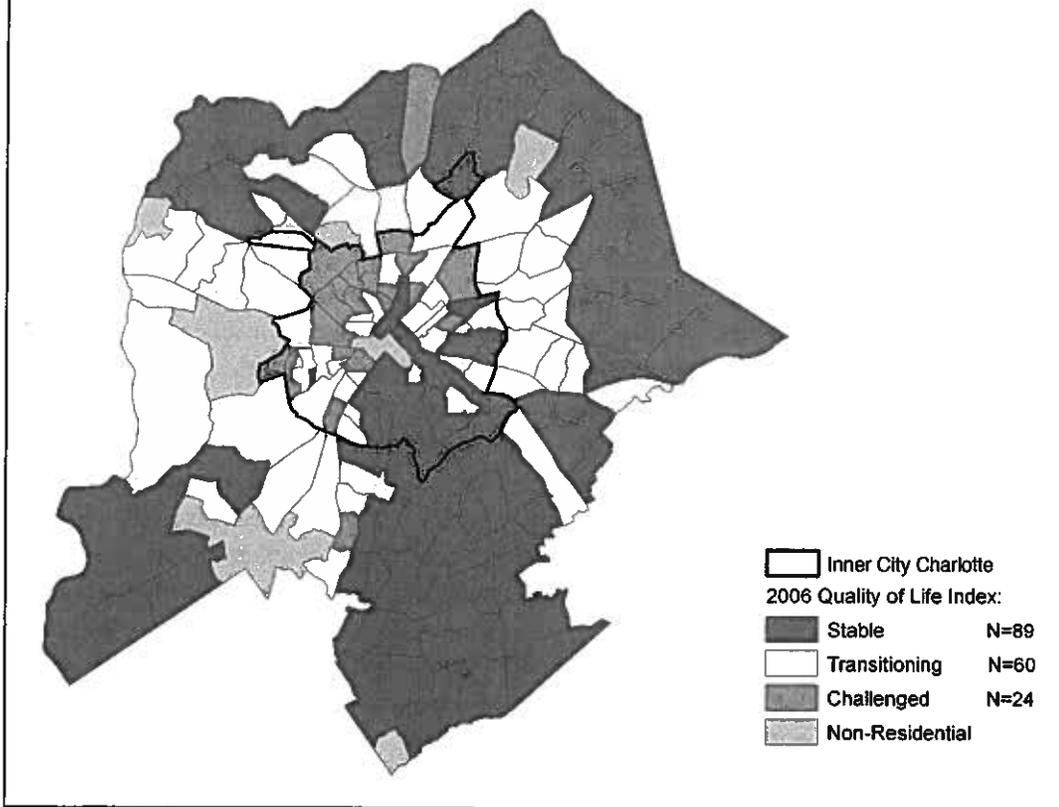
The president and Congress should take a systematic look at our patchwork statistical programs, which have grown in an ad hoc fashion over many years, to see how we might improve efficiency and effectiveness. At the very least, these programs would benefit from better coordination to ensure they complement one another and that relevant data are shared across agencies and are easily accessed by the public (it can be a daunting challenge to figure out which agency is collecting what data).

There are also opportunities to consolidate statistical efforts to eliminate redundancies and enhance the quality of data produced. In some cases, there may be value in separating out statistical functions from policymaking functions, so that statistical functions are housed in a centralized location.

One promising suggestion is the creation of a Bureau of Environmental Statistics—like the Bureau of Labor Statistics—to take charge of environmental data.<sup>31</sup> This would create a sharper focus on developing robust data while helping to insulate data collection and analysis from political influence, so that our biggest problems are spotlighted regardless of the policymaking agenda.



## Charlotte 2006 Quality of Life Index



Problem assessment also requires checking for potential downsides or limitations in the data, a number of which are discussed in greater detail below. In particular, as noted earlier, there may be problems that are difficult or even impossible to capture quantitatively. Inappropriate decisions might be made if these factors are not identified and taken into account.

### *Publication of Data & Results*

Government should provide those outside government (the press, nongovernmental organizations, academics, businesses, and concerned citizens) with tools to do their own data analysis. Through the Internet, the public should be able to search integrated databases by multiple variables and geographically map and overlay datasets.

Many federal agencies now provide searchable databases and GIS features through their Websites. Yet there are still many datasets that are not available through the Internet, while the ones that are available are not integrated with each other and restrict searches to a limited number of variables. Investments must be made in more robust information dissemination, so that the public is empowered to help spotlight problems and identify solutions.

Government should also package its data and analysis so problems are easy to spot and address. This might be as simple as providing quantitative tables that draw attention to key data; as noted in the introduction, NHTSA does a good job of this. But it might also involve a more sophisticated measurement system.



The city of Charlotte, N.C., provides one model of how data can spur action when it's unlocked and presented in a way that is meaningful. The city (in partnership with the University of North Carolina-Charlotte) has developed neighborhood "Quality of Life" rankings, updated every two years, based on 20 indicators measuring the social, safety, physical and economic conditions in 173 "Neighborhood Statistical Areas."<sup>32</sup>

From these indicators, neighborhoods are statistically grouped as "Stable" (with above average scores relative to other neighborhoods), "Transitioning" (with some below average scores), or "Challenged" (with mostly below average scores), as shown in the map on page 17. These groupings translate raw data into language that can be understood and used.

The city has responded by targeting resources to improve indicators in "Challenged" and "Transitioning" areas. Since 2000, the number of fragile neighborhoods has declined from 32 to 27, and three neighborhoods targeted for revitalization have been graduated to "Stable." Decisionmaking and accountability would benefit if other federal agencies could also find ways to package and translate raw data for easy consumption.

### *Setting of Quantitative Goals*

Quantitative goals should be set to address problems and judge progress over time. It may be valuable to have some "aspirational" goals that are long range and very difficult to achieve, such as No Child Left Behind's goal of making all students proficient in reading, math and science by 2014. Goals like this provide a vision of where a particular policy domain is trying to go. Shorter-term and more realistic goals may be appropriate for day-to-day or year-to-year management.

This approach to goal-setting is embodied in the Government Performance and Results Act (GPRA) of 1993, enacted as part of Vice President Gore's Reinventing Government initiative. Under GPRA, each federal agency must develop an updated "strategic plan" every three years to define its long-term vision, as well as an annual "performance plan" that sets short-term goals by which performance is to be measured.

Unfortunately, agencies often resist setting ambitious goals for fear of failure and associated repercussions, such as budget cuts, congressional or White House rebuke, and public embarrassment. Instead, strategic plans might restate ongoing work or express goals in such vague terms as to make them meaningless, while performance plans might focus on outputs (activities performed to achieve a goal), or worse yet, inputs (such as money spent), rather than outcomes (actual real-world improvements).

Several states now place increased emphasis on setting measurable outcome-based goals. As governor of Virginia, Mark Warner instituted "executive agreements," which he personally reviewed, to set performance objectives for the state's 10 cabinet secretaries and approximately 100 agency heads to meet.<sup>33</sup> Likewise, Iowa Gov. Tom Vilsack put in place a program called ResultsIowa that sets quantitative goals for state departments, as well as the state as a whole, organized around five broad priorities—the economy, education, health, safe communities, and the environment. State goals include creating 50,000 high-paid, high-skill jobs within four years; providing 90 percent of children with quality preschool; providing all Iowans access to quality health care; and eliminating all impaired waterways by 2010.<sup>34</sup>

The federal government should follow the lead of states like Virginia and Iowa and embrace ambitious, outcome-focused goals. This first requires direction and oversight from



the White House. Under the Bush administration's performance initiative, the Performance Assessment Rating Tool, or PART, the Office of Management and Budget recently began grading agency performance plans, which, if done well, could prod agencies that are under-ambitious to do more.

In addition, agencies that set the bar high and make an honest effort to achieve stretch goals should not be unfairly punished for falling short. Instead, policymakers should explore providing rewards such as public recognition, increased funding, or greater flexibility for experimentation, including the ability to retain and redirect any cost savings achieved as a result of increased performance.<sup>35</sup>

Finally, we should embrace outside participation in the development of performance plans.<sup>36</sup> Regular consultation with a broad array of stakeholders—including Congress, state and local governments, business, non-governmental organizations, and the public—could provide an accountability check and open agency decisionmakers to new possibilities and goals.

### *Determination of Policy Priorities*

Once we have identified our problems and set our goals, we then need to set policy priorities to achieve our objectives. Federal agencies primarily set priorities through the regulatory process and the budgetary process. Both would benefit from more systematic use of data and greater transparency.

For regulation, each federal agency prepares an agenda

every spring and fall that lists priority actions for the year.<sup>37</sup> Frequently, actions are placed on an agency's regulatory agenda as a result of legislation (or litigation to enforce legislation); many statutes require agencies to develop and update specific regulations according to specific timetables. Such congressional directives may make sense to keep an agency on task, but they can also create obstacles for data-driven decisionmaking. It may be that priorities set by Congress do not match priorities suggested by the data.

Agencies also have some statutory discretion to initiate regulatory actions on their own. However, how or why they choose priorities is often unclear. Agency regulatory agendas provide short explanations for priority actions, but they give little or no attention to the larger context. How do priorities link to goals and objectives? Why were they picked over other possibilities? What is their relative importance to each other? The impression left is that agencies have not grappled with these questions, and that their choices lack empirical grounding.

At the very least, agencies are not making their reasoning public. Indeed, the public is largely left out of the priority-setting process. Under the Administrative Procedure Act, which governs the regulatory process, outside parties can petition an agency to

## Action Items to Build a Results-Focused Government

- Set quantitative, outcome-based goals to define objectives and judge progress over time.
- Rigorously measure performance to inform whether and how to adjust policies.
- Compare the performance of peers, including states and localities, to identify and expand successful approaches.



# Washington Gov. Cl that budgetary tradoffs : This encourages creati the biggest k

undertake a rulemaking, and the agency is required to respond one way or the other within 60 days. Otherwise, however, there are few formal pathways to provide input on regulatory priorities.

What's needed is a system that explicitly links data to priority-setting and opens the decision-making process to the public and Congress. As one possibility, agencies could prepare annual regulatory priority reports that package problem-assessment data to identify and explain needed actions, delineate relative priorities according to tiers (high, medium and low priority),<sup>38</sup> and suggest specific legislative changes, where needed, to align statutory mandates with priorities suggested by the data. Draft reports could be used to solicit public input and congressional engagement.

The budget process likewise could benefit from better use of data and greater transparency. The Bush administration's PART performance tool evaluates the performance of individual programs to inform the president's budget decisions. A system like PART could contribute to data-driven priority-setting, but PART suffers from weaknesses in evaluation methods (discussed further on page 24) and questions over how or whether evaluations are linked to budgetary decisions.

Of the 85 programs assigned a top PART rating by the Office of Management and Budget in 2005, President Bush proposed to cut the budgets of almost 40 percent—including the National Center for Educational Statistics, whose work is critical for performance measurement and data-driven decision-making—while proposing to increase the budgets of some programs that received “ineffective” scores.<sup>39</sup>

Of course, it is not necessarily a given that ineffective programs should be cut—they might be underperforming because of inadequate resources—or that effective programs should receive funding increases. Yet the president's budget does not explain how funding decisions relate to performance findings under PART. That leaves outside parties, including Congress, in the dark about the priority-setting process.

A defining characteristic of data-driven policymaking is that decisionmaking is conducted out in the open. Data should be freely shared, and decisions should be clearly explained. For the budget process, this suggests a number of reforms. First and foremost, budget requests should clearly link data to funding decisions. As in the regulatory context, it is especially important to delineate relative priorities, so the differ-



# Christine Gregoire demands cross-agencies be articulated. Thinking about how to get bang for the buck.

ent parts of the budget are connected. Why is the pie divided the way it is? How do funding decisions relate to each other? Why is funding increasing in certain areas while stagnating or declining in others?

The state of Washington, under the leadership of Gov. Christine Gregoire, recently developed a system, called “Priorities of Government,” that provides a useful model. This system seeks to move beyond the agency-by-agency, silo approach to budgeting. Instead, decisions are organized around 10 broad priorities, such as improving student achievement and improving the health of Washingtonians.

A “results team,” made up of experts from different agencies and overseen by staff from the governor’s office, is formed every year for each of these priority areas. Each team is then given a set amount of money to address its priority area. This forces budgetary tradeoffs across agencies and programs to be articulated and encourages creative thinking about how to get the biggest bang for the buck.

It is also important that the budgetary process include public participation. In particular, the public should have adequate time to review and comment on budget

proposals prior to submission to Congress, and should be provided access to decisionmaking documents, including agency budget requests to the White House Office of Management and Budget (so that OMB is accountable for any changes it makes). Such public involvement can help bring new information forward that might influence decisions, and provide a check against misguided priorities.

## *Development of Policy Solutions*

When we know our priorities, we can then begin to develop solutions. In choosing the appropriate policy, decisionmakers should be guided by problem-assessment data, discussed above, and performance-measurement data, discussed below.

Problem assessment aims to identify cause and effect, affected people or regions, and trends. Decisionmakers should use this information to develop targeted, tailored responses that are focused on the most important causal factors, are calibrated to meet disparate impacts (so that greater resources are directed to serve people or areas most affected), and employ or permit different strategies to address divergent needs or circumstances.



Performance-measurement data, meanwhile, reveal the effectiveness of policy responses and compare different approaches among peer groups—such as federal agencies, states or localities, or private-sector entities—allowing decisionmakers to learn from real-world experience. Decisionmakers should use this data to expand successful strategies and push laggards to match the performance of top-performing peers. In addition, performance indicators can be analyzed against data on policy inputs and drivers (framework conditions, money spent, policy tools used, effort deployed, etc.) to identify statistically the determinants of policy success.<sup>40</sup>

Connecting problem-assessment and performance-measurement data to decisionmaking is a key challenge. Regulatory decisions, for example, are notoriously difficult to decipher. Data are seldom presented clearly and concisely in a single place. Instead, supporting data are often scattered among dense, technical documents. This makes it difficult for the public to understand decisions, but it also makes it difficult for agency political appointees and members of Congress who often lack technical expertise and do not have the time to sift out key data.

As one possible solution, decisionmakers could decide before each policy-making process what data are important to know and create a “data form” to be completed by agency staff. Generally speaking, these forms should provide data, packaged in a way that is easily digestible, on the problem being addressed, as well as the results projected from various policy options under consideration, which might derive in part from performance-measurement data.

For some policy categories, it is possible that forms could be standardized and then reused for future decisions. In other cases, it might be necessary to develop more tailored forms. For major policy decisions, in particular, there should be greater attention to data needs—ideally involving the assistance of an external advisory panel (federal agencies have numerous standing advisory committees).

Ultimately, it may be that some data requests cannot be met. In such cases, agencies should indicate data gaps—which can inform future data gathering—and proceed based on the best information available. The expectation is that a firm commitment

## Action Items to Link Data to Policy

- Infuse regulatory and budgetary priority-setting with more systematic use of data and greater transparency.
- Ensure that decisionmakers have relevant problem-assessment and performance-measurement data to craft policy solutions.
- Create systems that require high-level agency managers to regularly consult data to guide everyday management.
- Implement training programs to develop the necessary expertise to support data-driven policymaking.



# Once a policy is implemented, it must be continuously assessed to determine necessary adjustments.

to data collection and analysis will put more data at the decisionmaker's fingertips and narrow uncertainty. But policymaking will inevitably involve some unknowns, and the desire for data should not be allowed to cripple government responsiveness.

## *Feedback Loops & Policy Refinement*

Even with the best data, policymaking is not an exact science and will rarely be done exactly right the first time. Just as "continuous improvement" has become a business mantra, good policymaking requires a process of ongoing trial and error. Once a policy is implemented, we need to measure and continuously monitor how it is working.

This means identifying and collecting outcome data to track on-the-ground conditions and results, as well as output data such as resources invested, technologies deployed and policy choices made. It is vital to policymaking to understand the interplay of inputs, outputs, and outcomes to find the most effective and efficient approaches.

With performance data in hand, it is then possible to make necessary adjustments. Policies that are producing good results should be extended and expanded. Those that are

not should be rethought and redirected, with resources redeployed. As issues evolve, new goals and metrics will need to be developed and indicators reconfigured.

Credibility is a key issue for performance measurement. Sometimes it is not clear which metrics to use and how to isolate the influence of a policy from the influence of other factors. Careful, objective deliberation is required to ensure that metrics accurately reflect program performance. Currently, there is a danger that federal agencies will game the numbers and pump up their performance by choosing metrics that are easy to meet but may not provide a true measure of success.

To build a more credible system, it will be necessary to address the inherent conflict of having an agency evaluate its own effectiveness. As one possibility: each agency could set up a performance advisory board of independent outside experts (similar to EPA's Science Advisory Board) that provides a check against gaming the numbers and helps to ensure that measurement promotes real-world improvements. It may also be worth experimenting with having research-focused agencies evaluate the effectiveness of policymaking agencies. For example, the National Institute for Occupational Safety and Health could evaluate the performance of priority OSHA programs.



Building and maintaining such a system, of course, require sufficient and sustained investment. Unfortunately, many agencies have not been provided adequate resources to meet their obligations under GPRA and the Bush administration's PART initiative (see box). To ensure adequate resources, the president's annual budget proposal should detail funding for performance evaluation at each agency, and Congress should assess whether agency performance budgets are adequate and appropriately directed.

### *Benchmarking & Comparative Review*

Comparative data provide the essential element of *context*, so that we can understand differences in performance among actors who are similarly situated and identify the policy options employed by top performers. To achieve policy traction, it is particularly important that performance be benchmarked against a relevant peer group.

## Performance Evaluation under President Bush

Under the Bush administration's PART performance-evaluation system, the Office of Management and Budget answers 25 "Yes" or "No" questions for each program under four categories: (1) program purpose and design, (2) strategic planning, (3) program management, and (4) program results. OMB then uses these answers to assign each program one of five ratings: (1) effective, (2) moderately effective, (3) adequate, (4) ineffective, or (5) results not demonstrated (for a program that lacks adequate performance information or measures).<sup>41</sup>

This initiative is useful in that it systematically focuses White House attention on program performance and methods of measurement. But the PART review is open to a great deal of subjective interpretation and political manipulation.

For example, one question asks, "Is the program design free of major flaws that would limit the program's effectiveness or efficiency?" OMB answers "No" for EPA's program to control toxic air pollutants, arguing that technology-based standards required by the Clean Air Act are "not designed to maximize net benefits."<sup>42</sup> This answer reflects a long-running political debate over the best design and approach for limiting air pollution. As a measure of performance, it is essentially worthless.

The subjective nature of the evaluations can also produce findings that seem to go against objective facts. The Federal Emergency Management Agency's disaster response and recovery programs, for instance, were recently scored as "adequate" even after gross deficiencies were exposed in the response to Hurricane Katrina.<sup>43</sup> Not surprisingly, Congress has largely ignored PART ratings. According to the Government Accountability Office, "It is not clear that PART has had any significant impact on congressional authorization, appropriations, and oversight activities to date."<sup>44</sup>

To be successful, performance evaluation must be objective, credible, transparent and useful. Measures need to be developed in a way that reflects a program's goals and objectives. Ideological influence on performance data must be limited, so that it can garner trust across the political spectrum. The process for devising goals and measures, and making decisions based on performance data, must be open to public scrutiny. And above all, performance measurement should provide decisionmakers and the public with data that can be used to evaluate and refine government policy.



As highlighted by the Environmental Performance Index,<sup>45</sup> a global ranking system developed by the Yale Center for Environmental Law and Policy and Columbia University's Earth Institute, it is not particularly interesting to know that Haiti's environmental performance lags behind Finland's. But it is interesting that Haiti's performance lags badly behind that of the Dominican Republic, a country at a similar level of development with which it shares the island of Hispaniola. (Complete Environmental Performance Index rankings are shown on page 26).

Comparative analysis and benchmarking enables focused follow-up questions: Why does the Dominican Republic fare so much better on the environmental performance index? Is it because of specific environmental policies? If so, are they replicable? Or is it because of relative political stability compared to Haiti? If so, how does political instability affect environmental health?

Currently, federal performance measurement gives little attention to benchmarking. In particular, the relative performance of state and local governments is seldom publicly evaluated, even though their actions frequently determine whether a federal program or initiative is successful. Indeed, one objection federal agencies make to outcome-based performance measurement is that results depend on many factors outside their control, including the performance of state and local governments, whose goals and objectives may conflict with those of the federal government. At the same time, agencies are often reluctant to take on the politically thorny challenge of publicly evaluating state and local governments.

This sensitivity is an obstacle that must be overcome for the benefits of comparative analysis to take root. As a relatively easy first step, agencies could regularly

spotlight top-performing state and local governments and best practices that might be replicated. The Department of Education, for example, recently launched an initiative to identify state and local innovations to ensure schools have highly qualified teachers.<sup>46</sup> A visit to most agency Websites, however, will show that this sort of information is rare.

Agencies can also provide Web tools to enable the public to draw its own comparisons. For example, DataPlace, an online resource sponsored by the Fannie Mae Foundation, automatically generates state rankings by a host of indicators, such as household income and demographic characteristics.<sup>47</sup> Eventually, with political buy-in, agencies should move to directly compare the performance of states against each other, placing emphasis on evaluating peer groups composed of similar states. The ultimate goal is to promote a race to the top and provide useful information to state and local governments on how to improve.

### *Managing by Numbers*

In general, managers at federal agencies do not review performance data in real-time. Even after agencies issue their annual GPRA performance reports, decisionmakers seldom take notice or make use of the data. Data on problems and performance need to be linked to management and consulted on an ongoing basis. Examples of how this works abound in the business context, but local governments are also providing a growing number of success stories.

Shortly after being sworn in as mayor of Baltimore in 1999, Martin O'Malley implemented a data-intensive performance-evaluation system called CitiStat that provides a model of how to incorporate policy metrics into everyday management.<sup>48</sup> CitiStat requires city departments to gather data con-



## 2006 Environmental Performance Index Rankings

Rank	Country	EPI Score	Policy Categories*	Rank	Country	EPI Score	Policy Categories*	Rank	Country	EPI Score	Policy Categories*
1	New Zealand	88.0		47	Unit. Arab Em.	73.2		93	Kenya	56.4	
2	Sweden	87.8		48	Suriname	72.9		94	China	56.2	
3	Finland	87.0		49	Turkey	72.8		95	Azerbaijan	55.7	
4	Czech Rep.	86.0		50	Bulgaria	72.0		96	Papua N. G.	55.5	
5	Unit. Kingdom	85.6		51	Ukraine	71.2		97	Syria	55.3	
6	Austria	85.2		52	Honduras	70.8		98	Zambia	54.4	
7	Denmark	84.2		53	Iran	70.0		99	Viet Nam	54.3	
8	Canada	84.0		54	Dom. Rep.	69.5		100	Cameroon	54.1	
9	Malaysia	83.3		55	Philippines	69.4		101	Swaziland	53.9	
10	Ireland	83.3		56	Nicaragua	69.2		102	Laos	52.9	
11	Portugal	82.9		57	Albania	68.9		103	Togo	52.8	
12	France	82.5		58	Guatemala	68.9		104	Turkmenistan	52.3	
13	Iceland	82.1		59	Saudi Arabia	68.3		105	Uzbekistan	52.3	
14	Japan	81.9		60	Oman	67.9		106	Gambia	52.3	
15	Costa Rica	81.6		61	Thailand	66.8		107	Senegal	52.1	
16	Switzerland	81.4		62	Paraguay	66.4		108	Burundi	51.6	
17	Colombia	80.4		63	Algeria	66.2		109	Liberia	51.0	
18	Norway	80.2		64	Jordan	66.0		110	Cambodia	49.7	
19	Greece	80.2		65	Peru	65.4		111	Sierra Leone	49.5	
20	Australia	80.1		66	Mexico	64.8		112	Congo	49.4	
21	Italy	79.8		67	Sri Lanka	64.6		113	Guinea	49.2	
22	Germany	79.4		68	Morocco	64.1		114	Haiti	48.9	
23	Spain	79.2		69	Armenia	63.8		115	Mongolia	48.8	
24	Taiwan	79.1		70	Kazakhstan	63.5		116	Madagascar	48.5	
25	Slovakia	79.1		71	Bolivia	63.4		117	Tajikistan	48.2	
26	Chile	78.9		72	Ghana	63.1		118	India	47.7	
27	Netherlands	78.7		73	El Salvador	63.0		119	D. R. Congo	46.3	
28	United States	78.5		74	Zimbabwe	63.0		120	Guin.-Bissau	46.1	
29	Cyprus	78.4		75	Moldova	62.9		121	Mozambique	45.7	
30	Argentina	77.7		76	South Africa	62.0		122	Yemen	45.2	
31	Slovenia	77.5		77	Georgia	61.4		123	Nigeria	44.5	
32	Russia	77.5		78	Uganda	60.8		124	Sudan	44.0	
33	Hungary	77.0		79	Indonesia	60.7		125	Bangladesh	43.5	
34	Brazil	77.0		80	Kyrgyzstan	60.5		126	Burkina Faso	43.2	
35	Trin. & Tob.	76.9		81	Nepal	60.2		127	Pakistan	41.1	
36	Lebanon	76.7		82	Tunisia	60.0		128	Angola	39.3	
37	Panama	76.5		83	Tanzania	59.0		129	Ethiopia	36.7	
38	Poland	76.2		84	Benin	58.4		130	Mali	33.9	
39	Belgium	75.9		85	Egypt	57.9		131	Mauritania	32.0	
40	Ecuador	75.5		86	Côte d'Ivoire	57.5		132	Chad	30.5	
41	Cuba	75.3		87	Ken. Afr. Rep.	57.3		133	Niger	25.7	
42	South Korea	75.2		88	Myanmar	57.0					
43	Jamaica	74.7		89	Rwanda	57.0					
44	Venezuela	74.1		90	Romania	56.9					
45	Israel	73.7		91	Malawi	56.5					
46	Gabon	73.2		92	Namibia	56.5					

\* This column contains sparklines for each of the 6 EPI policy categories showing the relative strengths & weaknesses for each country.





tinuously on a variety of indicators, such as overtime pay and absenteeism, crime, trash collection, energy efficiency, and response time to public complaints, such as how long it takes the city to repair a pothole once it's notified. Department heads report to City Hall every other week to present updated performance data and answer questions from officials in the mayor's office—including the first deputy mayor and sometimes even the mayor—allowing city leadership to quickly spot problems and push for immediate improvements.

This approach has since been replicated in at least 10 other cities.<sup>49</sup> As Maryland's new governor, O'Malley is also beginning to apply the CitiStat approach to state

government. Presently, Washington is the only other state to have replicated CitiStat. Washington, however, employs thematic (as opposed to departmental) review sessions organized around specific state goals. Such thematic review might be a useful approach for the federal government, which frequently has difficulty coordinating activity across agencies and departments.

The CitiStat experience again demonstrates the importance of commitment at the top. City departments know the mayor is paying attention, so they give performance data priority. If political leaders do not commit to data-driven decisionmaking, there can be little expectation that government employees will. This problem can be solved by creating



*Under Baltimore's CitiStat system, department heads report to City Hall every other week to present updated performance data and answer questions from officials in the mayor's office. A CitiStat session is shown above. Then Mayor Martin O'Malley, sworn in as governor of Maryland in January, is at the podium.*



management systems—like the one used by Baltimore—that require agency political appointees and high-level managers to regularly consult data to guide decisionmaking.

### *Training*

In the corporate world, training is seen as an integral part of the data-centered Six Sigma system to improve business results. When implementing the system at General Electric, Jack Welch directed all professional-level employees to receive training and linked the bonuses of senior managers to Six Sigma progress. This quickly elevated measurement and statistical analysis as a central part of the company's decisionmaking. In 1998, GE spent nearly \$500 million on implementation, much going toward training, but reaped about \$1.3 billion in savings from improved performance.<sup>50</sup>

Government, by contrast, has invested very little in training. Indeed, the largest barrier to data-driven decisionmaking in education is the lack of training for district administrators, school leaders and teachers, according to a survey of educators by the Consortium for School Networking.<sup>51</sup> Investments are needed in training to turn data into action.

## WHY DATA-DRIVEN DECISIONMAKING WORKS

Data-driven decisionmaking brings insights and rationality to bear in the policy process. It provides a way to systematically check assumptions, spotlight problems, clarify choices, prioritize resources, target interventions, and identify successful policy solutions. This approach offers the promise of more effective and efficient government. It also provides new mechanisms for holding public officials accountable for policy results, and a way to challenge entrenched interests invested in maintaining the status quo.

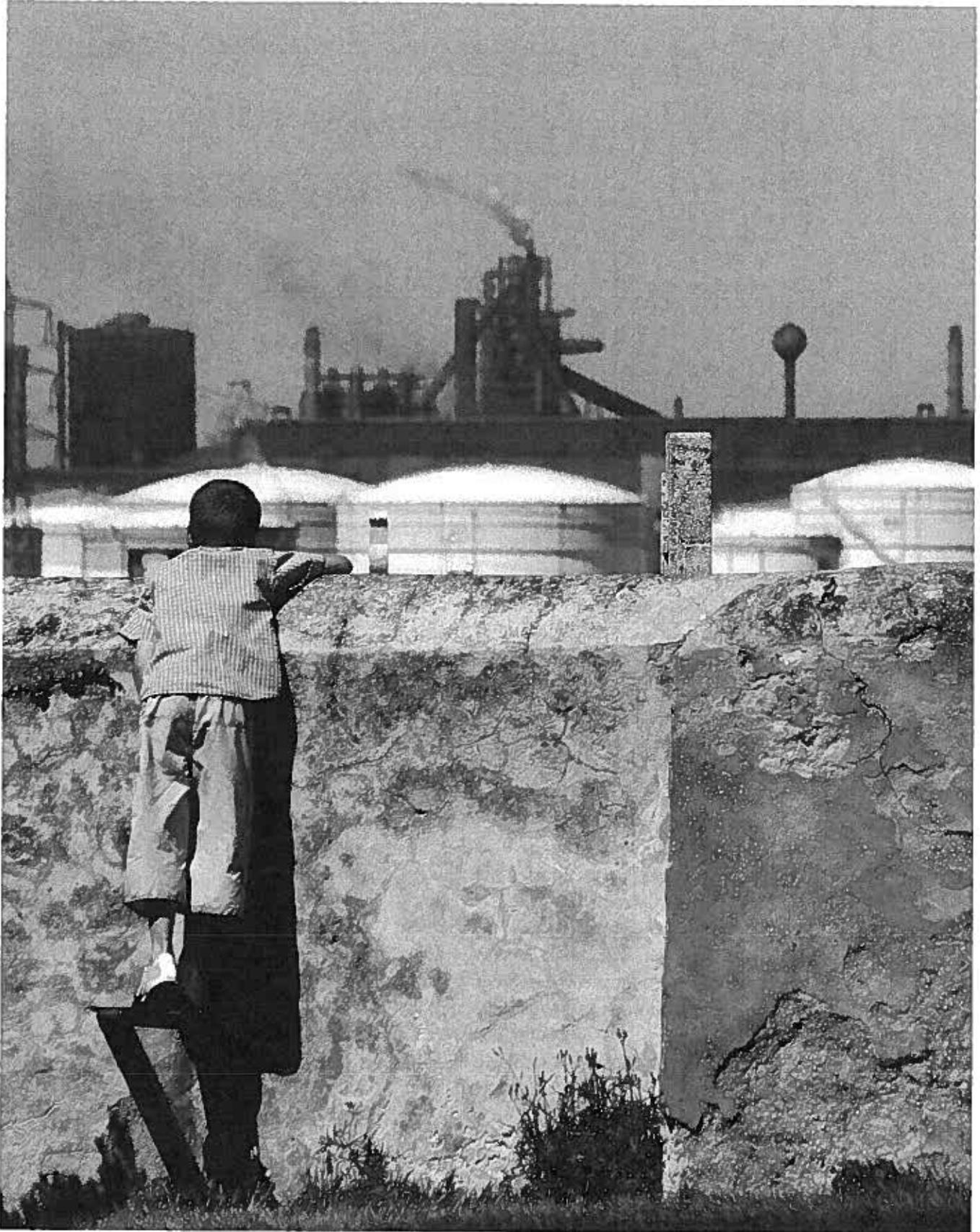
### *'Cool' Analysis*

Data and the ability to look at problems in a systematic fashion provide a check on errors of intuition. A considerable body of research has recently demonstrated how emotion, issue "framing," cascade effects, and other biases shape political and policy understanding.<sup>52</sup> Quantitative measures of both problems and potential interventions provide a mechanism for "cool analysis" that can help to overcome these decisionmaking distortions. Alternative approaches, such as reliance on intuition, past experience, or expertise, have all been demonstrated to have serious drawbacks. Rational analysis and systematic consideration of policy options provide an important path toward better governance and social-welfare maximizing outcomes.

### *Problem Spotlighting*

Data are particularly valuable as a way to get at hidden issues and to reduce uncertainty. From the greenhouse gas emissions causing climate change to particulates that have been identified as the source of increased incidence of childhood asthma, many of today's most vexing environmental problems cannot be seen. Likewise, without good data it is difficult to tease out the multiple elements that turn failing schools into successful ones, or identify the factors that cause some hospitals to outperform others. Data collection and analysis help make the invisible visible, the intangible tangible, and the complex manageable.

Modern information technologies also allow us to disentangle issues of causation that may be linked in a particular problem arena. For instance, new techniques permit the tracing of the "fate and transport" of pollution in much greater detail than ever before. This information on the flow of pollution through the air or water allows the policymaker to understand on a much more fine-grained basis the sources of contami-



*More refined data would provide a clearer understanding of the impact of industrial pollution on children's health.*



# Data disseminated through the Internet empower a broad array of actors to uncover problems, develop innovative solutions, and demand results.

nation within a particular air shed or water system. The soup of emissions that engulfs Houston, for example, can now be disaggregated by ingredient and source.

Statistical analysis can further reveal how multiple factors interact. For example, exposure to radon (a carcinogenic colorless and odorless gas found in many basements across America) presents a much greater risk of lung cancer for those who are smokers.<sup>53</sup> Understanding this aggravating factor is essential to an appropriate policy response. Similarly, careful data analysis can help to identify synergies or mitigating factors that can sharpen policy outcomes. Educational programs or interventions, for instance, improve student learning much more if they are undertaken in concert with a commitment to engage parents than if advanced alone.<sup>54</sup>

## *Democratic Engagement & Accountability*

Baseball's move toward data-driven decisionmaking was initiated not by teams but

by fans who used their personal computers to crunch statistics and generate a deeper understanding of the game. Oakland A's General Manager Billy Beane latched on to and applied these fans' ideas. Likewise, the public can be a huge asset for policymaking, enabling more data to be scanned and a wide range of ideas and theories tested—spotlighting problems and driving change.

Data disseminated through the Internet empower a broad array of actors—including the press, nongovernmental organizations, concerned citizens, and the private sector—to uncover problems, develop innovative solutions, and demand results. The press might search data on government contractors to expose corruption or influence peddling. Community organizations and parents might use testing data to push for better schools. And companies might use census and economic data to find underserved markets, or pollution data to compare their performance against other companies and move to best practices.



Since the EPA began disseminating data through the Toxics Release Inventory more than 15 years ago, for example, industrial toxic releases have declined nearly 50 percent, in large measure because of media exposure of the problem, public pressure to find solutions, and industry collective learning. Industrial facilities have become more accountable for their pollution and government has become more accountable for mitigating harm.

### *Political Leverage*

Entrenched special interests too often dominate government decisionmaking and block desirable public policies. A favored strategy is to downplay a problem or even to deny it exists. The tobacco industry, for instance, long disputed the dangers of smoking even as the evidence piled up.

If political action gets stalled by politicization of the facts, debate never moves on to possible solutions. The presence of robust data and analysis may not deter special interests from challenging the facts or fighting progress, but it will make their job more difficult. By clarifying problems and measuring policy performance, we narrow the zone in which political judgment plays out and enhance our chances of achieving consensus.

### *Public-Minded Government*

Because data can shine a spotlight on “outliers,” it becomes easier to identify corruption, self-dealing, manipulation by special interests, incompetence, and cheating. For example, careful data analysis allowed the Chicago public school system to spot teachers who were pumping up the standardized test scores of their students.<sup>55</sup>

Good governance also depends on decisionmakers who are public-minded and

“neutral” rather than predisposed to certain policy courses. The prospect that decisionmaking will be “captured” by special interests has been a key concern of both the left and the right, from those who have fought to reform government to those who have fought to reduce the role of government. Data-driven decisionmaking provides the opportunity to build confidence in government decisionmaking through greater transparency, accountability and neutrality.

### *Results-Driven Government*

Outcome-focused goals—especially those that are specific, challenging and measurable—hold enormous power to improve government performance, as research has repeatedly demonstrated, by providing direction and motivation, and by promoting innovation.

Federal agencies, as well as state and local governments, face a myriad of choices about how to direct attention and resources. Goals guide these choices by clarifying objectives and indicating relative priorities. If goals are unclear, government personnel are likely to suffer from uncertainty and confusion, sapping energy and organizational drive. Goals communicate expectations to staff, instill a sense of purpose, and provide targets to shoot for (for those both in and outside of the organization).

This focus on outcomes, in turn, promotes creativity and new ideas. As noted earlier, many federal agencies place emphasis on outputs—that is, the performing of specific tasks—which may have little to do with real-world results. Challenging outcome-focused goals, on the other hand, stimulate problem-solving and encourage experimentation to find the most effective approaches.



# Fine-grained data allow diversity and development instead of one-size-fits-all

## *Sensible Priorities*

Data can suggest priorities by facilitating comparisons of problems. Government may identify an array of problems that should be addressed, but because of resource constraints, it is frequently forced to pick and choose. Data can help decisionmakers identify our biggest problems and determine the most efficient allocation of resources.

In particular, data enable us to zero in on the problems that affect the largest number of people; carry the most severe consequences; are trending in the wrong direction; disproportionately harm particular groups of people (e.g., children, the elderly or racial minorities) or geographic areas; and are easiest and cheapest to solve.

While data sharpens priority-setting, it is also important to recognize that values and human judgment are essential. Values, for example, mediate questions over government's role (should government address the problem?), who deserves protection or service, the necessary level of protection or service, who pays, and the acceptable level of costs. Data provide a way to translate our values into action.

In addition, data alone cannot rank problems in terms of policy priorities. One problem may affect a large group of people, while another may affect a small number but with more severe consequences. Or one

problem may be smaller than another, but it may be easier and cheaper to fix. Only human judgment, informed by values, data and analysis, can determine where priority attention should be devoted. Data enhance human judgment but cannot replace it.

## *Targeted Responses*

A number of causes or sources may contribute to a problem. Statistical analysis can uncover their relative importance, so that decisionmakers are able to efficiently concentrate efforts and resources on the most significant causal factors. In addition, a problem may have disparate impacts, which analysis can also delineate. One set of people may disproportionately bear the consequences, for example, while others may be largely unaffected. This sort of information allows decisionmakers to calibrate responses according to severity, so that greater attention and assistance are given to people, groups or geographic areas most at risk.

Some discretionary funds are already distributed on the basis of data. For example, unemployment statistics are used to determine funding allocations for dislocated workers and public works projects, as well as waivers of time limits for food stamps and funds under Temporary Assistance for Needy Families, or TANF. Other programs, such as Head Start and



# Decisionmakers to manage individualized responses fits-all approaches.

Medicare prescription drug coverage, rely on federal poverty guidelines, derived from Census data.<sup>57</sup>

We can, however, do much more to target limited public resources based on data for other areas of policy concern. For example, clean air resources—funds and government personnel—can be focused on pollution control in communities and geographic regions that suffer the most from unhealthy air.

## *Flexible & Tailored Solutions*

Where federal decisionmakers are unable to reliably track performance and assess multiple strategies, they may be forced to mandate specific approaches. With robust data on outcomes, on the other hand, decisionmakers can make performance the primary requirement, leaving those responsible for implementation—state and local governments, industrial facilities, or schools, for instance—free to employ different approaches so long as program objectives are achieved.

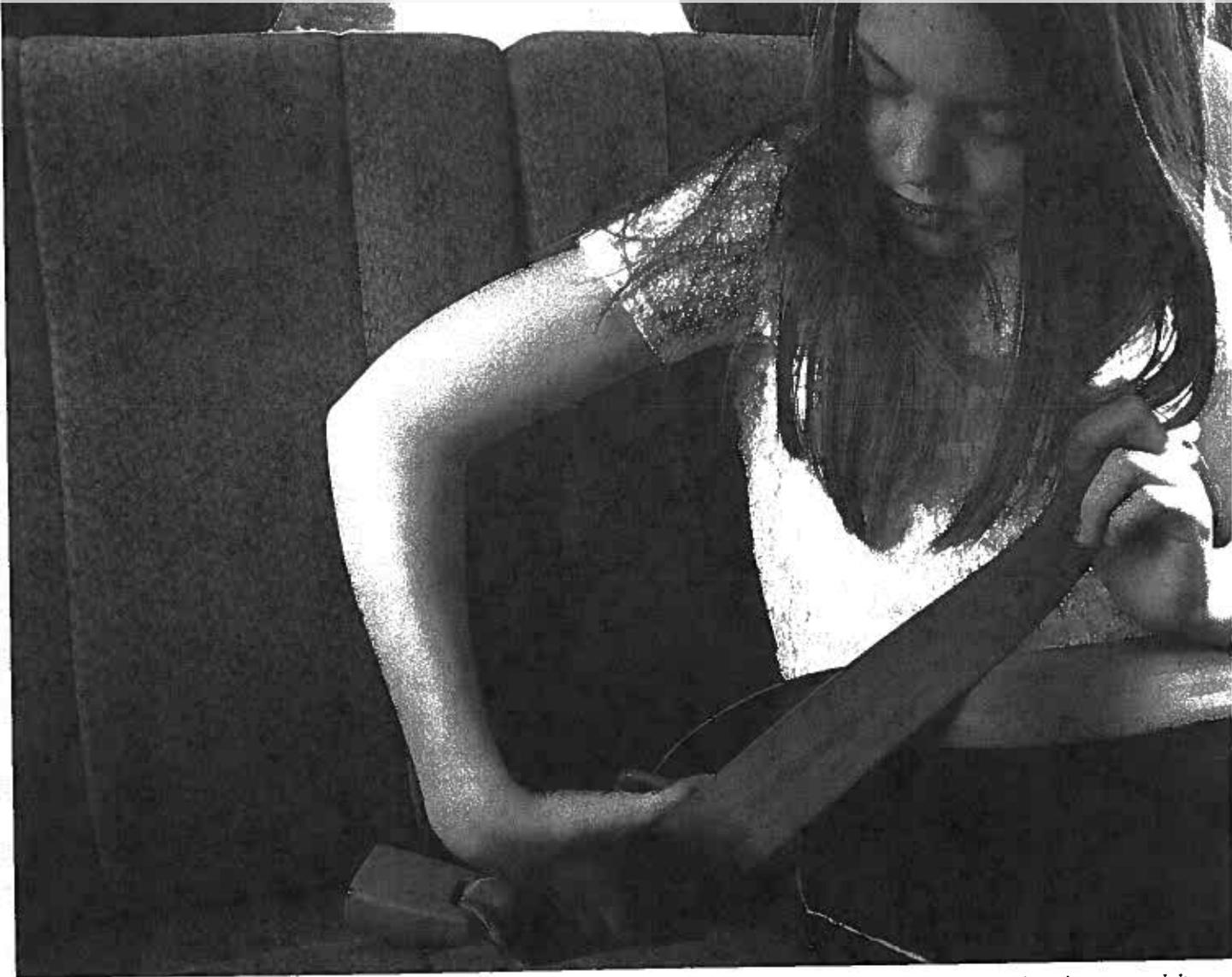
Under the 1990 reauthorization of the Clean Air Act, for example, Congress was able to establish a flexible market-based system to reduce power-plant emissions of sulfur dioxide (SO<sub>2</sub>)—one of the primary causes of acid rain—because of new smokestack and communications links that enabled real-time pollution

monitoring. This system allocates each utility individualized annual emissions “allowances” based on previous fuel consumption. Utilities are then able to decide the most cost-effective ways to achieve emissions reductions.

A utility that achieves emissions reductions may sell its unused allowances (each allowance is worth 1 ton of SO<sub>2</sub>) to another utility that may wish to exceed its allotted allowances, thereby creating a market incentive for pollution reduction and innovation. This approach has produced SO<sub>2</sub> reductions of more than 40 percent at costs billions of dollars less than originally projected.

In addition, fine-grained analysis facilitates tailored policy interventions to fit individual needs or circumstances. The shape of a problem, and the response required, may shift according to a host of variables, including differences in geography, local infrastructure, demographic makeup and even individual people. Data allow decisionmakers to account for these differences.

Clean-air rules, for example, can be customized to a city’s unique geography and demographic circumstances. Landfill regulations can be tailored to the amount of rainfall in an area. And the nature and intensity of educational interventions can be set with an eye on a school’s demographics and student starting points.



*The National Highway Traffic Safety Administration has promoted collective learning among states as one of its primary strategies to increase seat-belt usage.*

Indeed, a data-driven approach allows educators to devise customized teaching strategies for individual students. As part of its ongoing educational reform, the United Kingdom intends to personalize learning by drawing on information technology to provide teachers with a picture of each student's needs, strengths and interests.<sup>58</sup> This knowledge can then be applied at an early age, so that students are taught in ways that work best for them. Fine-grained data allow us to manage diversity and respond to individualized needs rather than forcing conformity to a single approach or standard.

### *Collective Learning & Constructive Competition*

Comparative analysis that measures the relative performance of peers—including states, localities, government agencies and private-sector actors—promotes collective learning by spotlighting the most effective strategies that should be expanded, as well as ineffective strategies that should be avoided. Without any government “command and control,” such benchmarking can produce a race to the top that drives up average performance.

The National Highway Traffic Safety Administration, for example, has promoted collective



learning among states as one of its primary strategies to increase seat-belt usage. In one case, North Carolina implemented a program, called “Click It or Ticket,” that achieved significant gains by stepping up enforcement of seat-belt laws, with particular attention aimed at teens and young adults. Armed with evidence of the program’s success, NHTSA then urged and worked with other states to replicate “Click It or Ticket.” The 10 states that undertook the most comprehensive efforts saw seat-belt usage increase by an average of 8.6 percent.<sup>59</sup>

Performance rankings can provide a particularly strong incentive to move toward top-performing solutions. No state, city or government agency wants to be identified

as a laggard, and all desire recognition for outperforming peers. Such constructive competition can be seen in the response to the United Health Foundation’s annual state rankings on public health,<sup>60</sup> which are released in coordination with state health officers. For example, both Louisiana, 49th in the 2005 rankings, and Wisconsin, ranked 13th, have initiated recent reforms based on the data, while Oklahoma and Nebraska are using the rankings for program assessment.

Comparative analysis also encourages innovation and experimentation, as those at the top strive to do even better. Careful performance assessment can test new approaches and isolate key variables, speeding up feedback loops.

Doctors, for instance, have adopted new treatments for cystic fibrosis through a combination of experimentation and comparative review. For 40 years, the Cystic Fibrosis Foundation has been collecting data on the performance of the country’s cystic-fibrosis treatment centers. This data has allowed hospitals to identify critical treatment options and to expand the best-performing treatment methods, producing dramatic gains.<sup>61</sup> In the 1950s, the average person with cystic fibrosis lived to age 3; now most live into their thirties, and many live into their forties.

### *Responsive Government*

For most areas of public concern, including auto safety, food safety, health care, the environment, and worker health and safety, there is a significant lag time—sometimes several years—before data is assembled and reviewed. By contrast, Baltimore’s CitiStat program, described above, places emphasis on real-time data collection and immediate review. This commitment to govern by the numbers has produced significant gains in responding to constituent needs and managing city funds.

Under CitiStat, the mayor’s office tracks the city’s response time to citizen complaints and pushes city departments to be ever quicker; the city now guarantees a pothole will be repaired within 48 hours after the city is notified. At the same time, the frequency of reporting—performance data is reviewed every two weeks for most city departments—allows the mayor’s office to catch and fix budgetary problems before they become unmanageable.

Baltimore’s limited tax base, which includes a high percentage of low-income residents, means the city must operate with maximum efficiency or face budgetary shortfalls. If performance data were consulted only on an annual basis—as is the case under the federal Government Performance and Results Act—the city



likely would be in perpetual budgetary crisis, as it was before CitiStat was implemented. Instead, by continuously consulting the numbers, the city has achieved significant savings—including savings of more than \$20 million in overtime pay since CitiStat's inception in 1999—and stayed out of the red.

This sort of data-driven approach enhances government's ability to adjust quickly and intervene to prevent public harm. As it stands, however, federal agencies frequently respond only after significant damage is done. For example, we are unlikely to know about drinking water contamination until after a community is exposed. The Government Accountability Office consulted over 40 nationally recognized experts about the possibility of terrorist contamination of drinking water, and issued a report in October 2003 noting that "experts most strongly supported developing near real-time monitoring technologies to quickly detect contaminants in treated drinking water on its way to consumers."<sup>62</sup> It is up to the president and Congress to provide the leadership to implement these technologies, which are now readily available.

## RISKS & DOWNSIDES

While a shift towards data-driven decision-making provides great promise, there are also risks that must be taken into account and addressed in moving forward with this approach. Among the greatest concerns are data gaps that impede progress, misleading data and mistaken policy conclusions, warped incentives and distorted behavior, and the misuse of data for improper purposes such as racial profiling.

### *Data Gaps*

In many areas, data-driven decisionmaking is impeded by an absence of good data. Where uncertainties are substantial, an emphasis on data as the foundation for

# Barriers to collecting Paperwork must be addressed implemented decisions

policymaking can become an obstacle to action. Ideally, policymakers should proceed based on the best information available. But in a political context, members of Congress or the executive branch have an incentive to play up uncertainties if they do not want to act. For years, this strategy has been employed to block action on global warming.

In some cases, appropriators have eliminated investments in data because they wanted to maintain uncertainty—and the status quo. For example, following the Gingrich revolution in 1994, Congress defunded the National Biological Survey—which was established to develop a baseline understanding of the country's plant and animal resources—largely out of fear that the results would be used to push for more environmental protection. An emphasis on data-driven policymaking might provide the politically motivated with additional incentives to block information gathering as a way to prevent substantive policy action or obscure public accountability.



# Information like the Reduction Act, identified and needed to fully implement data-driven decisionmaking.

Legal barriers are also sometimes erected to block information collection. Perhaps the most significant of these barriers is the Paperwork Reduction Act. Under the PRA, agencies are supposed to perpetually reduce the number of “burden hours” associated with information collections. The goal of burden reduction is one we should pursue. However, it should be done primarily by eliminating unneeded or redundant information collections and implementing new technologies, such as electronic reporting tools and remote monitoring devices, which reduce reporting burden or eliminate it altogether. It should not be done in a way that undermines our knowledge of critical problems facing the nation.

Unfortunately, the PRA has too often been a barrier to enhanced understanding. In September 2006, for example, EPA dramatically scale back data collection of toxic releases, citing the need to reduce paperwork.<sup>63</sup> Under this action, chemical facilities no longer need to fully document releases

of small quantities of persistent bio-accumulative toxins, which build up over time and are dangerous even at low levels, or other toxic chemical releases up to 2,000 pounds. Barriers to information collection, like the PRA, must be identified and addressed to fully implement data-driven decisionmaking.

## *Misleading Data*

Data that are not of high quality can result in errors or mistaken judgments. The federal government aggregates data from an array of sources, including state and local governments, the private sector, and service providers. Frequently, there are variations in the way these data are collected. For example, there is a wide disparity in the quality of data reported by states on foodborne illness. A state may appear to have a relatively high rate of foodborne illness when in fact it simply does a superior job of documentation. Comparative analysis may produce misleading conclusions about who is a top-performer and who is a laggard if data quality is not roughly uniform.

Comparative analysis can also suffer from oversimplified analysis. For example, when the World Health Organization produced a crude index of national health-care performance that failed to control for numerous critical variables, the results were so manifestly ridiculous that the WHO’s reputation for analytic rigor was badly damaged.

Another common problem is data manipulation. Those reporting information frequently have an interest in seeing favorable results. In the environmental context, for instance, government relies heavily on industry-generated data. Companies know the data they report could be used to initiate regulation or possibly to impose sanctions. This can create a temptation to fudge the numbers. If data are manipulated to generate a favorable picture,



we might miss or underestimate a problem and set misguided priorities.

Straightforward errors are also a common problem. In 2003, hundreds of schools in Illinois were incorrectly labeled as failing because of reporting errors.<sup>64</sup> In Nevada, the board of education fined a testing contractor in 2002 for a mistake that skewed the high school exit-exam scores of 31,000 students.<sup>65</sup> Without adequate data quality controls, data-driven decisionmaking can produce wrong conclusions and unfair results.

### *Warped Incentives*

High-profile performance evaluation based on quantitative data can warp incentives. This problem plagued the Environmental Protection Agency when it graded the enforcement performance of its 10 regional offices by tracking the total number of cases brought each quarter. Instead of emphasizing big issues and launching significant enforcement actions, regional enforcement

officials turned their attention to noncompliance with asbestos removal policies.

The asbestos cases took about two hours to develop, while building the foundation for an enforcement action against a metropolitan air shed for noncompliance under the Clean Air Act might take 2,000 hours to establish. The crudeness of the “bean counting” at headquarters—where each case got scored the same—resulted in an emphasis on less important policy matters rather than the harder but more significant cases.

Likewise, if done badly, scorecards comparing peer groups can misdirect attention and incentives. Instead of sparking constructive competition, as intended, they can create a disincentive to address harder-to-serve populations. This is what happened with the federal government’s hospital “death list.” In developing hospital death rates, government analysts did not control for how sick a hospital’s patients were. As a consequence, some doctors have report-

Without adequate data quality controls, data-driven decisionmaking can produce wrong conclusions and unfair results.



edly begun to turn away needy (and risky) patients to enhance their closely watched personal fatality ratings.<sup>66</sup>

### *Misuse of Data*

Perhaps the greatest risk is the possibility that data generated for decisionmaking will be misused. Where policymakers extrapolate from limited data or make judgments in the face of uncertainty that are not well grounded, wrong answers may emerge. The end result can be an emphasis on second-tier priorities or even actions that drive results in the wrong direction.

In the run-up to the 2000 presidential election, for example, the state of Florida chose to rely on information supplied by the giant data broker ChoicePoint to identify convicted felons who were illegally registered to vote—despite the company’s warning about likely errors in the data. After the election it was learned that hundreds of legal voters were expunged from the rolls because of inaccurate information. The U.S. Commission on Civil Rights concluded that as many as one in seven of those excluded were actually legal voters.<sup>67</sup> The state could have used the ChoicePoint data as a starting point to identify illegal voters, but instead misused the data to make final decisions about who could vote.

There exists, moreover, a risk that absent careful controls data could be used to support age discrimination, racial profiling, or other inappropriate approaches to policymaking. More data in the health-care arena might, for example, lead insurance companies to raise rates based on genetic traits that run along racial lines. Or general trends might be used to override individual evaluation. Just because the accident rate of drivers over 80 is higher than for younger drivers does not mean all octogenarians are bad drivers.

### *Intrusions on Privacy*

In many areas, data-driven government presents little or no danger to personal privacy. Environmental data, for example, are typically concerned with air, water and the land, not individual people. Other areas, however, do depend on information on individuals, including law enforcement, education, and health care. Handled properly, this information should not infringe on privacy. Health-care data, for example, can be stripped of personally identifiable information—data linked to specific people—while still allowing decisionmakers to learn about the results of individual cases.

Nonetheless, the ability to aggregate, manipulate and transfer large amounts of data can result in unwarranted intrusions on personal privacy if proper protections are not put in place. The Privacy Act (the central law protecting personal information in the hands of the U.S. government) has been essentially unchanged since 1974. Key definitions in the act no longer correspond to the reality of computerized information exchange, collection and use, which has given rise to loopholes that subvert the intent of the law.

This concern has grown especially acute in the area of homeland security. Law enforcement agencies have come to rely on commercial data brokers, such as ChoicePoint, LexisNexis, and Acxiom, to supply personal information on American citizens.<sup>68</sup> Personal information provided by these data brokers can then be combed for investigative purposes—even if there is no evidence of actual wrongdoing or intent to cause harm—with virtually no consideration of privacy (due to a Privacy Act loophole<sup>69</sup>). In 2003, privacy concerns prompted Congress to pull the plug on the Bush administration’s infamous Total Information Awareness data-mining initia-



tive for domestic surveillance, but other similar initiatives are ongoing.

Health care also lacks adequate privacy protections. At the urging of the health-care industry, the Bush administration weakened medical privacy protections issued at the end of the Clinton administration.<sup>70</sup> As a result, personal records can be shared without patient consent between doctors, pharmacies, pharmaceutical companies, employers, insurance companies, and the government. This information is frequently shared for purposes other than health care, such as drug marketing.

For data-driven decisionmaking to earn public confidence, privacy must be protected. This means providing citizens with control over their personal information—including the ability to correct inaccurate information—and ensuring fairness in how personal data are collected, shared and used to make decisions. Congress should start by amending the Privacy Act to fit the digital age and examining specific areas where privacy concerns are especially acute, such as health care, to see if additional protections are needed.

## CONCLUSION

While information-age breakthroughs have transformed decisionmaking in areas such as business and sports, the federal government is just starting to harness these new technologies. The E-Government Act of 2002 created the Office of E-Government within OMB to promote information technology and identify resource needs government-wide. But its efforts generally have focused on making more efficient use of technology and facilitating citizen interactions with government, such as online tax filing and electronic submission of rulemaking comments.

These are important goals, to be sure, but we still lack a broader vision to deploy information technologies for more effective policymaking. Consequently, our approach to government has been slow to change, even as technology has raced ahead. The first step toward data-driven decisionmaking then is to recognize the tremendous opportunity that now exists to rethink and reshape our approach to governing.

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Revolutionary advances in information technologies provide the ability to quickly and cheaply collect, aggregate, analyze and disseminate enormous volumes of data. These technologies, if fully utilized and applied to serve policymaking objectives, can bring problems and policy solutions into focus as never before. With a clearer and more fine-grained understanding of issues, underlying causes, and policy options, decisionmaking can become more targeted, tailored, responsive, and innovative—maximizing limited public resources and dramatically improving government effectiveness.

As we move to deploy new technologies, there needs to be accompanying changes in the policymaking process, so that decisionmakers are positioned to capitalize on the information generated. Too often, the various components of data-driven decisionmaking—data gathering, analysis, dissemination, performance measurement, priority setting, and policy development—are pursued almost as separate enterprises, with little thought given to how they

connect to and support each other. These elements must be brought together into a coherent whole to fulfill the vision of data-driven decisionmaking and achieve the full set of synergies available.

More than anything else, a move toward data-driven decisionmaking will require leadership. Getting the dozens of different departments and agencies that make up the federal government to embrace data-driven decisionmaking and harmonize efforts where responsibilities overlap will require significant planning, coordination, oversight and, perhaps most crucially, investment so core agency functions are enhanced and not disrupted.

As we break down these barriers, however, we will begin to reap the benefits of a government that is more effective, efficient, open, accountable, and guided by evidence, not ideology or special-interest influence. The opportunity is in front of us. What we need now are political leaders with the vision to seize it.

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