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From Compstat to Gov 2.0 Big Data in New York City Management

In the 1980s and early 1990s, New York City was a dangerous place to live. The city's homicide rate peaked at more than 2,200 in 1990; meanwhile the risk of robbery and muggings was a daily reality for the city's roughly 7 million residents. *Time* magazine's September 17, 1990 cover story proclaimed "the rotting of the Big Apple," citing a "surge of brutal killings" that had left New Yorkers feeling unsafe and uncertain whether to remain in the city.[1] The *New York Times* declared in December that the city's streets resembled "a New Calcutta, bristling with beggars and sad schizophrenics tuned to inner voices."[2]

In 1994, William J. Bratton took over as commissioner of the New York City Police Department (NYPD) with an ambitious goal: bring the crime rate down, fast. Key to his efforts was a management tool known as Compstat ("computerized comparison crime statistics"), which allowed Bratton to reorient the department toward proactive crime prevention by analyzing crime data and directing more resources to higher----crime areas. Using up----to----date data to guide decision---making was a radical departure for the department, and it paid off. By the end of the decade, New York City's crime rate had dropped by half.[3]

The Police Department's success using data analysis to improve service delivery drew the notice of other city departments—in particular, the New York City Fire Department (FDNY). After a 2007 fire that killed two firefighters, due in part to inadequate safety inspections, FDNY's leadership decided it needed a better way to prioritize building inspections. In 2013, the department instituted a computerized inspection system based on sophisticated and up----to----date measures of a building's fire risk and, like the Police Department, began directing scarce resources to the highest----risk areas.

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[1] Joelle Attinger, "The Decline of New York," *Time*, September 17, 1990.

[2] "To Restore New York City, First Reclaim the Streets," *New York Times*, December 30, 1990. See: http://www.nytimes.com/1990/12/30/opinion/to-restore-new-york-city-first-reclaim-the-streets.html

[3] Dennis C. Smith and William J. Bratton, "Performance Management in New York City: Compstat and the Revolution in Police Management," in Dall Forsyth (ed.), *Quicker, Better, Cheaper? Managing Performance in American Government*, New York: Rockefeller Institute Press, October 2001. p. 455. Note that this decline started under the Dinkins administration.

This case study was written by Kathleen Gilsinan and Adam Stepan for the Case Consortium @ Columbia and the Picker Center for Executive Education, SIPA. Research assistance was provided by Nora Shannon Johnson. The faculty sponsors were Professor of Professional Practice in International and Public Affairs William B. Eimicke of Columbia University and Associate Professor of Public Policy Dennis Smith of New York University. Funding for the audiovisual piece came from the Lemann Foundation. (05/2014)

Meanwhile, Michael Bloomberg took office as New York City's mayor in 2002. A financial data services mogul, he championed efficiency through data----driven decisionmaking. Data became a City Hall watchword. The mayor oversaw the implementation in 2003 of a 311 non----emergency hotline to streamline the delivery of city services through a single point of contact. In 2013, he created a new Mayor's Office of Data Analytics (MODA)—a team of number----crunchers tasked with uncovering correlations and locating problems.

As Bloomberg's three----term tenure drew to a close in late 2013, more city agencies had moved to data----driven decisionmaking. Still, information was often stovepiped in individual departments. While city agencies were collecting more and perhaps better data than ever before, the uncoordinated nature of department----level reforms made it hard to reconcile data sets to solve system----wide problems. MODA had managed this itself on an ad hoc basis by aggregating data to solve a specific problem, like identifying which pharmacies distributed painkillers illegally.

But it was unclear whether Bloomberg's initiative would continue after his term expired. Should data----driven governance be standardized across all city agencies? What about privacy concerns? Was the New York model one to emulate across the country and around the globe? At what cost?

Crime meets Bratton

By the early 1990s, New York City had experienced more than two decades of rising crime. New York City's 1975 fiscal crisis—the city nearly went bankrupt—prompted a brutal series of budget cuts, including 5,000 layoffs in the NYPD.[4] By 1980, the department had lost another nearly 8,000 officers to attrition; taken together, the department had shrunk by about 34 percent, even while the rate of serious crime rose 40 percent.[5] Smaller offenses like vandalism and vagrancy proliferated largely unchecked, contributing to an overall sense of disorder and chaos.

"There was this sense that New York was declining, and that crime was a critical part of that," says Professor Dennis Smith, an expert on public policy and performance management.[6] Rudolph Giuliani won New York's November 1993 mayoral election with promises to crack down on crime.[7] On January 10, 1994, Mayor Giuliani installed William J. Bratton as commissioner of the NYPD.

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[4] Michael D. White, "The New York City Police Department, its Crime-Control Strategies and Organizational Changes, 1970-2009," Published online via John Jay College of Criminal Justice, September 13, 2012. See: http://www.jjay.cuny.edu/white.pdf

[5] Ibid.

[6] Authors' interview with Professor Dennis Smith on February 17, 2014, at Columbia University. All further quotes from Smith, unless otherwise attributed, are from this interview. Smith was an associate professor at the Robert F. Wagner School of Public Service at New York University.

[7] Todd S. Purdum, "Giuliani Ousts Dinkins by a Thin Margin; Whitman is an Upset Winner Over Florio," *New York Times*, November 3, 1993. Available: http://www.nytimes.com/1993/11/03/nyregion/1993-elections-mayor- giuliani-ousts-dinkins-thin-margin-whitman-upset-winner.html. Two thirds of voters who identified crime as a decisive issue voted for Giuliani.

Bratton had overseen a reduction in subway crime as chief of the New York City Transit Police from 1990----92. Embracing the novel "broken windows" theory of policing, which posited a link between general disorder and serious crime, the transit police under Bratton aggressively enforced lower----level infractions such as farebeating. The logic was that by cracking down on minor infractions, NYPD could prevent more serious crimes. In his first six months with the Transit Police, Bratton oversaw a spike in summonses, ejections, and arrests in the subway, and subway crime fell.[8]

New job. In 1994, Bratton took the helm of a much larger and more complex organization than his previous assignment at the Transit Police: some 50,000 police officers responsible for the public safety of 7 million New Yorkers spread throughout 76 precincts. Yet he and his team had some advantages. Former Mayor David Dinkins had expanded NYPD resources with an initiative called Safe Streets, Safe Cities, which authorized the NYPD to hire some 6,000 officers. "Crime had already started going down a little bit" at the end of the Dinkins administration, says Smith. "[The NYPD] already had this pipeline of more officers coming in… And it gave Commissioner Bratton the opportunity to innovate." Police departments across the country had to devote significant resources to meeting standards such as average response time to 911 emergency calls, says Smith, but with money and officers flowing into the department, Bratton had space both to maintain traditional standards and experiment with other policing strategies.

Real----time statistics. Bratton believed that the Police Department was capable not just of responding to crime, but of proactively preventing it. To do so, however, would require detailed knowledge of where crimes were most likely to occur, and a strategic and timely deployment of resources. The NYPD already knew a lot about crime. The department had been an epicenter of what later came to be known as "big data" since at least the 1970s, when it became one of the first US cities to institute a 911 emergency call system. "Almost immediately, there were [millions of] calls a year to the police department," says Smith.[9] The department had long used data from these calls and other sources to create precinct----specific pictures of crime patterns.

But the reports were compiled quarterly, so data was already four months old by the time it reached police commanders. Though detailed, the reports provided "management information history" rather than a basis for decisions, says Smith. With crime patterns that shifted on a weekly or even daily basis, Bratton felt police resources should move correspondingly. Says Smith:

> When you decide you're going to actually try to get on top of crime, you're going to fight crime, you're going to fight it block by block, you need to have information that is more timely, more

[8] John Buntin, "Assertive Policing, Plummeting Crime: The NYPD Takes on Crime in New York City," Harvard Kennedy School of Government, August 1999, p. 3.

[9] In 2012, New York City was estimated to receive some 11 million calls per year. See: "New York City Completes Major 911 System Overhaul," *Government Technology*, January 9, 2012. Available: http://www.govtech.com/public-safety/New-York-City-Completes-Major-911-System-Overhaul.html

> disaggregated, and given attention of a different kind than it had [been] in the past.

But implementing a new decision system was not going to be easy. For example, when the new deputy commissioner for crime control strategies, Jack Maple, wanted the previous day's crime figures, he was told it would take six months to get. Bratton recalls his dismay: "The largest police department in America was going to take six months to tell us what happened yesterday in New York City."[10]

NYPD and Compstat

In response, Maple in early 1993 required each of New York City's 76 precincts to compile crime statistics and map crime locations daily, then fax the information to headquarters. NYPD's technology department told Maple it would take 6----12 months to computerize the process. But Maple and Bratton were in a hurry. "We were losing six people a day being murdered in the city at that time, another 15 or 20 being shot," Bratton says. "Lives were being lost." With money from the Police Foundation, funded by private donors to support the department, Maple and his team bought a Hewlett----Packard 360 computer. "Jack [Maple] and his people quickly wired that up and began the Compstat revolution," says Bratton.

As Maple introduced technological change, Bratton turned to the department's management. He devolved unprecedented authority to the city's 76 precinct commanders—each of whom oversaw about 200----400 police officers serving some 100,000 residents. Bratton gave the commanders flexibility to respond to area crime on an individual basis and as they saw fit.[11]

By April 1994, Maple had put in place a system of computerized, up----to----date crime statistics that provided commanders with a clear picture of day----to----day crime patterns. At the same time, Bratton, Maple, and Chief of Patrol Louis Anemone convened twice----weekly meetings for top commanders to review crime statistics with their precinct colleagues in an effort to determine response patterns. Compstat, Bratton recalls, "allowed for the creation of a system of accountability."

Maps were important from early on; the new data allowed commanders to visualize where crime was occurring and, crucially, whether arrest patterns matched crime patterns. A map projected at the front of the room used dots to indicate crime incidents—and precinct commanders were held accountable for "putting cops on the dots," says Bratton. The meetings were designed so that NYPD leaders could ask, in effect, "'What are you doing about the crime problem that we are identifying?'" Bratton says. "'We now know where [crime] is happening, who's doing it… What are you doing about it?'" In addition to holding commanders accountable, the process also allowed departmental units to share intelligence on successful tactics.

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[10] Stepan's interview with William J. Bratton on March 21, 2014, at One Police Plaza, New York City. All further quotes from Bratton, unless otherwise attributed, are from this interview.

[11] Buntin, "Assertive Policing, Plummeting Crime," p.10.

The process could be adversarial. Bratton recalls one meeting in which a narcotics squad was touting the number of arrests it had made. Using the Compstat maps, however, Maple demonstrated that arrests were not occurring where most of the crime took place. "'Your arrests should be where the problems are,'" Bratton recalls Maple saying.

Compstat changed the way data was collected, how resources were deployed and how commanders were held accountable. As Maple later summarized, its key components were "accurate and timely intelligence combined with effective tactics, rapid deployment, relentless follow----up and assessment, and decentralized accountability."[12] By the end of 1994, index crime in New York City had declined by 12 percent compared to 1993, exceeding Bratton's promise of 10 percent (nationwide, it dropped a scant 1.1 percent).[13] From 1993 to 1999, New York City crime dropped 50 percent.[14]

A similar shift in mentality—from responding to problems to preventing them—would soon take hold at other city agencies. Among them was Parks and Recreation, which in March 1997 held its first Compstat----style meeting. The department dubbed its version ParkStat. Managers were encouraged to describe in detail developments in each district, and to brainstorm collective solutions. ParkStat, wrote expert Dennis Smith, "builds on the earlier development of a systematic parks conditions inspection and rating system that divides the Parks Department facilities into ratable sites that receive pass/fail marks after each inspection."[15]

In addition, the department implemented weekly performance reviews in order to establish a direct connection between headquarters and park managers. By putting statistics and direct communication at the forefront of park management, ParkStat was able to double the number of sites passing inspection.[16] By 2002, ParkStat had expanded to monitor such indicators as crime, vehicle maintenance, personnel, resource allocation and enforcement.

Before long, the Fire Department of New York (FDNY) would also take a close look at Compstat.

FDNY and Risk----Based Assessment

FDNY was considered one of the most successful fire departments in the United States. Transformed in 1865 from a volunteer organization to a career department, it was the first in

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[12] Dennis C. Smith and William J. Bratton, "Performance Management in New York City: Compstat and the Revolution in Police Management," in Dall Forsyth (ed.), *Quicker, Better, Cheaper? Managing Performance in American Government*, New York: Rockefeller Institute Press, October 2001. p. 477.

[13] John Buntin, "Assertive Policing, Plummeting Crime: The NYPD Takes on Crime in New York City," Harvard Kennedy School of Government, August 9, 1999, p. 22

[14] Dennis C. Smith and William J. Bratton, "Performance Management in New York City: Compstat and the Revolution in Police Management," in Dall Forsyth (ed.), *Quicker, Better, Cheaper? Managing Performance in American Government*, New York: Rockefeller Institute Press, October 2001. p. 455. Note that this decline started under the Dinkins administration.

[15] Dennis C. Smith, "What Can Public Managers Learn from Police Reform in New York?: COMPSTAT and the Promise of Performance Management," New York University Robert F. Wagner Graduate School of Public Service. Paper prepared for presentation at the 19th Annual Research Conference of the Association of Public Policy and Management, New York, NY. November 1997. pp. 5-6.

[16] Ibid, p.6.

the nation to create a bureau of fire prevention to inspect buildings and identify risks. But by 2007, the inspection system had broken down.

The September 11, 2001 World Trade Center attacks, in which more than 343 New York firefighters lost their lives, showed that while the department was expert at firefighting, its command and control operations were lacking. "We were not prepared because what happened is [firefighters] ran to the World Trade Center—that's the way that those people are," says William Eimicke, in 2007 appointed FDNY deputy commissioner for strategic planning.

> But what would have happened if there was another event in the Bronx? It took months to figure out who died because we didn't know who was there. Because a lot of people went there without being called—they were off duty, some of them were retired. They took other people's equipment to go. All laudable, but organizationally awful.[17]

FDNY's management deficiencies were further evidenced in an August 2007 fire at the Deutsche Bank building at 130 Liberty Street. It had been vacant since 9/11, and was undergoing demolition when an errant cigarette set it ablaze. Firefighters responded within 3 1/2 minutes; still, it ultimately took 475 firefighters seven hours to put out the fire. Two firefighters died from suffocation. A city investigation later attributed the severity of the fire to the building's lack of a functioning standpipe to help direct water to the blaze and concluded that inadequate inspection and reporting procedures had contributed to the firemen's deaths.

Strategic Plan. Deputy Commissioner Eimicke was put in charge of analyzing the existing inspection system. He learned that a cadre of 350 civilian inspectors was responsible for some 300,000 buildings. FDNY classified buildings as either A, B, or C: A buildings were inspected annually, B buildings biannually, and C buildings every three years. The classifications—largely unaltered for six decades—were based on a combination of factors, including the building's use, its location, and the commander's intuition about whether it was hazardous. FDNY kept a record of the rankings in a card catalogue.

Eimicke chose Rich Tobin, FDNY's assistant chief at the Bureau of Fire Prevention, to lead efforts to reform the inspection system. Tobin and his internal team realized that the existing system lacked hard data. "We had assigned those ratings based on our own experience in the area," says Tobin. "And a lot of times they were just passed on. There was no up----to----date data… A new company commander could come in and never update the status of a building."[18] Moreover, certain FDNY units, such as in midtown Manhattan where most

[17] Professor William B. Eimicke's lecture on February 10, 2014, for his course. "Effective Management in the Public Service," at Columbia University. Columbia granted Eimicke a leave of absence in 2007 to work for FDNY.

[18] Stepan's interview with FDNY Assistant Chief of Fire Prevention Richard Tobin, on February 25, 2014, at FDNY's Bureau of Fire Prevention in New York City. All further quotes from Tobin, unless otherwise attributed, are from this interview.

buildings were high----rises, did not have enough manpower to complete the required inspections in any given year.

Eimicke and Tobin saw much to be gained by applying certain principles from the Compstat model to a new fire safety inspection system that could more accurately predict and forestall fires. "We saw all of the successes the Police Department had with Compstat," says Tobin.

> We saw where they were targeting their resources to where the crime was occurring. The whole idea was to get there before the crime occurred, saturate the area. And we wanted to duplicate the same thing with our inspection process. We didn't want to wait for a fire to hit, we wanted to be out there proactively inspecting these buildings, eliminating their hazards before they had a fire there.

Compstat's basic principle of resource allocation based on risk could be adapted to the Fire Department, and specifically to the Bureau of Fire Prevention. FDNY had a fixed number of inspectors and too many buildings to inspect. If the department could send inspectors to buildings with the highest risk of fire, the same number of inspectors could prevent a higher number of fires.

Digitize. The first step was to update and digitize FDNY's existing inspection data. In 2009, Eimicke brought in consultants from IBM. The IBM team began its work by accompanying inspectors on every step of the inspection process for a period of months. Claudia Gerola, an IBM business strategy and development consultant, had the challenging job of mapping the status quo. She explains:

> To determine how to proceed with this project, we had to understand what everybody did all day long, what the flow of their day was, when they captured information, how they recorded it, what did the form look like that they had to fill out—the purpose being obviously to capture that data and digitize it so that it could be accessible and manipulated. But in order to do that… we would bring 10 or 12 experts into a room and get them to open up.[19]

It was important to involve the *inspectors* early in the reform process, not least to bridge the culture gap between the tradition----bound FDNY and the IBM consultants. The IBM survey potentially invited a backlash from the close----knit—and unionized—firefighters. "We were… telling them to go out with these teams and re----inspect every building in their district and take their card---based data and put it into the computer with the IBM team," says Tobin. "So we were doubling their work."

By mid----2010, FDNY had digitized its inspection system. But making the inspection system truly risk----based required a more sophisticated assessment of each building's chance of catching fire. Data that could help predict the probability of fire in any given building

[19] Stepan's interview with Claudia Gerola on March 3, 2014, at Columbia University, New York City. All further quotes from Gerola, unless otherwise attributed, are from this interview.

was spread across multiple city agencies. For example, buildings in poor or high----crime neighborhoods were more likely to catch fire than the same kinds of structures in safer, more affluent neighborhoods—but crime and income information resided with NYPD and the Finance Department. Buildings with code violations were also more likely to be at risk, but that information was at the Buildings Department.

It became clear to Eimicke, Tobin and their team that one of the biggest challenges would be access to data from other city agencies. Tobin explains that the even though many agencies had digitized their data, it came in formats that could not be read by other departments. "One of the biggest challenges to overcome was the fact that every one of the agencies had its own silo of data. The other point was, they weren't all on the same platforms. So sharing that data across lines was very difficult, really difficult," he recalls. Not only was other departments' data difficult to merge with that of the fire department, it was also in some cases out of date. "We hit some real bumps in the road" in constructing the risk----based system, Tobin says. FDNY inspectors, for example, might visit a building flagged by the Buildings Department only to discover that there was no longer a building at that location.

Bloomberg and Open Gov

While Eimicke, Tobin and their team were working through the challenges of data sharing across city agencies as part of their work on the FDNY inspection system, a parallel development at City Hall provided crucial help—the public sharing and publishing of city data of all kinds. Michael Bloomberg had succeeded Giuliani as mayor in 2002 (he was reelected in 2005 and 2009). Bloomberg had come from Bloomberg LP, a financial information services company he created and ran. Over his business career, Bloomberg had learned to appreciate the value of reliable numbers. "In God we trust. Everyone else, bring data," he was known to quip, only partly in jest.[20] He made it a priority to promote the use of data to govern better.

An early innovation was a hotline that would provide a single point of access to city services. The call----in telephone number was 311, and it launched on March 9, 2003. It functioned like a 911 hotline for non----emergencies. In its first 10 years, 311 handled an average 16 million calls a year, and "consolidated more than 40 separate City call centers and hotlines—and 11 pages of government listings in the phone book—into one, easy----to----remember number," according to the city's history of the program.[21]

Goldsmith. Meanwhile, Bloomberg in 2010 brought in Stephen Goldsmith as deputy mayor for operations. He had been former two----time mayor of Indianapolis, a special advisor to President George W. Bush, and chair of the board of directors of the Corporation for National and Community Service. As mayor of Indianapolis, Goldsmith improved the quality

[20] Sam Roberts, "Statistics, Beloved by Mayor, Show a Slump in City Services," *New York Times*, August 29, 2011. Available: http://www.nytimes.com/2011/08/30/nyregion/new-york-data-shows-slump-in-city-services.html

[21] "Mayor Bloomberg Commemorates Ten Years Of Nyc311, The Nation's Largest And Most Comprehensive 311 Service," New York City Office of the Mayor, March 11, 2013. Available: http://www1.nyc.gov/office-of-themayor/news/089-13/mayor-bloomberg-commemorates-ten-years-nyc311-nation-s-largest-most-comprehensive-311

and accessibility of public spaces and rebuilt neglected neighborhoods. He had learned to listen to citizens and address their needs in an effective and efficient manner. In New York, he was still charged with addressing the needs of the public, but in an entirely new context: Big Data. He recalls:

> When I came in as new deputy mayor of operations, the city's budget was very stressed… High----quality services were being produced, but they were being produced at reasonably high costs that I didn't think was sustainable. So we looked for ways to increase the efficiency, productivity [and] effectiveness of [New York City] government.[22]

One of his key missions was to take the various "big data" initiatives under way in the administration, and give them an official shape and direction. There was a need to connect data mining and citizens' issues, and Goldsmith saw social media as a key tool in establishing the link— citizens were already creating data, but it had not yet seen practical application within city management. "You have cloud computing which drives down the cost of acquisition of sophisticated solutions," says Goldsmith.

> You have essentially every field worker with the capacity to have a handheld device, real----time data, actionable data, at the scene of a crime or… child welfare problem. You have social media, which means that broad arrays of individuals in the community, New York City, can communicate or complain or tweet about a very significant problem or not. You can mine that data and identify it.

New York City already had an infrastructure for collecting data on city services delivery. Since the 1970s fiscal crisis, the mayor's office had tracked aspects of city government performance, including money spent and services delivered, through the Mayor's Management Planning and Reporting System (MMPRS), which published management statistics every six months. A study found that at the end of the 1980s, however, the MMPRS' "voluminous agency statistics reported to the public twice a year included almost no measures of outcomes or 'results.'"[23] That perception persisted for the next decade. Good government advocates and the public alike saw it as little more than "an obligatory exercise in eyestrain and endurance," according to a *New York Times* editorial early in the Bloomberg administration.[24] Goldsmith and his team revamped the Mayor's Management Report to make it more user----friendly, with less jargon and an online interactive tool that allowed users to access neighborhood----level statistics.

He also updated the 311 service. In 2011, a 311 Services Map went live on the city's website; it illustrated how 311 complaints were distributed geographically. Goldsmith

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[22] Stepan's interview with Stephen Goldsmith on February 24, 2014, at Columbia University. All further quotes from Smith, unless otherwise attributed, are from this interview.

[23] Dennis C. Smith and William J. Bratton, "Performance Management in New York City: Compstat and the Revolution in Police Management," in Dall Forsyth (ed.), *Quicker, Better, Cheaper? Managing Performance in American Government*, New York: Rockefeller Institute Press, October 2001. p. 545, referring to Smith 1993.

[24] "How am I Doing — Really?," *The New York Times*, October 1, 2002. Available: http://www.nytimes.com/2002/10/01/opinion/01TUE4.html

announced at the launch that New Yorkers had the "right to know where the problems and trouble spots are in their neighborhoods… so they can look at those problems and can hold government accountable."[25]

These initiatives made city government activities more visible to the public through user---friendly data, and made its services more accessible. It became easier for citizens not only to obtain but to evaluate government services. But for all the success, Goldsmith says, 311 in particular "assumes that people have to call to register a problem—that government can't figure out about the problem before somebody complains about it."[26] Given the amount of data available to government, was there a better way to use it to find and fix problems even before they generated complaints?

Sharing Data

Bloomberg had hired someone to look at exactly that problem. Michael Flowers was a key player in the administration's smart data campaign. A former prosecutor and Justice Department lawyer in Iraq, Flowers joined New York City government in December 2009 as head of the city's Financial Crimes Task Force. Among other tasks, he investigated mortgage fraud and learned, he says, that "the city knew a tremendous amount" about its people and businesses.[27] The task force's responsibilities evolved as Flowers discovered that information used to track mortgage fraud could easily be adapted to identify other problems. By 2012, Flowers was director of analytics for the Office of Policy and Strategic Planning in the mayor's office.

MODA. On February 14, 2013, Bloomberg announced the creation of the Mayor's Office of Data Analytics (MODA), a small team within City Hall that would synthesize data from 40 different city agencies in an effort to solve problems that spanned the responsibilities of—and the information collected by—those agencies. In announcing its formation, Bloomberg said MODA would "launch a new platform that will improve the way all agencies share information."[28] To lead this effort, he appointed Flowers as the city's first----ever chief analytics officer.

Flowers and his team of about six looked for innovative ways to use data to solve problems. They relied on the insight that data relevant to the performance of one city agency might be housed in another. Flowers believes that the challenges to sharing data across agencies fall into four broad categories—"technical, cultural, political and legal, in no particular order." Legal concerns included citizen privacy and statutory limits on the authority of certain

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[25] Elizabeth A. Harris, "Getting a Visual on New Yorkers' 311 Calls," *The New York Times* (City Room blog), February 16, 2011. Available: http://cityroom.blogs.nytimes.com/2011/02/16/getting-a-visual-on-new-yorkers-311calls/?_php=true&_type=blogs&emc=eta1&_r=0

[26] Adam Stepan's interview with former New York City Deputy Mayor of Operations Stephen Goldsmith on February 24, 2014, at Columbia University in New York City. All further quotes from Goldsmith, unless otherwise attributed, are from this interview.

[27] Stepan's interview with Michael Flowers, on February 26, 2014, at Columbia University. All further quotes from Flowers, unless otherwise attributed, are from this interview.

[28] Michael Bloomberg, State of the City Address, 2013, New York City Office of the Mayor, February 14, 2013. Available: http://www1.nyc.gov/office-of-the-mayor/news/063-13/mayor-bloomberg-delivers-2013-state-the-cityaddress

agencies. More nebulous and potentially nettlesome were the cultural and political hurdles to changing the way city bureaucracies worked. Flowers explains why change is hard:

> Bureaucracies are expressly designed to be resilient. That's why they exist, because we want them to be able to handle the vicissitudes of elected government. It doesn't matter if [the mayor] changes, because the trash still needs to be picked up... Moreover, tribal turf wars are real. They absolutely exist. Agencies get deeply invested in their subject matter areas… We want them to be deeply invested in their subject matter.

Technology was, in Flowers' view, the easy part—but that, too, was complicated. City agencies had developed indigenous systems for counting and categorizing the important features of their areas of responsibility. Getting a clear picture of the information housed in more than 40 city agencies was not simply a matter of combining databases. For example, different agencies had different ways to identify buildings. The Post Office used addresses. The Department of Buildings used unique building identification numbers. The Finance Department used the lot number for the land a given building sat on. Finally, emergency response agencies such the police and fire departments used latitude and longitude.

Flowers saw good reason for the differences in how each city agency handled its data— each method of categorizing a building, for example, at some point served a useful internal purpose. Not only would it be expensive and politically difficult to force each agency to move to a universal system; in Flowers' view, it was not necessary. "The technology has advanced and the data science has advanced to the stage where the barrier to entry, to synthesizing these different systems, for purpose----driven reasons, can be effected rather simply," he says.

Flowers worked as much as possible within existing systems at each agency. For example, if the Buildings Department had an inspection system, Flowers' team would not try to revamp it. Rather, it would use information from other city agencies, such as the Finance Department, to help Buildings improve the order, rather than the manner, in which it conducted inspections. Says Flowers:

> If I can demonstrate conclusively that if a property has a tax lien on it, and that the existence of a tax lien correlates with an order of magnitude increase in the likelihood of a catastrophic event at that location—one of the city's most fundamental jobs is to prevent those catastrophic events from occurring in the first place, if they can… What this piece of information is telling me is that there's a catastrophe more likely at this smaller subset of our one million buildings, and therefore I'm going to send my finite resources to that place first. That, without increasing the number of resources available to the Department of Buildings, dramatically increases their effectiveness.

There were some significant wins. Flowers' City Hall group worked with Tobin and his team to jumpstart the Fire Department's efforts to access and add data from other agencies

to its risk model. In May 2013, FDNY's digitized Risk----Based Assessment System launched as part of a massive, $26----million effort to improve fire prevention. The department saw the rate at which inspectors found serious violations jump from some 9----13 percent under the old system to 70----75 percent. New York City saw 47 fire fatalities in fiscal year 2013, a steep drop from 70 in fiscal year 2012.[29]

Flowers worked with other city agencies as well, on projects that ranged from identifying Medicaid fraud to tax violations. Even before MODA's creation, in 2012 both the police and health departments had observed an increase in prescription drug abuse in Staten Island, specifically of the painkillers oxycontin and oxycodone. Flowers' team thought it possible to identify which pharmacies were illegally distributing prescription drugs. It knew that the Human Resources Administration (HRA) was responsible for reimbursing Medicaid claims to pharmacies, and could audit pharmacies submitting Medicaid claims. But like any other city agency, HRA had limited resources—only a handful of auditors for some 2,600 pharmacies. Flowers and his team wanted to use data to maximize the likelihood that the auditors would find malfeasance. He recalls:

> We did a basic analysis of the redemptions for those specific high concentration oxy, and were able to find that one percent—about 20 of the pharmacies—were responsible for about 80 percent, 90 percent of the [oxycontin and oxycodone] distribution, at least for Medicaid redemptions. Then, we further tested that by having HRA train their audit capacity on those pharmacies, and about 19 out of the 20 turned out to be up to no good.

The team used the same approach for other problems. In fall 2012, the city's Department of Environmental Protection (DEP) enlisted Flowers' team to help locate restaurants illegally dumping cooking oil into sewers—a practice responsible for the majority of the city's clogged drains. It discovered that a city agency called the Business Integrity Commission was responsible for certifying that restaurants hired companies to dispose of grease. Using this information to identify which restaurants had not hired such services, and comparing it with data on sewers, the team advised DEP where to look for restaurants dumping grease illegally. By prioritizing the search for rogue restaurants, DEP found illegal dumping in 95 percent of the restaurants it inspected. "With nothing grander than public data," a *New York Times* article on Flowers and his team later recounted, "the Case of the Grease----Clogged Sewers was solved."[30]

Exit Bloomberg. As the Bloomberg administration drew to a close in late 2013, there were systems in place within some city agencies to use data for resource allocation based on informed predictions of where problems were most likely to occur. The approach had prevented crimes and fires, for example, at impressive rates. Meanwhile, data had been used to make city government as a whole more nimble, responsive, and efficient.

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[29] "FDNY Vital Statistics," FY2013 and FY2012. Available: http://www.nyc.gov/html/fdny/pdf/vital_stats_2013.pdf

[30] Alan Feuer, "The Mayor's Geek Squad," *The New York Times Magazine*, March 23, 2013. http://www.nytimes.com/2013/03/24/nyregion/mayor-bloombergs-geek-squad.html?pagewanted=all&_r=0

MODA, in particular, had helped overcome challenges to sharing information among agencies in order to solve cross----sectoral problems. But MODA did so outside the system, in an ad hoc manner and often on request. It was unclear whether the unit would survive. MODA had helped to build agency----level capacity to manage and analyze data, but it was a long----term process. Should it continue? Was this the best approach? What, ultimately, was the correct balance of centralization versus decentralization in the use of data for governance?

Police Department
City of New York

Bill de Blasio
Mayor

William J. Bratton
Police Commissioner

Volume 21 Number 13

CompStat

Citywide

Report Covering the Week 3/24/2014 Through 3/30/2014

Crime Complaints

	Week to Date			28 Day			Year to Date*			2Year	5Year	21Year
	2014	2013	% Chg	2014	2013	% Chg	2014	2013	% Chg	% Chg	% Chg (2009)	% Chg (1993)
Murder	9	4	125.0	22	20	10.0	67	74	-9.5	-30.2	-27.2	-86.0
Rape	31	24	29.2	95	109	-12.8	299	332	-9.9	-13.3	12.8	-58.3
Robbery	298	287	3.8	1,079	1,183	-8.8	3,832	4,129	-7.2	-15.0	-10.0	-81.4
Fel. Assault	340	317	7.3	1,401	1,335	4.9	4,446	4,162	6.8	6.5	27.8	-48.4
Burglary	272	293	-7.2	1,125	1,128	-0.3	3,857	3,967	-2.8	-11.1	-5.5	-83.8
Gr. Larceny	761	752	1.2	3,086	3,029	1.9	9,628	9,808	-1.8	1.7	8.9	-48.1
G.L.A.	119	142	-16.2	494	464	6.5	1,597	1,475	8.3	-7.5	-33.6	-94.2
TOTAL	*1,830*	*1,819*	*0.60*	*7,302*	*7,268*	*0.47*	*23,726*	*23,947*	*-0.92*	*-3.75*	*1.30*	*-76.34*
Transit	36	41	-12.2	158	163	-3.1	555	586	-5.3	-17.5	5.5	***.*
Housing	75	117	-35.9	339	362	-6.4	1,140	1,097	3.9	6.8	30.6	***.*
Petit Larceny	1,479	1,510	-2.1	5,856	5,841	0.3	18,164	18,264	-0.5	-4.7	0.2	***.*
Misd. Assault	819	797	2.8	3,378	3,107	8.7	9,925	9,728	2.0	-6.9	0.2	***.*
Misd. Sex Crimes	58	34	70.6	210	186	12.9	584	601	-2.8	-19.9	-14.5	***.*
Shooting Vic.	26	20	30.0	89	74	20.3	231	244	-5.3	-29.1	-21.2	-82.6
Shooting Inc.	21	17	23.5	73	60	21.7	201	208	-3.4	-27.2	-14.5	-83.4

Historical Perspective

(Historical perspective is a complete calendar year of data.)

	1990	1993	1998	2001	2013	%Chg '13 vs '01	%Chg '13 vs '98	%Chg '13 vs '93	%Chg '13 vs '90	
Murder	2,262	1,927	629	649	335	-48.4	-46.7	-82.6	-85.2	Murder
Rape	3,126	3,225	2,476	1,930	1,378	-28.6	-44.3	-57.3	-55.9	Rape
Robbery	100,280	85,892	39,003	27,873	19,128	-31.4	-51.0	-77.7	-80.9	Robbery
Fel. Assault	44,122	41,121	28,848	23,020	20,297	-11.8	-29.6	-50.6	-54.0	Fel. Assault
Burglary	122,055	100,936	47,181	32,694	17,429	-46.7	-63.1	-82.7	-85.7	Burglary
Gr. Larceny	108,487	85,737	51,461	46,291	45,368	-2.0	-11.8	-47.1	-58.2	Gr. Larceny
G.L.A.	146,925	111,622	43,315	29,607	7,400	-75.0	-82.9	-93.4	-95.0	G.L.A.
TOTAL	*527,257*	*430,460*	*212,913*	*162,064*	*111,335*	*-31.30*	*-47.71*	*-74.14*	*-78.88*	*TOTAL*

The above CompStat figures are posted on Monday, one week after the closing date.

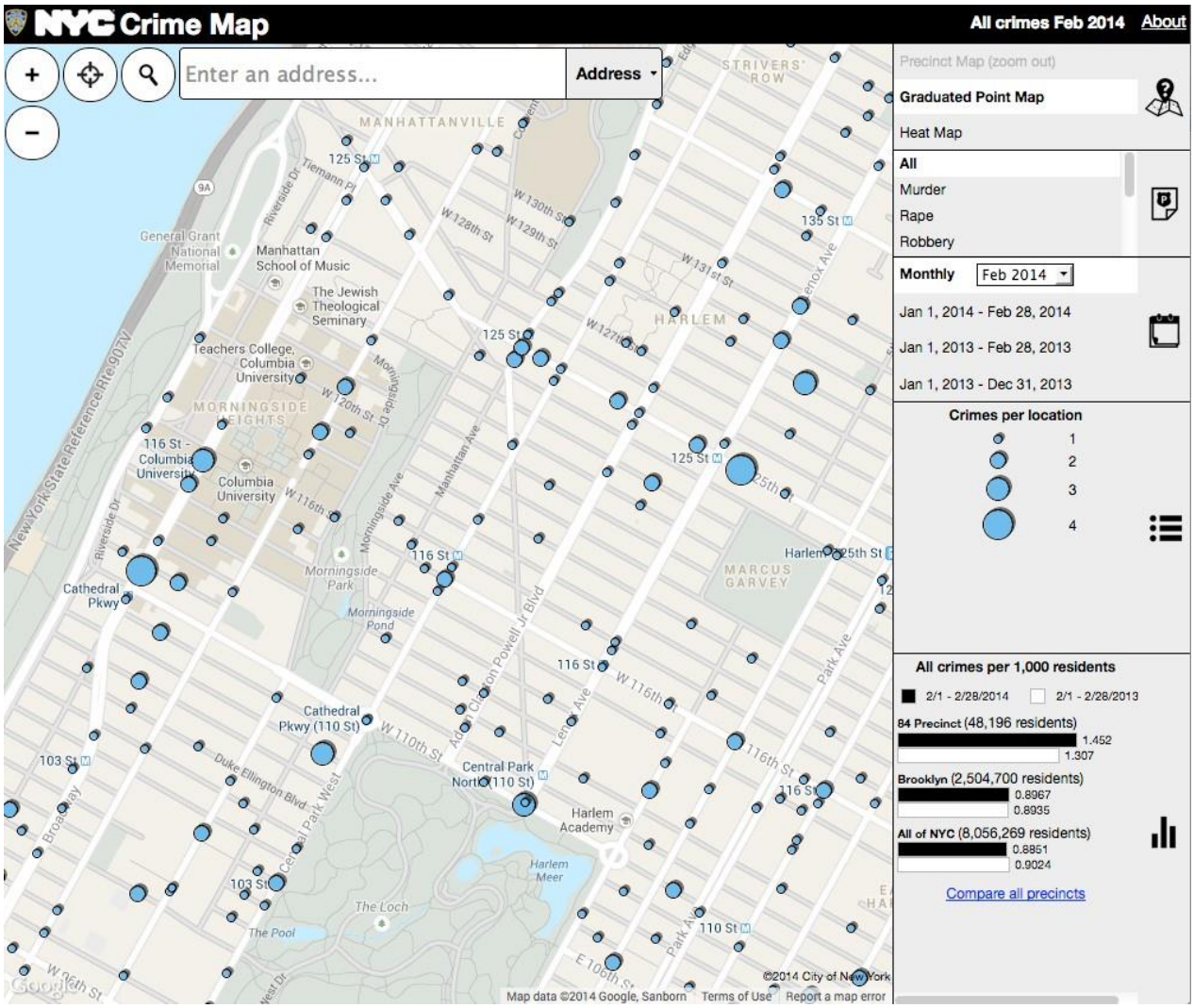
Crime statistics reflect New York State Penal Law definitions and differ from the crime categories to the F.B.I. Uniform Crime Reporting System. All Degrees of rape are included in the rape category. All figures are subject to further analysis and revision.

Prepared by
NYPD CompStat Unit

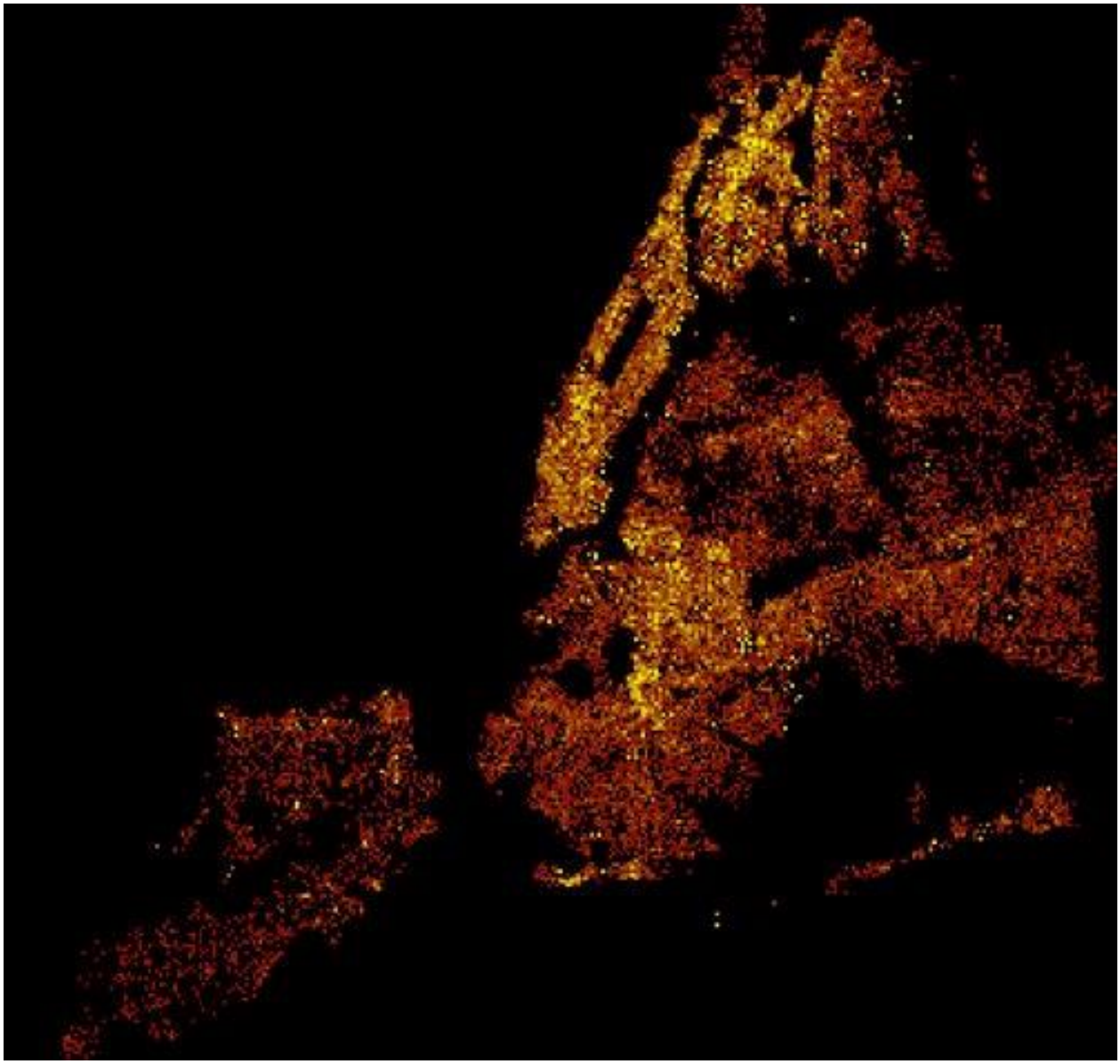
CompStat

APPENDIX 2

An image of an interactive map showing crime incidents in Morningside Heights and Harlem during February 2014. Available via maps.nyc.gov.



APPENDIX 3

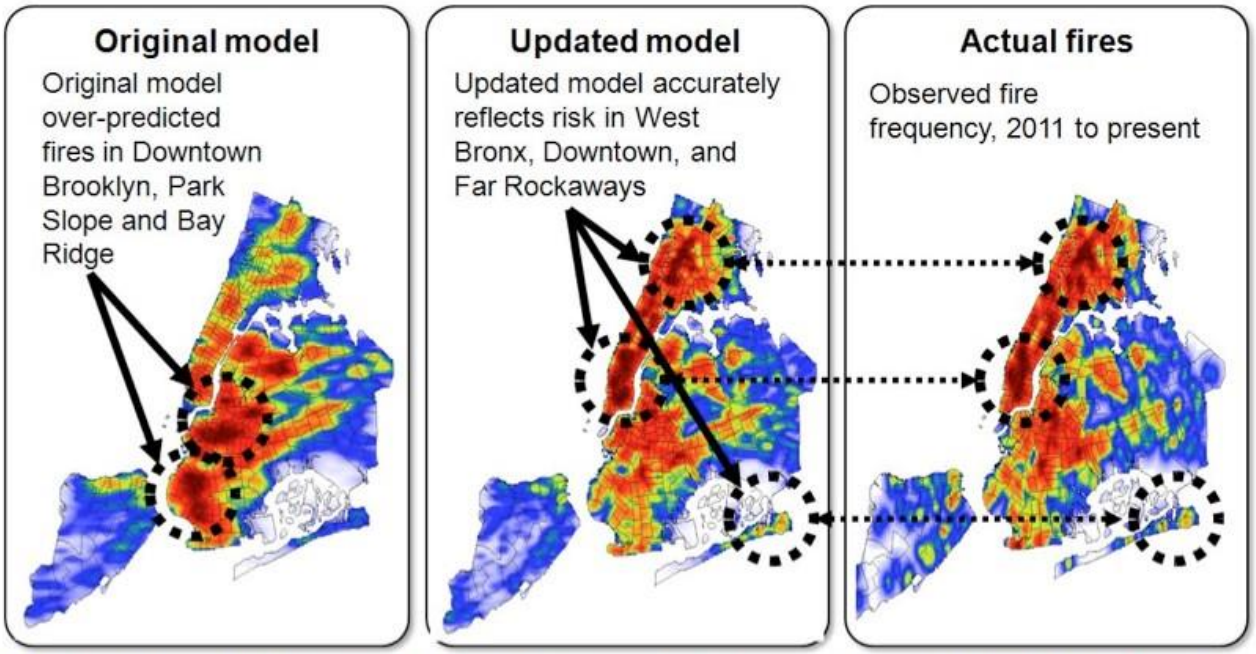


A map showing fire incidents in commercial and high----rise buildings in New York City. From FDNY Analytics and available via NYC Open Data, nycopendata.socrata.com.

APPENDIX 4

The Mayor's Office of Data Analytics illustration of FDNY's Risk----Based Inspection System. Source: Michael R. Bloomberg and Michael Flowers, "NYC by the Numbers Annual Report—2013," December 2013, p. 9. Available: http://www.nyc.gov/html/analytics/downloads/pdf/annual_report_2013.pdf

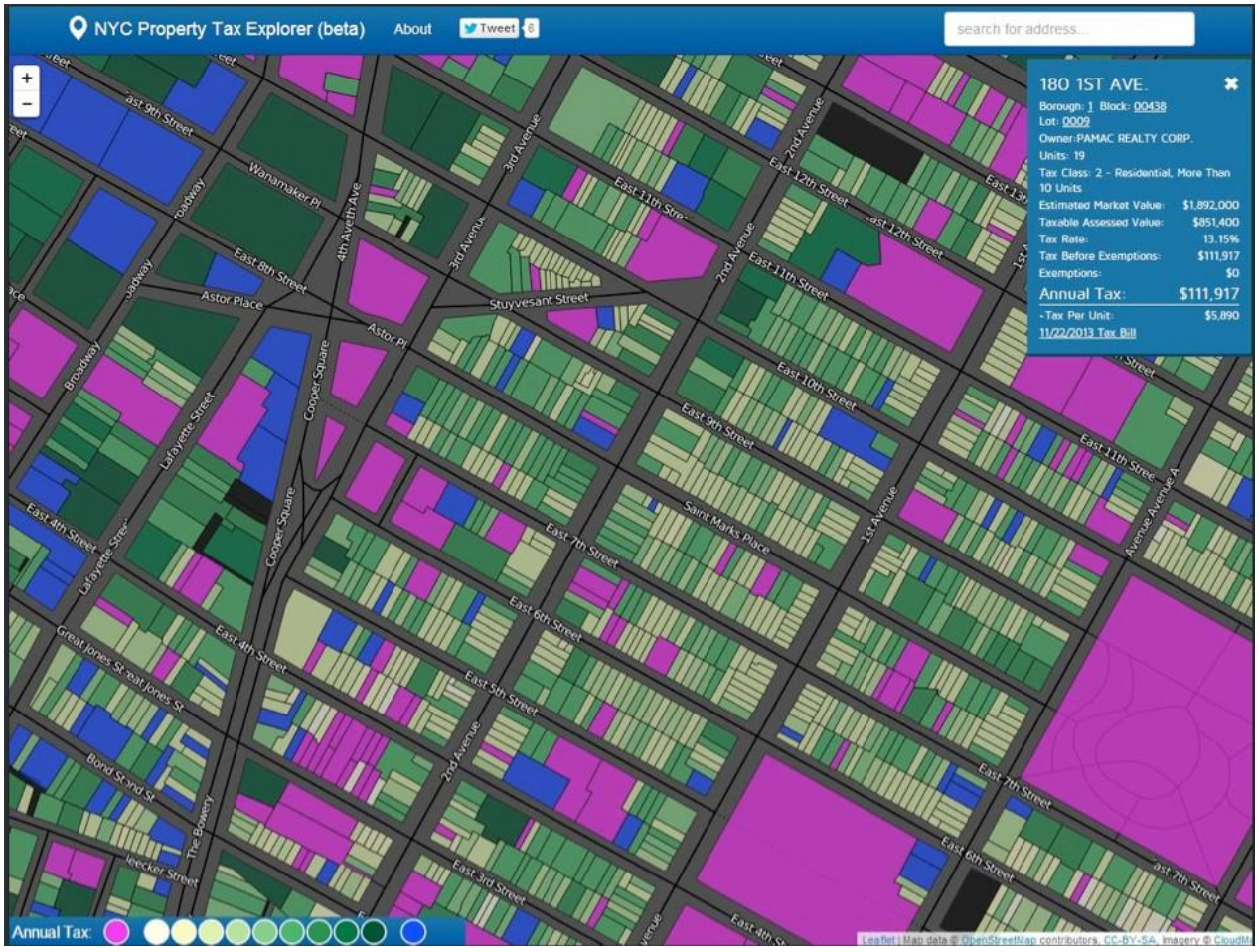
FDNY's Risk Based Inspection System (RBIS)



The three maps above of NYC represent the progress of the risk based inspection system algorithm that MODA created with the Fire Department (FDNY). At left is the original map of high-risk zones from the first version of the FDNY RBIS model; center is the updated model, weighting risk criteria based on MODA's statistical regression; at right is an actual map of recent fires in New York City.

APPENDIX 5

Image of the NYC Property Tax Explorer, which combines Department of City Planning data with information on estimated market value, assessed value, building type, tax rate, and annual tax from 2013 NYC property tax bills for buildings on New York City's Lower East Side. Built by Chris Whong, Akil Harris and Ameen Solemani and available via NYC Open Data, nycopendata.socrata.com.

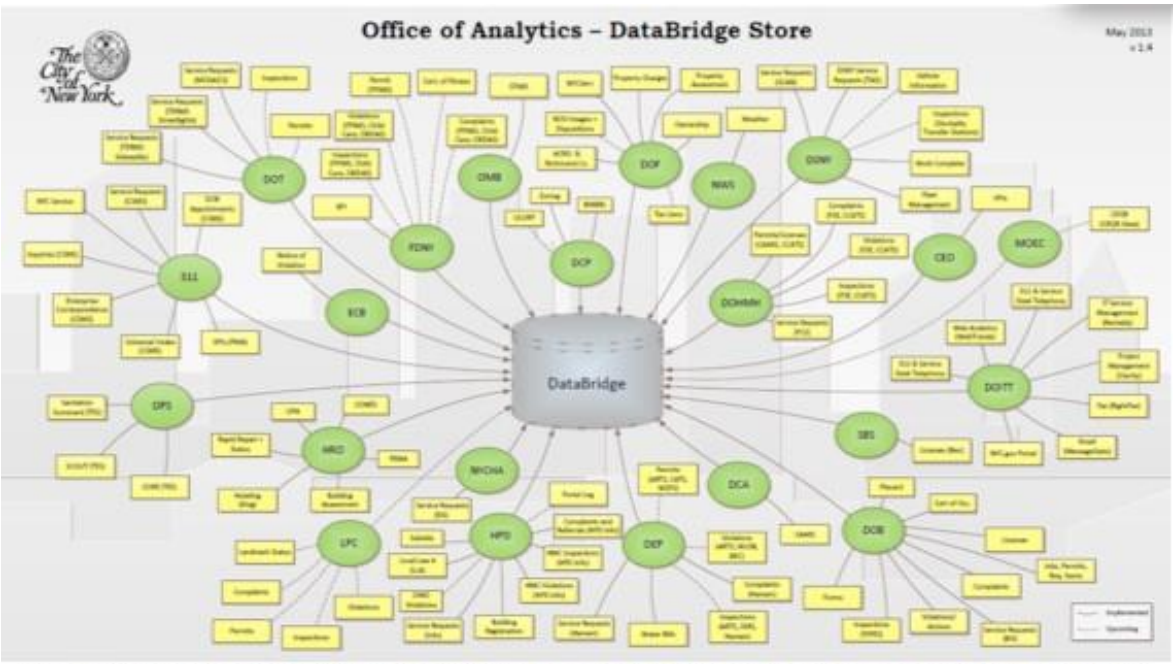


APPENDIX 6

Visualization of bike routes and bike lane parking violations in lower Manhattan from July 30, 2013 through October 29, 2013. Built using the ArcGIS Online Storytelling Text and Legend web application template by Tom Swanson and available via NYC Open Data, nycopendata.socrata.com.

APPENDIX 7

The Mayor's Office of Data Analytics illustration of the different datasets merged into the Databridge system, the platform MODA launched to aggregate cross----agency data. Source: Michael R. Bloomberg and Michael Flowers, "NYC by the Numbers Annual Report—2013," December 2013, p. 14. Available: http://www.nyc.gov/html/analytics/downloads/pdf/annual_report_2013.pdf



The above data map illustrates the data collected, by agency, and agency system, and fed into DataBridge.