Innovation in Pandemic Planning and Response

Building a Ready Community:

Pandemic Planning and Response in Oakland County Michigan

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Innovation in Pandemic Planning and Response: The Case of Oakland County, Michigan

Responding in a Time of Need

It would begin with a slow trickle of the sick into emergency rooms. But within hours of word breaking that your region was hit with a pandemic flu, healthy and ill citizens alike would be clamoring for care at hospitals, at drugstores, at schools, even at local government offices.

More chaotic for you than the crowds, though, would be the confusion: principals asking if their schools should be on lockdown, quarantined. Thousands of citizens calling your office, asking you to find their loved ones, asking where to go, asking what to do next. Hospital administrators begging you to guarantee doctors, EMTs, and police access to antiviral drugs so they don't walk off the job.

Executive Summary
Oakland County, Michigan
• Local government
• 1.2 million residents
Situational Challenge
• Pandemic exercise
• Maximize citizen vaccination
Enabling Policy
• Cross-boundary planning and response
• Innovative vaccine-dispensing model
Enabling Technology
• Cisco Internet Protocol Interoperability and Collaboration System (IPICS)
• Cisco Video Surveillance Manager (VSM)
Results
• Improved mobilization of vaccine-dispensing locations
• Vaccinated 12,000 residents in five hours

And as an elected official or senior executive of your city you know that within a matter of hours your region, known to have planned for a pandemic crisis, will be destination number one for anxious citizens from areas unprepared to deal with the outbreak. The situation could quickly escalate from a pandemic crisis into a law enforcement crisis as well.

You will be responsible for working with the first responders, community leaders, relevant agencies, and the media. You'll be coordinating the effort to react to the pandemic while simultaneously assuring the public of their safety. Critical to fulfilling all of these roles and responsibilities is the ability to quickly and accurately share real-time information across sectors and boundaries, and mobilize citizens, agencies and public health officials to work together to mitigate the crisis.

Are you prepared? How would your colleagues and staff respond to this scenario? Are your systems tested and capable of being mobilized? Are you ready to act in time?

The Oakland County, Michigan Challenge

These were the questions facing Oakland County, Michigan officials as they prepared for a large-scale pandemic exercise. Officials in Oakland County are proactive in their approach to preparing for a pandemic or other form of disaster, and regularly test their capacity for response. They know the stakes are high – the impact of an influenza pandemic on the 1.2 million residents of Oakland County could include 300,000 persons ill, 36,000 persons hospitalized and 840 deaths. Preventing this from happening was their charge as they prepared for their most innovative pandemic exercise to date.

Since 2005, the Oakland County Health Division (OCHD) has provided a mass-vaccination clinic once a year to test public health readiness plans. These exercises were designed to be cross-boundary (planning, processes, and procedures that cut across traditional jurisdictional, bureaucratic, or sector-based boundaries) in planning and execution. The Health Division takes the lead in a pandemic exercise and partners with key organizations including the local school district, hospitals, community groups, corporations, and police, fire and medical first responders.

A key component of the OCHD's plan is the deployment of vaccine-dispensing sites across the county. The sites are strategically situated in schools, hospitals and other public buildings. Officials understand that during the first hours and days of a pandemic or viral crisis, moving citizens through these dispensing locations smoothly would be critical to mitigating the spread of the virus.

> **Influenza is a highly contagious viral disease. Pandemics occur because of the ability of the influenza virus to change into new types or strains. People may be immune to some strains of the disease either because they have had that strain in the past or because they have recently received an influenza vaccine. However, depending on how much the virus has changed, people may have little or no immunity to the new strain. Small changes can result in localized epidemics. If a novel and highly contagious strain of the influenza virus emerges, an influenza pandemic can occur and affect populations worldwide.**

Oakland County's annual flu clinic taught officials several lessons on the importance of cross-boundary communication, information sharing and situational awareness – requirements for mobilizing citizens and providers to get to the mass-vaccination clinics. One of these lessons was that their current plan for communication among the wide network of responders, volunteers and medical professionals hindered effective preparation and response. In a public health emergency in Oakland County up to 5,000 people might

need to be contacted and given direction regarding their roles and responsibilities. Under their current plan, select OCHD staff would contact other employees and volunteers via work phones, cell phones or email. Many departments would utilize call-down lists.

But in a pandemic situation, information would consistently change and could be misinterpreted in a telephone chain. Officials also discovered that calling staff and volunteers individually wasted precious time, and caused communication pathways to a central location such as the Emergency Operations Center (EOC) to become congested. During a pandemic, officials at various community locations would need to provide status updates and resource requests, as well as to report emergency situations.

Past exercises also showed that the level of OCHD integration and communication with other agencies, community groups and employers would be decisive factors in being able to respond effectively to a crisis. Community-based organizations could provide critical information on how many citizens are possibly infected

> **About Oakland County, Michigan**
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> Oakland County was officially organized on January 12, 1819 when Michigan Governor Lewis Cass issued a proclamation establishing the new county's boundaries. The Pontiac Company offered to contribute both property and money to the establishment of a county seat in Pontiac, a central location no more than a day's journey from any point in the County. With the County seat established in Pontiac, the County was divided into two townships. The northern section was Oakland Township and the southern section was Bloomfield Township. In 1827, Oakland County was further divided into five townships: Farmington, Bloomfield, Troy, Oakland and Pontiac. The first official census of the county was taken in 1820 and counted 330 persons. The 2000 U.S. Census reports 1,194,256 people reside in Oakland County, the second most populous county in Michigan, and the 26th most populous in the United States.

during a pandemic as well as information on the pace and progression of the influenza within the community. First responders with solid connections to the community also improved crowd control and the movement of people to vaccination centers during the exercises.

The "Midwest Blackout" of 2003, a power outage in several states including Michigan, also taught the OCHD valuable lessons. Without power, many basic methods of communication such as television, radio and the Internet were severely impacted. The event highlighted the need to develop alternative communication sources during an emergency. If cell phones are not functioning, there needs to be other forms of reliable and redundant communication available for first responders and public health officials. While 800-Megahertz systems are useful tools for police and fire responders, the systems can not be accessed by school,

hospital and private industry response officials. Furthermore, traffic on radios could be congested during a large-scale event because public health issues may not be a priority for the communication towers. And while most have access to the Internet, the software packages that are used to communicate may not be compatible. Telephone lines may be disconnected or malfunction.

To meet these challenges, officials in Oakland County envisioned a system that would ensure interoperable and consistent communications across the staff and teams commissioned during an event. The system would have to have features such as interoperable communications independent of the 800-Megahertz system, a "mass alert network" to send messages to staff, a mechanism that can record and store key conversations and data, and the ability to collect, share and store situational-awareness data such as information from cameras and sensors.

Based on their findings and their vision for future capabilities, Oakland County officials knew they needed a more robust plan for cross-boundary communication and coordination. With a better system, they could mobilize dispensing locations and the incident-command structure faster, and optimize situational awareness. This would be the foundation for meeting their primary goal of maximizing the number of citizens vaccinated in the first hours and days of a pandemic crisis. What was needed was a "network-centric" approach to their planning and response, and they pondered how they would adopt one.

Innovation in Pandemic Planning: Network-Centric Models

In order to mitigate a pandemic crisis (or most other types of natural or human-made disasters) a community must act on two primary dimensions: comprehensiveness of planning and preparation and time of mobilization and response. The more advanced a

Innovative Network-Centric Preparation and Response Increases Speed of Mobilization and Mitigation

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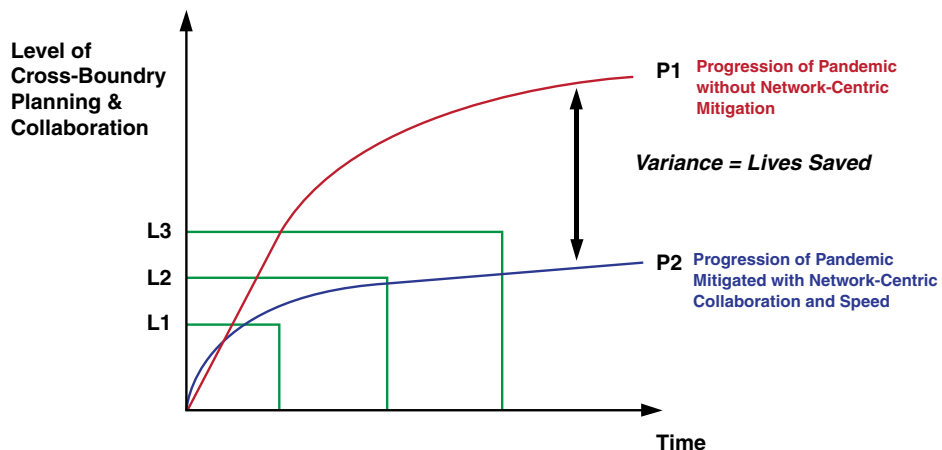
region is on these dimensions the greater its ability to curb the effects of a disaster. In action, this means a region must engage all of its resources – public, private, and community-based – and must be able to deploy them with speed and agility. This is ultimately what will save lives.

An emerging method for performing better along the two key dimensions is through "network-centric planning and response." A network-centric approach can be defined as one in which leaders and managers utilize information and communication technologies as a hub to share information and content across boundaries, to realize situational awareness, and to plan for and respond to a crisis.

Network-centric business models play a critical role in enabling a region to act on the two dimensions. First, they help provide the tools for information sharing and align the cross-boundary roles, responsibilities and resources that can increase the comprehensiveness of planning and preparation. Second, they help increase the speed of mobilization and response to a crisis as key personnel know the location and level of resources, can communicate with enhanced interoperability, and can respond with greater situational awareness and clarity in purpose.

When a region uses a network-centric approach it can mobilize resources and people with greater speed than with older methods such as one-on-one contact and silo-based organizational communication. Thus, a region can exponentially increase its surge capacity and response ability – which is critical when attempting to mitigate a crisis that itself grows exponentially.

In a flu pandemic, for example, it is critical to know the pace, direction and intensity of infection in order to mitigate its spread. This type of situational awareness is only possible with advanced methods of information gathering, synthesis and sharing. In practice, the information gathering must come from public, private and community-based sources and all in real time. Then the information can be synthesized by experts within the health community and the Emergency Operations Center. Ultimately, the information can be shared with first responders in the field in order to make life-saving decisions.

> **"Old silo-based planning and response approaches to a major crisis just don't work. The new and most effective way is through better partnerships across agencies and sectors – the cross-boundary collaboration that improves our surge capacity and our ability to save lives."**
>
> **– George Miller, Oakland County**
> **Health Division Manager**

Oakland County Pandemic Exercise and Results

To understand how to implement a network-centric business model for crisis preparation and response, Oakland County officials partnered with the Leadership for a Networked World Program at Harvard Kennedy School and with Cisco to test innovative preparation and response policy and technology ideas during their most recent simulated pandemic crisis.

In this exercise, the overarching strategic goal of Oakland County officials was to see how effective they could be against a fast-moving pandemic influenza or similar viral-based attack by maximizing the number of citizens vaccinated in a 5- hour period. The results would give the county insight into the maturity level of its ability to respond in the case of a real crisis, and key insights into areas for improvement.

The tactical goal of the exercise was to integrate communication, information sharing, and situational awareness systems across boundaries (jurisdictional, organizational and sector-based) to allow the Emergency Operations Center to mobilize dispensing locations and the incident command structure as quickly as possible in order to provide community members access to life-saving vaccinations.

Oakland County officials and Harvard researchers tested two primary methods for achieving these goals – a new command and control structure for dispensing vaccines, and emerging technologies for interoperable cross-boundary communication and situational awareness.

> **"Situational awareness, information sharing and communication is critical when responding to a crisis. IP-enabled platforms enable us to interoperate both horizontally and vertically – assuring us agility and speed on the front lines."**
>
> **– Phil Bertolini, Oakland County Chief Information Officer and Deputy County Executive**

Command and Control of Vaccine Dispensing

The Oakland County Health Division (OCHD) took the lead role in the cross-boundary exercise, which included representatives from the county executive's office, the county department of IT, hospitals, police, fire and medical, and the broader community. As they would in a real pandemic crisis, the OCHD initiated the emergency response plan, setting in motion a number of activities including the activation of the Emergency Operations Center, the deployment of staff and responders, and the staging (setup and opening) of the vaccine-dispensing locations. A dispensing location is a facility at which trained personnel give the influenza vaccine by injection. Citizens were informed prior to the exercise that the county would be testing its ability to provide vaccinations in case of a pandemic influenza, and they were encouraged to participate in the exercise in return for an inexpensive flu vaccination. Citizens could either sign up for a dedicated time slot or simply show up during the exercise and get in line at one of seven dispensing locations in the county.

Communication and Situational Awareness Technology

To enable their policy goals and operations, Oakland County brought in Cisco to deploy a network-centric communication and situational-awareness platform. The exercise involved a broad array of organizations – from local and state agencies, to traditional first-response organizations (police, fire and emergency medical services), to allied agencies (such as power utilities or other enterprises), to other nongovernmental organizations such as local community shelters and the Red Cross – and all of them needed to communicate and work efficiently together.

Using the EOC as the system's hub, Cisco and Oakland County deployed the Cisco® Internet Protocol Interoperability and Collaboration System (IPICS), which enables interoperability between disparate radio networks and traditional communications networks. They also deployed the Cisco Video Surveillance Manager (VSM) solution which can use both analog cameras and IP cameras to stream visuals over the web directly to the EOC or to other devices. As IPICS and the VSM send data over an IP network they enable comprehensive communications interoperability between different networks and devices such as Land Mobile Radio (LMR) systems, push-to-talk (PTT) phones, IP phones, and PCs.

Exercise Results

After the exercise, the Oakland County and Harvard teams assessed the results and found that both the model of the response and the enabling technology worked synergistically, effectively enabling parties involved to communicate situational awareness, data, and ever-changing plans to team members across the county.

The command and control structure for the dispensing sites was highly successful. Upon entering the dispensing site, citizens were directed through a short process during which they filled out basic forms and received their vaccinations. At the dispensing locations a traffic system was put into place to manage the flow of citizens and the rate of vaccinations. Each location had a Site Incident Commander who oversaw the site operations along with staff who managed logistics, supplies, communication, information technology, traffic flow, vaccinations, public information, security, etc. Dispensing location staging plans were developed and a staff resembling a "tiger team" (a specialized group tasked with testing the effectiveness of an organization's ability to accomplish an objective) assigned roles and responsibilities that helped make each location operable within hours.

Having an interoperable communication system dramatically increased the effectiveness of Oakland County officials and responders. The exercise demonstrated that in a real pandemic, the Emergency Operations Center representative could stand in front of the IPICS workstation and pull up information from the health division on what the symptoms of the outbreak look like. While looking at this content on the screen, the official could have a real-time conversation with an incident commander who could be on an 800-MHz radio, a dispensing site official on a mobile phone, an official from the health department on a networked desktop computer, and a hospital administrator on a traditional telephone. While they are in discussion, the EOC official could add other users to the system such as a first responder on a mobile phone. The EOC official could also view in real time the video feeds of the dispensing sites as captured from the Cisco Video Surveillance Manager solution and provide critical information as to what is happening in the field (such as too many citizens flowing into one particular dispensing location), which could help the others change their strategies and make decisions based on accurate and real-time information.

Combining these innovative technologies with comprehensive cross-boundary planning enabled Oakland County to improve its overall effectiveness and efficiency from previous exercises. Some of the results include:

- Faster deployment of dispensing sites
- Faster citizen flow through dispensing sites
- Situational awareness and reduced confusion for EOC and first responders
- Enhanced collaboration in EOC and at dispensing sites

Some of the metrics gathered from the exercise include:

- Total number of actual vaccinations = 12,096
- Total number of dispensing sites staged = 7
- Total hours of operation = 5
- Number of county employees involved = 369
- Time to mobilize seven dispensing sites = 4 hours
- Number of inoculations per hour = 345

Building Your Capacity for Preparation and Response

How should your region approach building a network-centric planning and response structure? The first step is reflecting on what happens when regions plan and respond with uncoordinated and silo-based methods – resources are lost, response is delayed and people are harmed. This is the way of the past and citizens will no longer accept governmental responses similar to the uncoordinated efforts in response to Hurricane Katrina. Modern, cross-boundary collaboration models and network-centric capabilities are ripe for adoption, and public leaders must now embrace these advances to protect and secure the public trust.

Proceeding with network-centric models takes political, strategic and tactical engagement across a range of organizations and sectors. At the political level, the governor, mayor or county administrator must be able to coordinate all organizations under their purview, as well as those in the community and private sectors with whom they have relationships. The political leader must then be able to communicate the status of action and results to the media and constituents. Deploying a robust IP-enabled communication and information sharing system is critical to these efforts because information needs to flow from organizations, communities and people in an integrated way and must be understandable and actionable for leadership.

On the managerial and tactical level, officials and first responders must be aware of where their critical assets and people are, and be able to track them in real time. Having IP-enabled communication and situational awareness tools ready for both pre-event planning and event response enables officials to execute effective operational plans. Investment in new management structures and IP-based open platforms is reasonable: IP-based systems are open (built upon standards that can easily synchronize with other technologies) and thus can scale economically while preserving existing investments in analog-based technology.

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Summary

Responding to a pandemic crisis or most other types of natural or human-made disasters requires a community to act on two primary dimensions: comprehensiveness of planning and preparation and time of mobilization and response. The more advanced a region is in these dimensions, the higher its ability to respond effectively to a disaster. In action, this means a region must engage all of its resources – public, private, and community-based – and must be able to deploy those resources in a timely manner. Using a network-centric approach and solutions such as the Cisco Internet Protocol Interoperability and Collaboration System and Video Surveillance Manager can enable your region to share planning information and content across boundaries, to realize situational awareness and to respond to a crisis situation with increased speed and agility. This is ultimately what will save lives in your community.

About Leadership for a Networked World

Leadership for a Networked World (LNW) helps those exercising leadership to better understand and respond to the challenges and opportunities created by information and communication technologies and network-enabled business models. Founded in 1987 at Harvard Kennedy School by Dr. Jerry Mechling, LNW now works across the Harvard community and globally to provide uniquely powerful executive education, research and advisory services.

Current LNW efforts are focused on the challenges of innovation and change moving across traditional organizational boundaries: departments, jurisdictions, branches of government and sectors of society. These cross-boundary reforms represent the next wave of the many opportunities and challenges opened by information and communication technologies and network-enabled organizational models.

Leading successfully in this networked world requires executives to collectively make difficult decisions and choices about the level and pace of reform and change. By bringing together leading practitioners, academics and executives to share ideas and learn about governance, LNW strives to deliver creative solutions to real-world problems and enable lasting public value for pressing challenges. Find more information at www.lnwprogram.org.

About the Author

Antonio Oftelie is the executive director of the Leadership for a Networked World Program (LNW) where he guides overall program development, produces research on innovation in policy and technology, and teaches cases on leadership and strategic management. In addition, Mr. Oftelie advises senior government and business executives on organizational transformation by helping them to evolve their mission and strategy, ideate new business and service models, build adaptive capacity, and create performance and value measures.

Mr. Oftelie is a recognized expert in technology-enabled innovation and organizational adaptation and has directly advised and written for four governors, federal agencies, states, and numerous private and public companies on topics ranging from homeland security and pandemic response to economic development to product and service design to organizational collaboration, government relations, and public-private partnership strategies.

Mr. Oftelie holds a BS in Management and Ethics from Crown College and an MPA with a Business and Government Policy concentration from Harvard University where he focused his studies on leadership, finance, and public policy at the Harvard Kennedy School, and on strategic management, technology, and innovation at the Harvard Business School. He can be reached at antonio.oftelie@post.harvard.edu.

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Innovation in Policy and Technology for Pandemic Planning and Response in Oakland County Michigan

Context for Action

Influenza is a highly contagious viral disease. Pandemics occur because of the ability of the influenza virus to change into new types or strains. People may be immune to some strains of the disease either because they have had that strain of influenza in the past or because they have recently received influenza vaccine. However, depending on how much the virus has changed, people may have little or no immunity to the new strain. Small changes can result in localized epidemics. However, if a novel and highly contagious strain of the influenza virus emerges, in influenza pandemic can occur and affect populations around the world.

Within the United States, local and county governments represent the first line of defense against man made or natural disasters. In the case of a pandemic threat or incident, the local department of public health will lead the cross-boundary (planning, processes and procedures that cut across traditional jurisdictional, bureaucratic, or sector-based boundaries) efforts. In the event of a case or an outbreak of a novel influenza strain (a strain in which little or no immunity exists overall in the human population) in Oakland County, the Oakland County Health Division (OCHD) will take the lead in a wide variety of public health activities.

Oakland County was officially organized on January 12, 1819 when Michigan Governor Lewis Cass issued a proclamation establishing the new county's boundaries. The Pontiac Company offered to contribute both property and money to the establishment of a county seat in Pontiac, a central location no more than a day's journey from any point in the County. With the County seat established in Pontiac, the County was divided into two townships. The northern section was Oakland Township and the southern section would be Bloomfield Township. In 1827, Oakland County was further divided into five townships: Farmington, Bloomfield, Troy, Oakland and Pontiac. The first official census of the County was taken in 1820 and counted 330 persons. In the 2000 U.S. Census reports 1,194,256 persons now reside in Oakland County, which is the 2nd highest population for counties in the state, and 26th in the United States.

Based upon the Centers for Disease Control Program FluAid 2.0, the impact of an influenza pandemic on the approximately 1.2 million residents of Oakland County could include the following:

- 300,000 persons ill with influenza
- 36,000 persons hospitalized
- 840 deaths

These estimates underscore the need for advanced planning to lessen the impact of a pandemic, and it's up to George Miller, Public Health Manager, Sara Wade, Public Health Educator, and Phil Bertolini, County CIO, to lead this effort.

Innovation in Pandemic Planning

In order to mitigate a pandemic crisis (or most other types of natural or human-made disasters) *a community must act on two primary dimensions; comprehensiveness of planning and preparation and time of mobilization and response.* The more advanced a region is on these dimensions the higher their ability to mitigate a disaster such as a pandemic. In action, this means a region must engage all of its resources – public, private, and community based, and must be able to deploy those resources in a crisis situation with speed and agility. This is what ultimately will save lives and the community.

An emerging method for performing better along the two key dimensions is through "network-centric planning and response." A network-centric approach can be defined as one in which leaders and managers utilize information and communication technologies as a hub to share information and content across boundaries, to realize situational awareness, and to plan and respond for a crisis situation.

Network-centric business models play a critical role in enabling a region to act on the two dimensions. First, it helps provide the tools for information sharing and aligns the cross-boundary roles, responsibilities, and resources that can increase the comprehensiveness of planning and preparation. Second, it helps increase the speed of mobilization and response to a crisis situation as key actors know the location and level of resources, can communicate with enhanced interoperability, and can respond with greater situational awareness and clarity in purpose.

Innovative Network Centric Preparation and Response Increases Speed of Mobilization and Mitigation
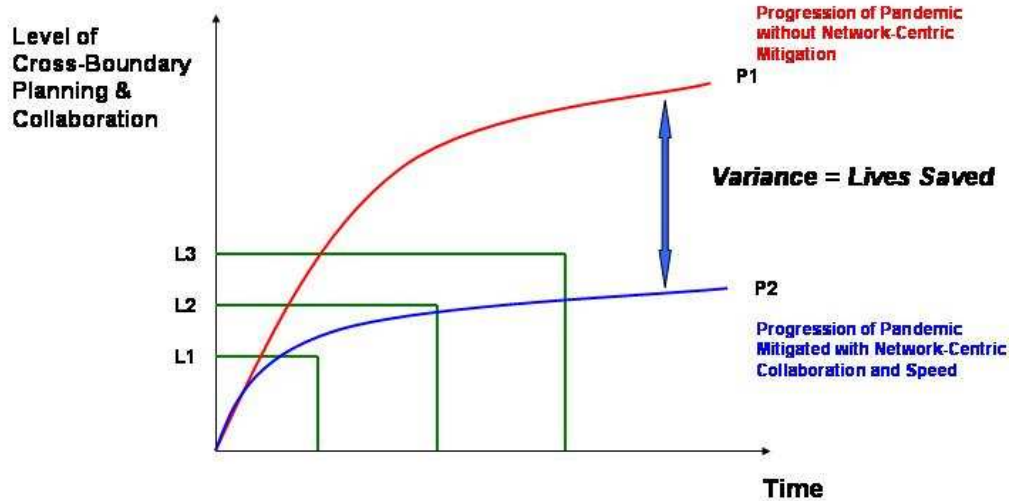
When a region uses a network-centric approach it can mobilize resources and people with greater speed than with older methods such as one-on-one contact and silo-based organizational communication. Thus, a region can exponentially increase its surge capacity and response ability – which is critical when attempting to mitigate a crisis that itself grows exponentially.

While the benefits of implementing new ideas like this are significant, there are many challenges and questions in making it happen. To start with, leading the level and pace of this type of change takes both political engagement at the highest levels and strategic and tactical engagement across a complex mix of organizations and sectors.

At the political level, officials must be able to motivate organizations, communities, and people to share the information and resources that form the underlying structure to plan together. And this must happen across traditional boundaries – jurisdictional, organizational, regional, and sector. Political leaders must then be able to hold these collaborations together during not only times of planning and calm, but also during times of action and distress.

On the strategic and tactical level, managers must be able to negotiate the agreements, develop the standards, finance the technologies, and execute the operational plans that make things work when it is time

to act. And this takes a deft hand, as leading the adoption of innovative policies and technologies will challenge organizations on both operational and social levels.

The regions that will be most secure in the future will be the ones that can master these challenges. And this is precisely what Oakland County Michigan is trying to do. As you read through this case and learn about Oakland County's efforts, think about how your region can become better prepared – and reflect on the opportunities and challenges that will present themselves on your journey.

Key Questions to Ponder:
- *At the political level, how can officials motivate organizations, communities, and people to share the information and resources that form the underlying structure to plan together? And how does this happen across traditional jurisdictional, organizational, regional, and sector boundaries?*
- *How can a political leader hold these collaborations together during not only times of planning and calm, but also during times of action and distress?*
- *On the operational level, how can managers negotiate the agreements, develop the standards, finance the technologies, and execute the tactical plans that make things work when it is time to act?*
- *How should they manage the adoption of innovative policies and technologies that will challenge their organization on so many levels?*

The Situation in Oakland County

The team in Oakland County is already ahead of the curve in preparing for a pandemic or viral crisis. The county has a comprehensive preparation and response plan and over the last three years the Oakland County Health Division (OCHD) has provided a mass vaccination clinic to exercise the public health readiness plans. The OCHD also reaches out to other partners and collaborates with county all-hazards emergency management teams, the Sheriff's Department, local fire and police jurisdictions, and local and regional hospitals and emergency medical services.

Yet, George, Sara and Phil were eager to be as prepared as they could be. They assembled their teams to assess the findings from their prior planning, exercises and experiences to determine where they need to go next in preparing for and responding to a major pandemic crisis.

The team found they had three significant areas for improving the maturity level of their overall abilities.

1. First – they need a common platform for integrating people, processes, technologies and tools.

2. Second – they need to extend the reach of the common platform to members of the community and private sector both pre-event and post event and with real-time scalability.

3. Third – they need interoperability of major communication devices during an event and the ability to gather and share situational awareness information.

Need #1: A Common Preparation and Response Information Sharing Platform

There are several communications, training and tracking software programs that Oakland County uses for emergency maintenance and operations. The Federal Government requires public health responders to take a number of training courses with the results being documented and the Emergency Operations Center relies on resource tracking systems to allocate staff, supplies, medications and other resources to the appropriate locations. However, at the current time, there is not one unique system that all responders utilize. Each entity, such as hospitals, police departments, as well as state departments utilize a different system causing data not to be incorporated into a mandated system.

In an emergency time is critical. Viewing and tracking multiple systems to determine where to send resources could cost lives. These separate entities that track resources differently need to communicate with each other. System integration is the most efficient way to communicate quickly and effectively, and a centralized system where information is documented and disseminated to various locations for viewing purposes will provide the county with information needed to make real-time decisions. The system would provide for integration of preparation and response plans across boundaries such as jurisdictional, public, and private environments and integrate "content" across organizations so that as one organization modifies its plan the other organizations in the network are updated in real-time in both the planning phase and the response phase. To ensure privacy and authority rules, the content can be communicated across different levels of the platform in a federated way across organizational boundaries and within the preparation and response hierarchy.

Envisioning a Scenario
The Oakland County team envisioned what an integrated solution would enable them to do. To start with, the pandemic preparation and response plan the county has could be more easily shared and distributed to all the partners in the county. The system would also enable real-time accuracy as when various agencies and units make modifications to the county's plan, the system would automatically update the other plans residing on it. In a time of a crisis, every first responder and official responsible for dealing with the situation would be working from the same plan.

And integrated solution could also bring about better communication between and among agencies and partners. For example, at a certain stage of a pandemic influenza, Oakland County activates select schools around the region to act as vaccination dispensing sites to the citizenry. Through an integrated system the Department of Health (DOH) official could send a real-time message to school officials notifying them to prepare for a dispensing operation. The Oakland County officials could then start viewing live video feeds of the dispensing sites and talk to school officials in real-time to provide advice and monitor the situation.

But Phil, Sara and George had questions on this - How do we mobilize numerous organizations to adopt a standard system? How do we finance a system across boundaries? Do we do it by some form of executive order or by some form of incentive?

Need #2: Extending the Reach of the Common Platform

The next gap to address and step at improving preparation and response was reaching out and extending the planning and response network to key partners in the community, educational, private and non-profit sectors. Couldn't there be a way to network in key Community and Corporate Response Officers (CRO) so that they then in turn could implement their internal response plans and help during a crisis they asked? And shouldn't we leverage their resources when applicable to improve the county's surge capacity?

First, in developing a "virtual community emergency operations center" (VEOC) they could extend the county's preparation and response platform pre-event by networking in key corporate response officers, hospital administrators, school officials, and community representatives with a "permission based view" into the system that enables them to input status and resource information and identify and network assets that pre-exist in their facilities and/or in the community. This data or "content" could then be integrated into the preparation and response plans.

Second, the system could then enable enhanced surge capacity during and post-event by extending the reach and scope of the county's emergency operations center (EOC) by real-time information sharing. All of the "content" loaded into the system can be tracked in real-time and integrated with situational awareness tools. For example, officials in the EOC and responders in the field will know exactly how many hospital beds are available across the county, what resources are staged at the local schools to help with triage or vaccination, and what the status is of resources and situations in key employer communities.

Envisioning a Scenario for Extending the Platform

What would a system like this look like in action wondered Sara, Phil and George? A new ability would be connecting with the private and non-profit sectors in a better way. For example, what if a corporate response officers was becoming concerned about the high number of employees in the facility and what

should be done next to communicate with them during a pandemic crisis. With a better connection between the county and the business the corporate response officer could log onto the extended system at the appropriate "permission level" to pull up the content from the pandemic response plan on steps for employers and pull up a bulletin that has been posted electronically on symptoms to look for. The corporate officer could then talk to the local incident commander to let him/her know the status of the employee base and to determine if he should let employees leave or stay for their safety.

Another example is in communicating with local hospitals. With better information sharing a hospital official waiting for a triage situation could look at content from the OCHD on the pandemic outbreak on a monitor and assess the level of readiness that is required. And if the hospital official became concerned with the signs, symptoms and volume of current patients and wanted more situational awareness on how many people potentially could be coming into the hospital he or she could connect with first responders in the field to gauge volume of patients. With better information sharing and situational awareness the hospitals in the region could have a better picture as to when to enact "Mutual Aid Agreements" among the hospitals in the region. Hospital officials could then start directing first responders to bring patients to the hospitals with adequate capacity.

Still, there were more questions on the feasibility of a system like this. With this new level of information sharing, how would disagreements be resolved? As information gets pushed out further to end users, what happens to the command structure during the crisis? And how should the county work with and integrate adjacent counties?

Need #3: Enhancing Communication and Situational Awareness

Over the course of the last three years, Oakland County Health Division has provided a mass vaccination clinic to exercise the public health readiness plans. The wide network of responders, volunteers and medical professionals require up-to-date information during an event. Through exercises such as Oakland County's annual flu clinic, communication has been identified as one of the largest gaps. Communication pathways have become congested when several dispensing sites are trying to communicate to a central location such as the Emergency Operations Center (EOC). During such an event, various community locations will need to provide status updates, resource requests, as well as to report emergency situations.

Phil, Sara and George wrestled with the issue of what type of communication systems to use. Although 800 Megahertz radios are touted as the standard device, they were concerned that the traffic on this type of system will be congested during a large scale event as public health issues may not be a priority for the communication towers. They also realized the need access to recordings of information during the event

and post event. Phil and George decided that some form of redundant communication with recording capability needs to be developed and deployed.

Lessons were also learned in 2003 when Oakland County was part of the Midwest Blackout which caused a power outage in several states. Without power many of the basic communication methods, such as television, radio and internet, were severely impacted. The event highlighted the reliance on communication and the need to develop alternative communication sources during an emergency. If cell phones are not functioning, there needs to be another form of communication available for first responders and public health officials. While 800 Megahertz systems are useful tools for police and fire response – school, hospital, and private industry response officials wouldn't have access to the system. And while most have access to the Internet, many times the software packages that are used to communicate are not compatible with one another. Additionally, telephone lines can be disconnected or malfunction.

In a public health emergency, there are up to 5000 people that may to be contacted and given direction regarding their roles and responsibilities. Currently, select people begin to contact staff and volunteers via work phones, cell phones or email. Many departments utilize call down lists to contact staff. The information consistently changes or can be misinterpreted via person to person and there is not enough time to call staff and volunteers on an individual basis.

To meet these new demands the team envisioned a system that would ensure interoperable and consistent communications across the various staff and teams commissioned during an event. The system would have to have features such as interoperable communications independent of the 800 Megahertz system, a "mass alert network" to send messages to staff, a mechanism that can record and store key conversations and data, and the ability to share and store situational awareness data such as information from cameras and sensors.

Envisioning a Scenario

Having an interoperable communication system would dramatically increase effectiveness during a crisis thought Sara, George and Phil. For example, an EOC representative could be standing in front of workstation and pulling up information from the OCHD on what the symptoms of the "outbreak" look like. While he/she is looking at this content on the screen he could be having a real-time conversation with an incident commander who is on an 800 MHz radio, a dispensing site official who is on a land line, and an official from the OCHD who is on a networked desktop computer. While they are in discussion the EOC official could add other users to the system such as a first responder on a mobile phone. The first responder could then provide critical information as to what's happening in the field (perhaps more infected people than originally anticipated) which would then helps the others change their strategies.

Or what if a police officer is on the scene at an "outbreak site" (a community location that may need to be quarantined) and is leaning into her squad car looking at a monitor and pulling up the pandemic plan section with the physical symptom description of the outbreak. The officer could talk with an OCHD official who is on a desktop, an EOC official via land line, and the Community Response Officer who is on a mobile phone at the same time. The officer could discuss with them whether or not she should "quarantine" the site or let people leave. Jointly, and in real-time, they could make a decision to quarantine the site.

Although Phil, George and Sara could see the benefits to building an interoperable communication system, they pondered critical questions – How would the county coordinate the performance and technical standards and infrastructure needed to align organizations on one system? Should the county wait for the federal government to set new standards or should they move forward on their own? Should the county look at IP-based solutions, other spectrum bridging solutions, or both?

A Look into the Future

As a way to better understand how their ideas would work in the real world, the team from Oakland County decided to test there new policy and technology ideas during a pandemic "exercise" conducted in the fall of 2007. The pandemic exercise was a way to test the preparedness and response ability of the county and community by simulating a pandemic crisis.

In this exercise, the overarching goal of Oakland County was to see how effective they could be against a fast moving pandemic influenza or similar viral based attack. The results would give the county insight into the maturity level of their ability to respond in the case of a real crisis. As a way to benchmark results the county had numerous goals including:

The Strategic and Primary Goal:
1. Maximize the number of citizens vaccinated in a five hour period of time.

The Tactical Goals:
1. Maximize comprehensiveness of cross-boundary preparation and ensure business continuity.
2. Mobilize dispensing locations and incident command structure as fast as possible.
3. Optimize situational awareness and control through interoperable communications.

Each of these goals was supported by innovative policy and technology ideas that were tested during the exercise.

Testing Emerging Policy

The Officials in Oakland County tested various innovative policies and operational procedures during the exercise. These policies can be categorized broadly in the following three components:

Citizen Communication Component: Citizens were informed prior to the exercise that the county would be testing its ability to provide vaccinations in case of a pandemic influenza, and citizens were encouraged to participate in the exercise in return for a low cost flu vaccination. Citizens could either sign-up before the exercise day for a dedicated time slot or simply show up during the exercise and get into line for a flu shot. Citizens were directed to one of seven "dispensing locations" in the county. Once at the dispensing site, citizens were directed through a short process in which they filled out some basic forms and received their vaccination.

Command and Control Component: The Oakland County Health Division (OCHD) took the primary role in this exercise. As in a real pandemic crisis the OCHD initiates the emergency response plan which sets in motion a number of activities including the activation of the Emergency Operations Center (EOC), the deployment of staff and responders, and the staging (set-up and opening) of the dispensing locations. The entire operation was cross-boundary in nature as representatives from the County Executive's Office, the County Department of IT, hospitals, police, fire and medical, and the broader community were all involved.

Vaccine Dispensing Component: A dispensing location was a facility at which the influenza vaccine was given via an injection by trained personnel. At the dispensing locations a system was put into place to manage the flow of citizens and the rate of vaccinations. Each location had a Site Incident Commander who oversaw the site operations along with staff that managed various functions such as logistics, supplies, communication, information technology, traffic flow, vaccinations, public information, security, etc. Dispensing location staging plans were developed and "tiger team" like staff were assigned roles and responsibilities that helped make operational the location in a matter of hours.

Testing Emerging Technology

The Oakland County team also tested some emerging technologies that could bolster and enable their policy goals and operations. These technologies can be categorized in the following ways:

- **Internet Protocol-Based Communications and Video System:** During a pandemic crisis Oakland County's response involves a broad array of organizations – from local and state agencies, to traditional first response organizations (police, fire, and emergency medical services),

to allied agencies (such as power utilities or other enterprises), to other nongovernmental organizations such as local community shelters or the Red Cross. And all of them need to work efficiently together to mitigate the effects of the incident. For the exercise, the county tested Cisco System's IPICS - an IP-based solution that enables comprehensive communications interoperability between different networks, devices, and agencies, such as Land Mobile Radio (LMR) systems, including Sprint/Nextel PTT phones, IP phones, and personal computers (PC). The county also integrated video surveillance into one of the dispensing locations and fed the live feed through to the EOC via IP.

- **Information-Sharing Platform:** The ability to share content and information both horizontally across organizations and vertically within an organization both prior to and during a crisis event is critical to the speed of response. With this in view, the County also tested various technologies that enabled enhanced exchange of key content and information among the participants in the exercise and extended the reach and scope of the County's emergency operation center (EOC). For the exercise, the county tested technologies that could bridge multiple teams, departments and organizations and enable geographically dispersed workgroups to collaborate seamlessly. Information on resources was shared in a way that it could be tracked in real-time and integrated with situational awareness tools. For example, officials in the EOC and responders in the field could know exactly how many hospital beds are available across the county, what resources are staged at the dispensing locations and what the status is of resources and situations in key communities.

Through these technologies the county wanted to test how preparation was affected and how they could improve their situational awareness, span of control, scalability, and efficiency of incident response. And ultimately, how these technologies enable their policy goals that lead to enhancing agencies' operational effectiveness and their ability to save lives and protect property.

Where Should Oakland County Go Next?

Upon the end of the exercise, the Oakland County team assessed the results and pondered what further steps they should take to improve their effectiveness and efficiency. Some of the anecdotal and preliminary results include:

- Faster Deployment of Dispensing Sites
- Faster Citizen Flow through Dispensing Sites
- Reduced Confusion and Situational Awareness for EOC and Responders
- Enhanced Collaboration in EOC and at Dispensing Sites

Some of the metrics gathered from the exercise include:

- Total # of shots/inoculations = 12,096
- Total # of dispensing sites staged = 7
- Total hrs of operation = 5
- Number of county employees involved = 369
- Time to mobilize seven dispensing Site = 4 hours
- Number of Inoculations per Hour = 345 P/H

With this data in mind the Oakland County team started to gauge their level of success and speculate on the future. In an actual event there would be about ten dispensing sites available in Oakland County for "shot based" (vaccinations that have to be given by an injection apparatus as opposed to a pill, patch or other form) inoculations. Assuming that the metrics from their exercise hold true, it would take Oakland County about 347 hours to vaccinate all of their residents.

Phil, George, Sara and the rest of the Oakland County team were please with the result from the exercise. But they pondered on questions about the future – Was our exercise a "win?" Would we be able to scale-up our plans enough in case of a widespread pandemic? What happens if citizens from neighboring and under-prepared counties stream to Oakland County during a crisis? What other new policy and technology ideas should we try?