

Intergovernmental Solutions Program Working Paper

# WEST NILE VIRUS

*May 2004*

*Terrence A. Maxwell*

**Intergovernmental Solutions Program**

Nelson A. Rockefeller College of Public Affairs & Policy ♦ University at Albany

135 Western Avenue, Albany, NY 12222

Phone: (518) 442-5293 Fax: (518) 442-5298

E-mail: [igsp@albany.edu](mailto:igsp@albany.edu) Website: [www.albany.edu/igsp](http://www.albany.edu/igsp)

## INTRODUCTION

It was a hot and dry summer in the northeastern United States in 1999. During July and August, residents in the borough of Queens, New York City, found several dead and diseased crows, a fact noted by the local paper. A Queens veterinarian attempted without much success to treat some of the diseased birds, who showed signs of neurological damage. Across Throg's Neck Bay in the Bronx, birds in and around the Bronx Zoo were also dying. In Manhattan, some Central Park birds were also found dead, and a New York State Agriculture and Markets Department pathologist determined they had been poisoned.

On Monday, August 23, Dr. Marcelle Layton, the head of the Bureau of Communicable Diseases at the New York City Health Department, received a phone call from Dr. Deborah Asnis, of the Flushing Hospital Medical Center in Queens. Dr. Asnis reported that two elderly men had been admitted to Flushing Hospital with similar symptoms—encephalitis and severe muscle weakness. The hospital's tests of the men's spinal fluid suggested a viral infection, and the hospital had originally diagnosed the patients as having Guillian-Barre virus. However, treatment for this disease was unsuccessful, and Dr. Asnis was calling for the health department's assistance. Dr. Layton suggested sending samples of spinal fluid and blood to the NYS State Health Department's laboratory in Albany.

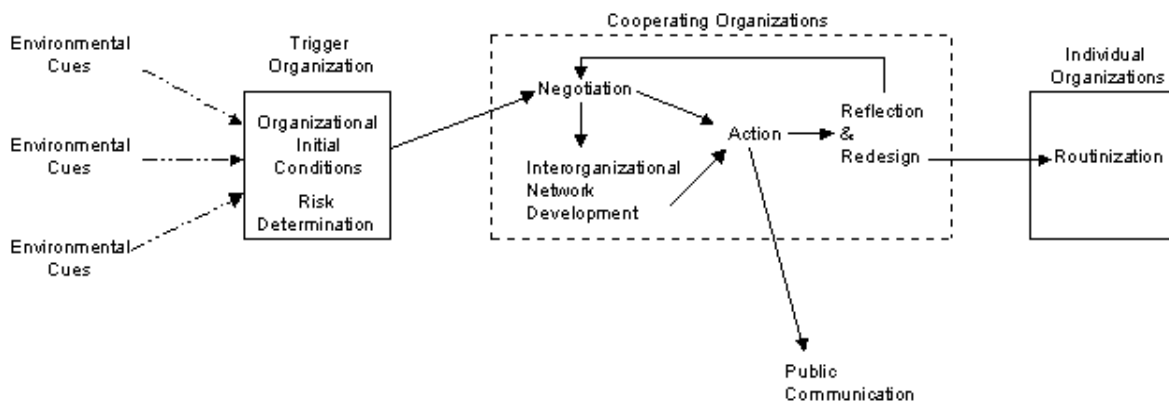
Looking back, the New York City bird deaths and the elderly men's illnesses in Queens would appear to be the kind of seemingly isolated and unconnected events that often begin the horror films so popular at movie theaters during the summer months. And while it turned out the Central Park bird poisonings were the classic "red herrings" of detective novels, within weeks the other deaths would help set off a chain of events that led investigators to the discovery of a new, potentially deadly virus in the United States.

The following case study working paper traces the beginnings of the West Nile Virus (WNV) outbreak response effort, focusing on the interorganizational and intergovernmental management challenges and lessons. As such, it does not attempt to tell the whole story of the WNV outbreak. Rather, it focuses on the pieces of the puzzle that hold lessons for practitioners in the public management field. By doing so, we attempt to extend our view beyond the particulars of the West Nile case to a broader understanding of crisis management in an intergovernmental environment.

### **A MODEL OF INTERGOVERNMENTAL CRISIS MANAGEMENT**

A close study of the WNV case shows a flow of information, decisions, and actions undertaken by governmental and other professionals that provides a window to help us understand the crisis management process. The case uncovers the means by which a network of practitioners moves from a crisis situation to the commonplace of bureaucratic systems.

The following diagram provides an overview of the process, detailing the main steps organizations in the West Nile Virus case took in identifying the scope of the problem, marshalling resources to deal with the emergency, making decisions, communicating results, modifying actions, and eventually routinizing procedures to incorporate the lessons learned into daily practice.



In subsequent sections, we will explore the details of each of the steps in the model, and highlight areas of particular interest and importance to government practitioners.

## ENVIRONMENTAL CUES

Managers in every organization are constantly bombarded by information. The problem they face is making sense of conflicting or ambiguous data, so that they can either decide to ignore the information, or search for data that either confirms or contradicts their ideas about what is happening “out there.” To undertake this filtering process, managers use previously developed schemas, or mental models, and determine whether new information can be fit into what they expect to see.

As noted above, managers in the WNV case were presented with anomalies. Increased numbers of dead birds, patients with unusual symptoms, and inconclusive clinical results all presented indications that something unusual might be happening. It is important to note that different individuals identified different anomalies at separate times and places. They processed the environmental cues based on their own knowledge and expectations, and acted in manners consistent with their own professional and organizational stance.

The Queens veterinarian attempted to treat the birds he encountered based on his diagnosis and training. The physicians at Flushing Hospital diagnosed and treated two elderly men using their skills and tools. When their efforts failed, they reached out to the New York City Health Department for assistance in sharpening their diagnosis and reducing uncertainty. At the Bronx Zoo, Dr. Tracey McNamara reacted to the zoo’s animal deaths as a veterinary professional, by investigating the deaths and sending samples to the wildlife pathology labs at the New York State Department of Environmental Conservation. Finally, the city’s Department of Public Health responded to Flushing Hospital’s call for help by beginning the process of investigation, which involved requesting that Flushing forward tissue and blood samples to the state Health Department, and eventually alerting the national Centers for Disease Control (CDC) about the possibility of some form of viral outbreak in New York City.

## THE TRIGGER ORGANIZATION

While indications of the West Nile Virus occurred at different times and places, and were picked up by different individuals and organizations, one organization—the New York City Department of Health—acted as a trigger mechanism for subsequent activities. In addition to

instructing Flushing Hospital to forward tissue and blood samples to the state, Dr. Layton and her staff began a series of actions that were based on their professional and organizational knowledge about how to respond to public health emergencies.

Dr. Layton first sent an epidemiologist to Flushing Hospital to review the patients' charts, and her team reviewed the information at their regular weekly meeting convened to discuss epidemiological outbreaks in New York City.

Three days later, Dr. Layton called Dr. Asnis at Flushing Hospital to review her staff's findings, and was informed that two other patients had presented with similar symptoms. Dr. Layton called the CDC to discuss the possibility that the cases might be related to botulism. The likelihood of botulism was slight, because the patients all had fevers, but she wanted to be sure. The CDC staff agreed, but a test for botulism was ordered just to be sure.

The next day, Dr. Layton and a colleague, Dr. Annie Fine, took their investigation to Flushing Hospital, even as another case was reported in a hospital elsewhere in the borough. While at Flushing, hospital staff alerted Dr. Layton to a sixth case. The two doctors from the city's Department of Public Health spoke with patients and their families, asking a range of questions to determine what similarities existed between patients. Their query yielded the information that the patients lived in the same area and were well tanned, suggesting they spent a lot of time outdoors. This in turn led to speculation that the patients might have contracted the infection from mosquitoes.

Dr. Layton consulted textbooks for information on mosquito-borne arboviruses. After she and Dr. Fine reviewed the information, they thought St. Louis Encephalitis (SLE) might be a candidate virus, save for the fact that patients with SLE did not normally exhibit muscle weakness, which was common in the New York City cases. Information on the disease suggested that the mortality rate for infected individuals was between two and 20 percent, particularly affecting the young and elderly. Dr. Layton then contacted the Division of Vector-Borne Infectious Diseases at the CDC in Fort Collins, Colorado, to determine if that division's experts were aware of any possible connection between arboviruses and the patients' muscle weakness symptom. The CDC's expert in arboviruses knew of no known symptom of SLE, but concurred with the New York City doctors' preliminary diagnosis. This diagnosis was confirmed the following week when blood tests were completed by the New York State Department of Health and the CDC. In the meantime, Dr. Layton notified the city's hospitals via broadcast fax to be on the lookout for patients showing signs of neurological impairment and muscle weakness, symptoms that might lead to a mistaken diagnosis of meningitis.

#### **RISK DETERMINATION AND INITIAL CONDITIONS**

Dr. Layton's actions can be viewed as an outgrowth of her organizational role and norms of professional action. The New York City Health Department is responsible for the public health of the city's residents. As such, the Queens cases fell within their geographical and regulatory authority.

As the public health authority for New York City, the Health Department regularly monitors hospital admissions, looking for signs of unusual conditions or clusters of cases. In this role, the department traditionally developed a close working relationship with city hospitals. When Dr. Asnis reported the first two cases, the Health Department followed standard investigation

procedures. These procedures did not, however, trigger further actions until a second pair of cases was reported. At that point, the risk profile of the unknown disease increased, both because of the severity of the symptoms and the close clustering of the outbreak.

Dr. Layton's subsequent research led her to speculate that the disease was mosquito-borne. This realization represented a key turning point in the Health Department's response to the problem, for two related reasons.

First, no one within the Health Department had expertise in arboviruses, so that Dr. Layton had to seek the help of colleagues outside her organization to increase her knowledge. This reliance on outside cooperation was well within the cooperative ethos of the broader public health professional community. Similarly, the city's Health Department relied on the state's Health Department and the CDC for testing, a capacity not located within their home organization.

Secondly, New York City government had no effective mechanism for mosquito control activities. There had been few instances of mosquito-borne diseases during the previous decades, and as a result the city had disbanded mosquito control activities during a 1980s fiscal crisis. An effective response to the outbreak would therefore require a wider response, not only because of the city's lack of mosquito control expertise, but also because mosquitoes were not respecters of political boundaries.

The experience of the New York City Health Department underscores two important features of trigger organizations. First, they have the position and authority within an established network of organizations to set a process into motion and control its management. Even though local physicians, hospitals, and veterinarians were all picking up signals of a problem from the environment, they did not have the authority, capacity, and centrality within the network to "set the wheels in motion." Secondly, part of the Health Department's role was to determine what it could and could not handle internally, and act accordingly. In the case of New York City, while the staff was well versed in the procedures of epidemiological investigation, their professional and organizational capacity did not include sample testing, expertise in arboviruses, or mosquito control.

To underscore the importance of these factors, we can contrast the New York City Health Department with Sullivan County, a smaller upstate county that also responded to the West Nile Virus outbreak in 1999. While Sullivan County has a health department, it does not have staff with expertise in epidemiological investigation. Nor does it have an ongoing working relationship with the CDC. As a result, the county's response to the outbreak required it to rely far more heavily on the state Health Department, to such a degree that the organizational locus of coordination during the first weeks of the outbreak might very well have shifted immediately to the state level, had Sullivan County been the first locality to experience the outbreak. Similarly, an original WNV outbreak at the United States Military Academy in neighboring Orange County might have led to a significantly different triggering response, since the Military Academy, while possessing physicians, does not normally carry out public health functions. Rather, West Point is imbedded in a far different federal and military network than local municipalities, and as such would probably have relied on federal public health organizations for their first response.

## **COOPERATING ORGANIZATIONS**

The necessity of bringing new expertise and capacity to bear on a public health emergency involves forming an event-driven network. In the case of West Nile, the network consisted of three types of relationships: functional, jurisdictional, and knowledge-driven. The functional network included organizations in the business of public health management. These actors included physicians, hospitals, local and state health departments, and the federal Centers for Disease Control. Jurisdictional actors included departments of an affected municipality or state that would be required to coordinate actions to respond to the threat. In the case of the WNV outbreak, staff representing emergency management, public information, public works, and the community's political leadership were all mobilized. Finally, the knowledge-driven participants include individuals or groups with particular expertise in areas requiring action. In this case, it included mosquito control experts, information managers, and scientific experts who could pinpoint the DNA structure of the virus in order to improve diagnosis.

## **INTERORGANIZATIONAL NETWORK DEVELOPMENT**

In the weeks immediately following the discovery of the viral outbreak, the number of organizations and localities responding to the public health emergency expanded rapidly. Within New York City government, the Commissioner of Health notified the mayor's office, the Office of Emergency Management, and the Departments of Sanitation and Transportation to discuss the elimination of standing water on city properties. In addition, representatives of the state Department of Health in Albany and at the New York City regional office were brought into the network of crisis responders, as were two divisions of the federal CDC, one specializing in encephalitis and another that focused on arboviruses. In addition, New York City staff contacted Suffolk County for assistance with mosquito control questions.

As evidence of the virus radiated outward from the New York City epicenter, other counties and states became connected to the effort. Within four weeks of the original discovery of the disease, several county public health representatives from the Long Island and Mid-Hudson regions of New York joined New York City, representatives of the CDC, and Connecticut and New Jersey health officials in regular conference calls. In turn, these organizations coordinated internal information exchange and action within their jurisdictions, spreading the network outward to mirror the virus's geographic advance.

## **NEGOTIATION**

The establishment of inter-organizational, inter-municipal and inter-disciplinary networks involved a constant process of negotiation and adjustment. All the organizations involved were mutually committed to addressing the crisis at hand, but all were also subject to political, regulatory, and cultural restraints. Response success required constant communication, and give and take by all parties.

As word of the outbreak spread, the state's capacity to test blood samples (which had degraded over time due to budget cuts) was soon overwhelmed. City and state officials negotiated with CDC representatives to provide surge capacity for testing at their labs in Colorado, and CDC worked with state and local representatives to establish testing protocols, assist in data interpretation, and provide investigatory and public information expertise.

City-state actions also required frequent negotiations. Traditionally, New York City Department of Health saw itself as an equal in status with the state Department of Health.

This organizational structure is embedded in history and the federal designation of New York City as one of four national metropolitan regions eligible for funding independent of state control. As a result, coordination between New York City and New York State required constant communication that occasionally broke down, as when the state decided to have a California lab investigate the diagnosis of St. Louis Encephalitis without local knowledge.

The interaction between the state and localities was not limited to New York City and the state. As worries about the outbreak spread, state and county officials in affected areas had to negotiate public information campaigns. Hotlines were established in New York City, in large counties, and at the state Health Department, and public messages needed to be coordinated. Eventually, the state health department took on the role of providing general medical and public health information, while local health and political officials managed information regarding local identification, abatement, and treatment. The informational boundaries were, however, never cut and dried, and required constant monitoring.

Similarly, smaller counties often relied on the expertise of New York City in tailoring their own responses. The city Health Department's role as trigger organization put it in a natural leadership position for subsequent players. Other circumstances might have found the state health department in such a role, as occurred during a simultaneous *e. coli* outbreak in upstate New York.

Negotiation and adjustment also occurred within jurisdictional boundaries. For example, New York City's health department and Office of Emergency Management had different methods for crisis response, and required mutual adjustment. The state Health Department was influential in coordinating county-level spraying permit applications with the state Department of Environmental Conservation. In Westchester County, the local health department had to coordinate spraying activities of three county departments: Public Works, Parks, and Transportation.

Negotiations were also required across disciplinary boundaries. Dr. McNamara of the Bronx Zoo—suspecting a connection between the New York City human outbreak with the bird deaths around the city—tried unsuccessfully for several weeks to negotiate agreement with the CDC (which normally deals only in human diseases) for testing of bird fluid samples. Finally, the CDC relented and subsequent testing confirmed the veterinarian's suspicions and helped lead to the change of diagnosis from SLE to West Nile Virus. Mosquito control officials engaged in the response noted cultural differences with the public health community regarding perceptions of issues of importance and approaches to action. These differences also required mutual adjustment.

### **ACTION, REFLECTION AND REDESIGN**

The risk of the potentially deadly virus infecting large numbers of New Yorkers required prompt action. Although government agencies are most often known for slow, deliberative actions that seek to minimize risk and encourage ongoing stakeholder participation, public health emergencies trigger a different response. This is described in management literature as the “ready-fire-aim” approach. In these instances, actions are taken quickly with all currently available information, and then adjusted as new knowledge and observed results are presented. In the case of WNV and other public health emergencies, such an action plan is rational; the

risks of doing nothing are most often greater than taking action that may in probability help ameliorate the situation.

For example, the tentative diagnosis of SLE, while not definitive, moved the public health system to action. The network was formed, resources were gathered, and within a week parts of New York City were being sprayed with Malathion, an effective but somewhat controversial insecticide. Later in the month, after further discussions and information collection regarding methods of mosquito control, New York and other municipalities were able to fine-tune their response, changing to a more environmentally neutral insecticide, and mixing aerial spraying with direct application of larvicide to mosquito pools. At the end of September, new research and information caused a change in the diagnosis from SLE to West Nile Virus (an arbovirus strain never before encountered in the Western Hemisphere). Public officials could then plausibly argue that even though the diagnosis of the disease had changed, the immediate actions they had taken to control disease-carrying mosquitoes were relevant to both diseases.

Similarly, tracking the extent of the outbreak required a mixture of quick decision making and learning over time. Since officials could not be immediately certain where the disease would spread, they concentrated on spraying locations in the vicinity of the original victims residences. As new cases became known, they expanded insecticide treatment outward through the rest of the city. At the same time, officials asked the public to alert them to the presence of dead birds, while experts from the CDC and state Health Department fanned out to search for likely vectors for the diseases, including inspecting drainage sewers and trapping birds in Long Island Sound. In New Jersey, health officials inspected mosquito traps and tested “sentinel” chickens, who contracted but were not affected by SLE, and whose blood could be conveniently tested without harming the birds. Eventually, these and other efforts allowed scientists to focus their surveillance efforts on the presence of dead crows as the most likely indicator of the presence of infected mosquitoes.

These and other instances of action, reflection, and redesign allowed the government community to quickly respond to a new and potentially fatal threat to public health. While in retrospect it may seem that some of the early decisions were incorrect or inefficient, in total they allowed the public health community to engage in “real time science” by acting quickly, gathering relevant information, and reformulating theories, plans, and actions within a compressed period of time.

Successful implementation of such techniques requires two factors: flexibility and communications. Participants and the public alike must understand that in emergencies like the WNV outbreak it is important to act quickly and not have decisions to change course slowed out of fear of possible subsequent public recrimination. It is also critical to maintain a constant flow of information among all the partners. In the West Nile Case, the participants relied on several information technologies, including traditional telephones, cell phones, conference call technologies, walkie-talkies, email, broadcast email, fax, broadcast fax, and web sites. In particular, conference calls were heavily utilized during the early weeks of the outbreak, as network participations jointly struggled to make sense of what was going on and share information. As the effort progressed, staff at the state Department of Health modified a web-based Health Information Network to support better diffusion of information related to serum test results. In this and other ways, local officials were able to provide reliable and timely information about the status of the outbreak in local communities.

Part of the challenge of using information technology to support the network involved matching the right technology to the task. Questions such as whether a technology is available to all parties, the type of information to be exchanged, whether one-way or two-way communication was needed, if participants needed to be constantly available, the speed required for message broadcasts, and the communication styles and procedures of different organizations all figured into the design of an effective system.

## **PUBLIC COMMUNICATION**

Many government operations meant to serve the public occur without the average citizen's knowledge. Public health emergencies are different. Since the public is directly affected both by the threat and the actions taken to ameliorate the situation, public information is critical to the process.

Beginning with the first news conference on September 3, 1999, the public officials in charge of communicating with the public tried to balance the call for public vigilance with a tone that emanated calm and control. This difficult task was accomplished by providing information in a straightforward manner, and by coordinating public information across organizations and jurisdictions so that contradictory statements—capable of causing anxiety and suspicion—were minimized.

Additionally, the public's energy was mobilized by asking them to assist in the fight against the outbreak. In addition to wearing mosquito repellent and long clothing to decrease the chance of bites, citizens were requested to empty stagnant pools of water in and around their properties and report the presence of dead birds. To respond to concerns about the risk of infection, public information and public health officials did not attempt to minimize the dangers, but instead focused on the low probability of receiving an infectious bite, while underscoring the efforts being taken to control mosquito infestations through spraying. Since the potential danger of insecticide spraying was also a public concern, information about treatment schedules and steps to avoid insecticide contamination were also highlighted.

Success in message modulation was not, however, the entire issue. An equally serious challenge lay in getting the message out. New York City has an extensive television, radio, and print media infrastructure, but different media outlets were more or less receptive to calls for calm, objective reporting. In communities outside the city, media outlets were less pervasive, so officials supplemented media messages with direct outreach by other means, such as through key community leaders, town officials, and school districts. In addition, special outreach efforts were required for large communities where English and Spanish were not the primary spoken languages.

The job of directly interacting and collecting information from the public was also a challenge, since the physical and human resource to receive numerous phone calls from concerned citizens was not in place during the first hours of the emergency. The existing lines were quickly swamped, and people were called in from other governmental departments and units to help staff hotlines. In addition, many public officials not directly concerned with the day-to-day operations of the emergency response were not kept informed. This caused some citizens difficulty in reaching the right people even when they attempted to contact public officials.

## INDIVIDUAL ORGANIZATIONS

As a result of government efforts and the coming of colder weather, the 1999 West Nile Virus outbreak died down the month of October. By November 1<sup>st</sup>, 58 people from New York City, Westchester, and Nassau counties, and one visitor from Canada had contracted the disease. Seven people, or about 12 percent of those infected, had died. The temporary disappearance of the outbreak was not, however, an invitation to relax and celebrate success, since the virus was likely to reappear the following year.

As a result, the CDC and the state and city health departments took the lead in developing a more coordinated and regularized response to the threat of the virus. In November, CDC announced its intention to conduct a national surveillance of dead birds in 2000 to determine if the outbreak had spread out of the New York region. In addition, scientists and public health officials from New York and elsewhere in the country convened to develop protocols for surveillance, prevention, and control. The New York State Health Commissioner, Dr. Antonia Novello, announced in December that the state had developed a plan for monitoring and controlling the disease. New York City also developed its own city-specific plan.

## ROUTINIZATION

By developing plans for future outbreaks, public officials, and staff throughout the state, in coordination with the federal government, had begun an important activity. They reflected on their experience from the previous months and began a long process of adjusting their internal organizations, as well as their relations with outside groups, building the necessary capacity to respond to the virus should it arise again. In doing so, they were engaging in the process of moving from what Deborah McCartan of IGSP has termed “crisis to commonplace.”

This adjustment did not merely entail the development of paper-based strategic and operational plans. The plans served an important role; they decreased uncertainty, not only for those communities first infected by the virus, but also for future administrators and officials inside and outside of New York. However, they alone could not close the gaps identified during the original crisis. New “surge” capacity was needed in state laboratories, as well as new resources to undertake ongoing mosquito surveillance and communicate with the public. As a result, the state hired 35 new workers, including laboratory staff, and began a statewide public education campaign. In addition, the statewide information network used to report on laboratory results and virus “hot spots” was enhanced to increase the capacity for efficient web-based one- and two-way communications.

New York City installed mosquito surveillance equipment and “sentinel” chickens. The state and city both improved their communications with the veterinarian community, while emergency management and public health officials reflected on the lessons of the WNV outbreak in an effort to fine tune their emergency response plans. Counties throughout the affected region made plans for mosquito surveillance and control, primarily through the use of larvicides, although many expressed concern about the availability of state funding to help defray added expenses occasioned by the new requirements.

## THE “HIDDEN” NETWORK

By working to institutionalize their lessons, federal, state, and local governments sought to normalize the new capacity they developed during the West Nile Virus crisis. It is important

to note that, in doing so, they changed both their internal organization and their capacity to act in concert with other stakeholders. While many facets of the new intergovernmental network were “latent,” embodied in procedures and technological infrastructure rather than human representatives, as a result of the routinization process organizations were ready to be more swiftly and efficiently mobilize when needed once again.

Additionally, the new capacity caused by the routinization of activities extended beyond the risks of WNV. Several participants noted that the procedures and relationships forged during the crisis of 1999 served to help the public health and government community respond more effectively when confronted by the horrible events of September 11, 2001 and the subsequent anthrax outbreak the following month. The network of public health and other professionals, mobilized by the deadly threat of arbovirus in 1999, lit up once more in 2001, and in doing so, not only improved the public health, but also continued its process of network strengthening, modification, and expansion. While it is hard to point to one location, and say “there is the new intergovernmental network,” it exists, and will likely evolve with each new challenge.