A Review of North Carolina Public Health Response to Novel Influenza A (H1N1)

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Abstract

Pandemic influenza is a global outbreak of disease that occurs when a new influenza A virus appears in humans, causes serious illness and then spreads easily from person to person worldwide. Three major influenza pandemics swept the globe in the 20th century causing millions of deaths. With the emergence of SARS in 2003 and the variant avian influenza H5N1 in 2005, the federal, state and local governments have spent immense amounts of time, money and human resources on efforts to plan for the complex issues and serious impact of a new influenza pandemic. Plans developed were modeled on an all hazards emergency preparedness templates that were used successfully by those responding to natural/ or man-made chemical and fire emergencies. Until the spring of 2009, these plans were not effectively challenged beyond local or regional communicable disease outbreaks.

On April 23, 2009, the NC-HAN (Health Alert Network) sent a high priority message across the state of North Carolina indicating CDC reported 7 cases of new variant swine influenza A (H1N1) infection among residents of Southern California and Texas. All infected persons recovered. Within 24 hours, the number of new US cases began to escalate and more cases in Mexico associated with deaths were reported. The newest pandemic challenged and tested North Carolina local public health system’s ability to respond to a widespread communicable event. This offered an opportunity to examine plans and response through the review of events and reports from NC state, regional and local public health agencies. What was found was a reassurance that the framework of initial response is intact, plans are workable and partnerships to extend local resources are in place. Equally, there is a need to continue to improve and refine the
plans, processes and infrastructure to utilize these measures to prevent and contain
disease spread and to minimize poor health outcomes in people.
Introduction

After September 11, 2001 the federal government recognized the need to assist the local community in responding to man made emergencies specifically those biologics that could be weaponized. The anthrax event of October of 2001 that left 6 people dead, many others ill, and closed postal facilities, brought home the message of the need for a local public health coordinated response (Casani, 2001). Between 2003 and 2005, a series of natural respiratory influenza like illnesses emerged that reminded public health and emergency responders that diseases can have untoward consequences that require a strong public health infrastructure. In Asia, a new corona virus produced a contagious respiratory illness termed severe acute respiratory syndrome (SARS) that caused significant morbidity and mortality in Hong Kong and Canada. A variant of the H5 N1 avian flu occurred in the poultry flocks of the northern provinces of China causing human illness with deaths. Within 18 months, H7N7 caused illness in the poultry flocks of turkeys and chickens in Norway, decimating those flocks and causing conjunctivitis among workers and veterinarians tending the flocks. One death resulted. These events led the World Health Organization to convene a congress to consider planning and response to influenza like illnesses. Most of the member nations, including the US, put influenza pandemic planning at the top of their public health surveillance and response agenda.

Congress created the Pandemic and All Hazards Preparedness Act in January 2006, by amending the Public Health Services Act. This strengthened the infrastructure of public health and provided federal funding through the Center for Disease Control (CDC) to specifically address local pandemic influenza planning and response. Lessons learned from the historical framework of the 1918 and 1957 flu pandemics as well as the
more recent emerging infectious disease events of 2003 indicated there was much work to be done. Preparation was divided into creating a consistent language and organization of response through the Incident Command System, and multidiscipline local collaboration for planning and training was encouraged with funding to support those efforts. Understood was the realization that resources would be limited and capacity building at the federal, state and local level would be needed. Interventions such as non pharmaceutical responses, vaccines and antiviral distribution needed to be prioritized and implementation guidance developed. It was recognized that risk communication and public information messaging would be the key to a successful response as little could be done without the cooperation of the public.

**Public Health in the US**

Public health in the United States is a system with wide variations in organizational structure. Responsibilities and boundaries overlap across federal, regional state, and local jurisdictions. Governmental, private, for profit and not for profit agencies or organizations may provide traditional public health functions of surveillance, disease prevention, health risk reduction, and assurance of access to health care. Defining public health can be elusive. Public health has been described as “a social enterprise that is inherently political in nature based on the principles of social justice that dictates fairness in distribution of benefits and burdens and whose primary responsibility it is to fulfill society’s interest in assuring conditions in which people can be healthy” (Institute of Medicine [IOM], 2003).

Public health is often portrayed as neutral, when at it’s best nothing happens - no epidemics, food and water are safe to consume, citizens are well informed about their
health risks and needs and children are immunized. In the absence of catastrophic events, politicians and officials managing resources are often not able to recognize the work needed to sustain that absence and funding for public health efforts are redistributed to other perceived immediate needs (Garret, 2000). Because of this, between the 1980’s and 1990’s, every state in the US lost funding and personnel in key governmental public health infrastructure roles at the local and state levels as resources were redistributed to meet other priorities.

The challenge to respond effectively due to the loss of public health infrastructure became evident with the 2001 anthrax event and emergence of biological influenza like epidemics of 2003. As a result, the recognition that public health was needed and should be responsible for pandemic preparedness and response is now recognized as part of “assuring conditions in which people can be healthy”.

With the bolstering of public health capacity comes the responsibility for public health preparedness and planning. In his book Public Health, What it is and How it Works, Turnock (2004) makes the point that preparedness and response are inextricably linked. Preparedness is based on lessons learned from both actual and simulated response. Effective response is all but impossible without extensive planning and thoughtful preparation (p 313). After 2003, states began the process of recreating the public health infrastructure at the state and local level to enable effective response to influenza like illnesses. Determining the most efficient and effective methods to become prepared for and responsive to public health emergencies would challenge the infrastructure.

Based on the requirements of the federal directives in both bioterrorism and pandemic influenza preparedness, states and localities began to shore up the public health
system to fulfill the primary role of public health. Public health is always called upon to identify problems that call for collective action to protect, promote and improve the health status of a population primarily through prevention, containment and control (Turnock, 2004). Priorities for building the base of pandemic influenza planning included epidemiology and surveillance capacity, laboratory infrastructure, communication, supply and delivery of pharmaceuticals, health care needs and continuation of community services (Gensheimer, Meltzer, Postema, & Strikas, 2003).

In 2003, the Center for Disease Control (CDC) began providing guidance for preparedness that centered on adopting standardized response nomenclature, putting capacity resources in place, and setting specific targets and deliverables required by the public health organizations receiving preparedness funding. In the guidance were clear recommendations to rebuild the public health infrastructure of surveillance and epidemiology. The 2005 Institute for Medicine (IOM) recommendations also included a specific call to action to rebuild and sustain public health by educating and training the microbial threat workforce (Smolinski, Hamburg, & Lederberg [Eds.], 2005).

In addition, the US Department of Health and Human Services (HHS) released the nation’s Pandemic Influenza Plan in December 2005. This document was intended to be a guide for state and local planners to develop local response plans and assist local public health agencies in preparedness planning.

**Public Health in North Carolina**

Many states including North Carolina chose to use the federal resources to build effective response teams to supplement local public health efforts. North Carolina public health preparedness began in post 9/11/2001, when the North Carolina Division of Public
Health (NC DPH) was awarded seed money from the State “Rainy Day” fund for bioterrorism preparedness. As in other states, additional federal grant money through the Centers for Disease Control and Prevention (CDC) became available allowing NC DPH to expand this program. In 2002, an office dedicated to public health preparedness was opened within the Epidemiology Section of NC DPH. This office is now known as the Office of Public Health Preparedness and Response (NC PHP&R). The NC PH preparedness and response system was intended to function as a coordinated network of NC public health agencies, linking key resources, personnel, and capabilities across the state, regional, and local levels. In North Carolina, health policy and rule making are invested at the local level with the local Boards of Commissioners and Boards of Health. The NC PH preparedness system allows for the distribution of responsibility for preparedness and response throughout the state however, ultimately emergency response occurs at the local level (Brogden, L. & Easterling, D., 2009).

Based on the directives of HHS and the CDC, all state and the local public health agencies will coordinate the pandemic influenza response within and between their jurisdictions. State and local responsibilities include:

- Enhancing disease surveillance
- Distributing public stocks of antiviral drugs and vaccines
- Providing local health providers guidance on clinical management and infection control
- Preventing local disease transmission using a range of containment strategies
- Providing ongoing communication with the public
Current National Capacity:

Capacity building in public health began in earnest after September 11th. Unprecedented federal resources for enhancing public health were made available in the aftermath of the respiratory illness events (Gensheimer, K. F., Meltzer, M. I., Postema, A. S. & Strikas, R. A. 2003). Public health systems on all levels increased the infrastructure necessary to carry out public health emergency response.

Public health at the national level is administered through US Department of Health and Human Services (HHS). HHS is composed of many divergent health services and health related subdivisions. The health related agencies do include those most closely associated with emergency preparedness; the CDC, the National Institutes of Health, and the Food and Drug Administration. A review of the budget indicates that 85% of net operating costs for HHS is consumed by health services agencies that control Medicaid and Social Security functions leaving limited resources for public health functions (HHS, 2008). Although “The U.S. Department of Health and Human Services (HHS) is the government’s principal agency for protecting the health and well-being of all Americans” it has no direct line authority over the functioning of public health at the state or local level. The government’s role in public health emergency response is setting the agenda and policy with clear directives for outcomes that are expected and to provide resources to achieve those outcomes. The capacity to fulfill that role has been augmented by government support of homeland security issues and federal emergency response agencies. State, tribal and local levels cooperatively implement federal mandates and policies through funding agreements.
Across the States, public health systems and their associated capacity vary widely. The National Association of County & City Health Officials (NACCHO) recently published 2008 National Profile of Local Health Departments (LHDs). A survey across the 50 states was done and the results are a testament to the diversity of local public health systems in the United States. There are 2,794 LHDs across the 50 states. Of those, 64% serve populations less than 49,000 and 60% are individual county based departments. Health departments in twenty-nine states are governed primarily by local authorities (boards of health, local officials) including North Carolina. The remainder are state governed or in some shared governance of state and local authority. Sources of revenue supporting the local public health system includes State and local funding 45%, fees, Medicaid, Medicare reimbursement 28%, Federal pass through 17%, with Federal direct 2% and other sources 9%. In NC, only 8% of funding is from Federal pass through which includes funding for public health emergency preparedness. CDC funding for emergency preparedness came to LHDs through state health agencies in three funding streams: base funding, pandemic flu funding, and cities readiness initiative (CRI) funding. Of the LHDs surveyed, 23% received no funding for base emergency preparedness and even more reported not receiving funding for pandemic influenza or CRI. Median funding received was $45,700 and varied widely by the size of the population served.

Funding for public health preparedness in North Carolina is based on local funding through the county tax base, State funding to assist the locality in carrying out core public health functions and CDC administered grant funds originating from the Federal government and passed through the State to the local jurisdictions. Each of those
funding streams is tied to expectations, deliverables and requirements set by the source. Preparedness activities center on those expectations. Understanding the interrelationship and capacity of the three levels and funding expectations is crucial in promoting an effective public health response system.

The staffing profile of the NACCHO survey respondents show that 59 percent of all LHDs had less than one FTE supported with emergency preparedness funding, 20 percent with one to less than two FTEs, and 22 percent with two or more FTEs. In spite of only 57% of LHDs surveyed reporting an emergency planner on staff, more than 80 percent of LHDs had developed or updated a pandemic flu preparedness plan, participated in a tabletop drill or exercise, and/or provided emergency preparedness training to staff. In addition, most LHDs had selected a method for mass prophylaxis. Mutual aid agreements had been developed by 59 percent of LHDs overall and Medical Reserve Corps development was reported by 39 percent of all LHDs.

**Capacity in North Carolina:**

Early in 2009, the North Carolina Division of Public Health (NC DPH), and the NC Association of Local Health Directors (NCALHD) contracted to assess public health preparedness across the State of NC (Brogden, L. & Easterling, D., 2009). The assessment was designed to capture key indicators from the state, regional and local public health system and was intended to describe the current level of readiness and identify critical issues for system improvements.

The assessment indicated the North Carolina public health preparedness system builds on assets associated with North Carolina’s overall system of public health. NC DPH and local health departments have long histories of communicable disease response,
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epidemiology, laboratory analysis, and environmental health investigations. Federal funding has allowed for new positions, additional training, upgraded technologies, and new systems and equipment for communications. Critical capacity expansion of the NC State Laboratory of Public Health (SLPH) and the development of three Regional Public Health Laboratories has enhanced the surveillance and identification of potential risks. Implementation of data systems that support automated syndromic surveillance (NC DETECT), emergency notification of key public health partners (NC HAN), and management of disease investigation data (NC EDSS) allows the state and local public health agencies to trend and investigate communicable disease threats. North Carolina has used federal funding of preparedness planning and response to increase infrastructure personnel, activities, and resources in the 85 local health departments in the state; including the creation of seven Public Health Regional Surveillance Teams (PHRSTs) who support the activities of the local public health agencies.

The greatest strength of the North Carolina public health system may be the many dedicated professionals with extensive public health emergency experience (and the public health components of natural disasters) and a strong culture of working together that contributes to the effectiveness of the NC system. All three levels, state, regional and local public health representatives are united in a common understanding of epidemiology and surveillance, contacting and communicating with response partners. All three levels recognize the need to have personnel trained and knowledgeable in preparedness as needed capacities to fulfill the public health response role.

Although the NC preparedness system has a number of important strengths, several limitations were identified by state level respondents. North Carolina is a large,
geographically diverse state. There is tremendous variation between the 85 county and district health departments in the level of resources available to LHDs. Especially in smaller counties, limited funding and/or personnel can inhibit the local health department’s ability to support a full-time Preparedness Coordinator (PC) and carry out the range of functions associated with public health preparedness. Grant guidelines from CDC require each local health department to adhere to the same deliverables and contract requirements, even though there are considerable differences in county (or district) populations, vulnerability and risk, and relative wealth. This limits the flexibility of planning and response options in communities. Because the local public health agencies are governed by local authorities, the high degree of local autonomy can pose problems in effective preparedness and response. During an emergency, it takes longer to coordinate multiple agencies across the state. Additionally, numerous layers of administration can be a roadblock that slows down the response. The division of authority and competing priorities inherent in the system can also lead to conflict between localities and the state. Local health departments vary in terms of the degree to which the local Health Director, local Board of Health, and local elected officials are committed to preparedness.

Challenging the system? What happened?

The NC PHP & R described the April-May response to the emergence of novel H1N1 flu variant as an exercise allowing public health to test surveillance and laboratory systems. In April 2009, cases of infection with new variant swine influenza A (H1N1) were identified through routine surveillance. The cases exhibited symptoms typical of uncomplicated influenza infection (fever plus cough and/or sore throat) and appeared to
be unremarkable as influenza like illness. However, the rapid identification of the unusual variant of H1N1 through existing surveillance systems made it clear the surveillance system worked. Plans put in place to “catch” an emerging infection resulted in the US public health system’s ability to recognize and initiate response across the country using the Health Alert Network. Initial response actions to emerging novel H1N1 was case finding, enhanced surveillance and pre positioning resources.

On April 26, 2009 the US government declared a public health emergency allowing resources to be released through the Strategic National Stockpile (SNS), the federal government’s cache of pharmaceuticals and medical supplies. The declaration also allowed greater access to laboratory and surveillance resources by the States. By April 29, 2009, the spread of novel H1N1 was felt worldwide. Consequently, the WHO raised the pandemic alert level to Phase 5. On a national level, the CDC began issuing guidance and updates for both clinicians and laymen.

On April 24, 2009, the public health units across North Carolina were notified about the “novel” swine H1N1 influenza. One local health department preparedness coordinator mentioned the cases in the southwestern part of the US as an FYI in an Epi-team meeting that was called to discuss a current case of Pertussis. By April 27, 2009, local public health departments and systems began to mobilize key staff and were receiving updates and guidance from NC PHP&R. Also on April 27th the decision was made at the federal level to deploy 25% of the Strategic National Stockpile (SNS) to the states’ receiving sites. These supplies were to be shipped to the jurisdiction’s local receiving sites. Shipments began to arrive in Raleigh within days. The local public health departments initiated their pandemic influenza plans and contacted their key community
partners for assistance. A review of local after action reports across North Carolina (unpublished reports, NC PHP&R, 2009) indicates the health department systems responded by immediately instituting case investigations related to spread of H1N1(Novel) and applying isolation for mitigation as warranted and directed by NC DPH. As soon as clear clinical guidance was received from NC DPH, localities began educating staff and clinical partners on protocols for case investigation and reporting. They began working with community emergency management and response partners to provide guidance about mitigation measures, including school closures. Within 2 working days local public health agencies had initiated the process to receive antiviral medications and other medical supplies at the local receiving sites from the Strategic National Stockpile by working with the local law enforcement and emergency management personnel. By day 5, the agencies had distributed the appropriate inventory to local hospitals and securely stored the remainder of local supplies. A risk communication media message map was begun within 24 hours of the realization this was a new pandemic in order to provide important information related to key activities or events in the H1N1 response to the public. Localities also began establishing information centers with their local government partners.

In North Carolina, the Public Health Coordination Center was established in Raleigh by NC PHP & R and daily updates provided to local health departments. The State Laboratory of Public Health (SLPH) began around the clock operations in an attempt to keep pace with all specimen submissions. Guidance in surveillance, treatment, protection, and prevention was issued.
By May 7, 2009 there were 7 confirmed novel flu cases in North Carolina and the SLPH had processed 496 specimens. By June 25 the number had increased to 179 confirmed cases with 2 deaths.

**What we learned**

Locally, public health departments spent the years 2001-2009 writing emergency preparedness plans to address the areas of bioterrorism, pandemic influenza, natural disasters, and receipt and processing of the SNS. Those plans were exercised with agency partners in their community and agreements are now in place with those partners to identify agency responsibilities and processes. Use of the National Incident Management Systems protocols through common language and roles allowed public health to understand the structure of emergency management.

A basic tenet of emergency preparedness and response is the concept of evaluation of all events to determine what went well, where the gaps in response occur and what areas can be improved (Federal Emergency Management Agency, March, 2009). In addition, public health must continually evaluate the impact of those health programs to improve outcomes. The NC PHP&R requested local public health Preparedness Coordinators submit after action reports for the time period of April 23, 2009 thru May 19, 2009 in order to examine gaps and consider improvements that can be made. Forty-nine local public health agencies responded representing over 70 local health departments in North Carolina. The after action report format was a simple matrix of what happened, what went well, improvements needed, identification of the responsible parties for corrective actions and a time line to achieve the improvement. The results provided a look at the effectiveness of response to the pandemic H1N1 influenza event in
North Carolina (Appendix A, Table 1). In addition, NC PHP&R also received drill reports and hotwash minutes (evaluation meetings held immediately after an event) from several local public health agencies.

Local public health agency reports indicated commonalities of strengths and areas of needed improvement in the response to novel H1N1 influenza. Surveillance systems in place worked, enabling rapid detection of possible cases. This, in turn, allowed for implementation of the pandemic influenza plans. However, existing plans were based on the premise of a novel pandemic beginning as an avian based virus in Asia and would need to be slowed and contained upon reaching the US. Case finding and surveillance response to a virus originating more locally required a faster response with reduced likelihood of containment. Because the situation changed so quickly, local health care providers depended on the local public health agencies for clinical guidance in case identification, testing and treatment. Maintaining surveillance activities, managing and disseminating quickly changing information stressed the capabilities of the local public health agencies.

Review of the reports also found infrastructure and capacity needs with concerns for staffing the response when balancing the needs of the daily operations. In this event, cases were few in North Carolina and did not necessitate the closure of services normally provided or reallocation of essential resources. Many localities spoke of the need for additional back up personnel in key positions because of fatigue or lack of available trained personnel needed for the role. Training for staff was also identified as a capacity need. Local public health agencies need epidemiology training for staff, respiratory protection plan updates, and overall just in time training plans for roles in event response.
None of the reports indicated a strong medical reserve corps volunteer base to assist with personnel surge capacity in the event.

Technological capacity for communication and resource tracking was another gap identified in the reports. Twenty four hour hot line capacity, inventory management system and better radio communications between inter and intra agency partners were concerns for local public health agencies. Further, better use of internet capabilities for messaging and communication was also noted as a need.

As indicated by the local public health agencies, the basic receipt of antiviral and respiratory protection supplies through the Strategic National Stockpile (SNS) was accomplished with little complications. However, local public health agencies did recognize the need to improve the decision making process in deciding how to release those supplies to best benefit the community. Public health agencies are charged with determining priority health interventions and mitigation efforts such as education, mass vaccinations or medication delivery that will reduce the risk of future cases of disease or complications. Making decisions regarding distribution of resources was more difficult when many local public health agencies found local health care providers and emergency services providers did not have the necessary training in respiratory protection.

Training of local public health agencies staff and interagency partners in the overlap areas of SNS and isolation and quarantine issues was also identified as common issues that needed to be addressed throughout North Carolina. Training needs included determining use of public health measures such as school closures and other methods of social distancing.
By and large the most common theme of the reports was a need to improve communication in all directions from the State to the local jurisdictions including inter- and intra-agency partners, local public health agency staff, and the general public. Capacity building in risk communication, message mapping and recognizing and supporting the role of a trained public information officer was identified consistently throughout. Several local public health agencies noted a need for a clear risk communication plan. Local public health agencies were stretched by public and partners’ desire for information while from the federal and state authorities information changed rapidly and at times appeared to be inconsistent and incomplete.

Review of LHD after action reports, drill reports, and “hotwash” local health department team meeting minutes (unpublished reports to NC PHP&R, May 2009) indicates successful collaboration and cooperation among state, regional, and local public health participants and successful distribution of SNS assets to local public health agencies and other healthcare providers. The reports support the capacity of local public health agencies to respond resulting in the successful implementation of incident management procedures as defined in local health department plans. The reports reflect the ability of local public health agencies to coordinate and communicate situational status to the interagency partners, adjust to necessary changes to local receiving sites procedures and the ability to plan, conduct, and evaluate a regional event at multiple sites, using multiple communication modalities, with multiple agency representatives.

Most local public health agencies agree the plans in place for responding to pandemic influenza and use of SNS assets were effective and could be operationalized, but needed to be modified. Some of the adjustments were locality driven and spoke to a
need for alternative local receiving sites, additional equipment needs and needs to update contact lists and practice call down drills. Common recognized modifications to plans include a need to link and coordinate the two plans, SNS and Influenza Pandemic Response, including recognition of different triggers for response. Within the pandemic influenza plan, a need to provide more decision making guidance in isolation and quarantine and for deciding when school or public event closures should occur based on the local needs. Also noted was a need to rethink partner possibilities to include pharmacists and other non physician healthcare partners.

Support for plan revisions is made by the NC Office of Public Health Preparedness and Response. In a presentation to local public health agencies on September 24, 2009, Dr. Julie Casani stated the North Carolina pandemic influenza plans were based on the incorrect assumption that pandemic strain would be a shift from an H5N1 influenza A virus and the morbidity and mortality would be as severe as H5N1. The pandemic would start overseas and we would be able to slow its spread to the US. Much like a hurricane, the US would have time to prepare. Because of this incorrect assumption triggers and thresholds were based on WHO phases and ignored the other model intervals and triggers. In spite of the fact that North Carolina has responded effectively, plans need to be adjusted and updated before the next phase or pandemic.

Recommendations

Prior to September 11, very few people including public health professionals considered the role of public health in emergency planning and response. After 9/11 the attitudes held toward public health by the community at large, partner agencies and public health practitioners and the roles the public health professionals were expected to
perform changed and grew more extensive. The daily mission of public health is to assure the conditions under which people can be healthy. The substance of public health consists of organized community efforts aimed at the prevention of disease and promotion of health. Integrating the expectation of today’s public health professionals to include emergency planning and response into the daily mission and essential services can strengthen public health and encourage a commitment to public health emergency response. While recognizing local autonomy in local health departments does cause variation in degrees of commitment to preparedness and funding for local public health does vary across North Carolina, local public health agencies and local boards of health need to embrace the concept that emergency preparedness is a core public health function commit the necessary resources and time to improve services and outcomes (Brogden, L. & Easterling, D. 2009).

As noted previously, national indicators and local response reviews are clear that the need for more competent, well trained staff exists across the state and the localities. Preparedness and response coordination, communicable disease/epidemiology support and public information coordination were vital skills needed in the response to the novel Influenza H1N1 event. Local public health agencies need to consider public health emergency response competencies such as those when reviewing job descriptions and making agency hiring plans. Those roles key to planning and response need to be filled with competent individuals as soon as feasible. It is recommended that local public health agencies review staffing needs of the organization in a response event and determine how to support those needs through volunteer pools and partnering with local healthcare providers or other agencies. In addition, they must consider the need to plan for key
personnel to be unavailable for their primary role during an event. Many local public health agencies have staff with response roles during an event that is different from the primary position they fill in ordinary operations. For example, the designated public information officer in a public health emergency may have the role of administrative assistant to the local health director during normal business. This can limit the staff member’s availability to perform the role of administrative assistant when needed for risk communication in an event that is not so large as to curtail normal services. Planning needs to be done to determine how both roles can be adequately met in a response event.

A 2005 survey conducted by Balicer, Omar, Barnett and Everly in Maryland local health departments indicated that only about 53.8% of public health workers would report in an influenza pandemic event. Of those surveyed, only 38% felt they were knowledgeable of the public health impact and less than 30% understood their role in a public health emergency. Over 80% recognized the need for additional preparedness training and education. The issue of workforce training and competency is central to the success of any public health systems. Public health has an obligation to have human resources to respond who understand their roles and are practiced enough to be flexible in implementation of local plans. Public health professionals need to understand and be able to articulate their unique role in preparedness and response. Certainly this was found to be true by NC local public health agencies when evaluating their initial response to novel Influenza H1N1. In North Carolina, both local health directors and the regional public health response teams recognized the need for additional preparedness and response training, especially for new Preparedness Coordinators (PCs). It is recommended the State provide that orientation and training to new preparedness staff and that regional
PHRSTs assist the local public health agencies to provide training to all the staff of the local public health agency. The local public health agency has a responsibility to make training a priority and to put processes in place that will assure new staff understand their role and that continuing staff have regular updates and drills to sharpen their skills.

In the model Pandemic Influenza Plan (HHS, 2005), it is noted that planning is not to be done in a vacuum but must include all community responders and the influenza plans must be congruent with already established emergency response protocols and plans. In the local plans, establishment of community-based task forces and collaboration between local governmental agencies that support response is the basis for extending scarce resources and reducing duplication of effort. Public health now takes a lead role in either initiating the community planning process or participating actively in the process.

In the review of the North Carolina public health response, local public health agencies have made great strides in accomplishing a high level of collaboration with interagency partnerships. However to continue to maximize results, a process needs to be in place to maintain those relationships and to establish effective communication avenues before, during and after an event. It is recommended that local public health agencies develop an electronic database of inter- and intra-agency contact information that has reminder flags to trigger review and updates on a regular basis.

In addition, local public health agencies are encouraged to expand formal collaboration with adjacent jurisdictions. Sporadic drills and exercises are held across county lines but there are few formal processes to establish sharing of best practices that include determining effective approaches to planning and exercises, response models and resource sharing (Brogden, L. & Easterling, D. 2009). The PHRST network and local
health director forums allow for public health inter-jurisdictional meetings and sharing systems but seldom do other agency planning partners have an opportunity to collaborate collectively with local public health agencies across jurisdictions. Diverse organizations and agency partners would benefit through face-to-face networking when engaged in community planning. The logical entity to coordinate this process is the Public Health Regional Surveillance teams and with support from local public health agencies efforts can be made to create annual regional community response planning opportunities that include all agency partners, not limited those to public health and emergency management.

Preparedness planning for public health emergencies also includes a framework to address isolation and quarantine as non pharmaceutical methods of controlling and containing pandemics. Because of the lessons learned from the 2003 SARS event in Toronto, it was clear that legal issues surrounding isolation and quarantine can hamper crisis response (Campbell, 2004). Since 2005, federal regulations have moved to fill legal gaps to support decision making at the time of a pandemic event. Guidance from the Congressional Research Service (Swendiman and Jones, 2009) indicates the issues surrounding isolation and quarantine, volunteer management, closure of public services and business, and worker compensation still need to be addressed but that case law has clarified some of the issues. In the North Carolina response to novel H1N1, state guidance for instituting isolation and quarantine was given to the local public health agencies. However gaps in the knowledge base of interagency partners, such as local law enforcement and local community leaders, could lead to enforcement issues in a pandemic outbreak. In local public health response planning it is important that state and
local statutory provisions are reviewed locally with community authorities to assure the pandemic influenza plan has the legal support to implement needed control interventions in a crisis. To that end, local public health agencies need to provide ongoing regular training to their boards of health, county commissioners and law enforcement entities. This can be supported by the NC Association of Local Health Directors (NCALHD).

State and local public health agencies utilize the tools of epidemiology to establish active and passive surveillance methods that allow for timely recognition of potential threats. Preparedness and response rely on monitoring patterns and analysis of those patterns to help put in place prevention activities or mitigate poor outcomes (Turnock, 2004). This allows local public health organizations to determine extent of disease within a community and to identify priority health problems in the affected community. In local public health agencies in North Carolina there is a need to improve training in the use of the existing passive surveillance system in place. While computer based surveillance tools exist that collect data from emergency departments and emergency responders, there is a need in local public health agencies to have trained staff to utilize these tools. In addition, regional trending has been neglected at the local level. Because of concerns with protected health information, the epidemiologist or communicable disease nurse in one county cannot view the numbers or locations of cases in an adjacent county so little data comparison and analysis is able to be done at the local health department level. The overburdened system capacity of local public health also contributes to a lack of time and resources for case investigation and analysis. It is recommended that a process be established to allow those responsible for local level surveillance to share information and collaborate on data analysis, review existing
research, and investigate cases to determine case definition, identity, source and modes of transmission and risk factors. These measures will reduce the burden of the local health departments by creating multicounty epidemiology/ surveillance positions with the intent that more effective control methods can be recommended from this information leading to better regional and local health outcomes. It would follow this could be expedited and coordinated through PHRST with a medical or nurse epidemiologist taking the lead.

One of the primary roles of local public health planning is in preparing to make decisions on acquisition and distribution of antiviral drugs and vaccines (HHS, 2005). The HHS guidance holds the expectation that the plans made for pharmaceutical interventions will be jointly exercised across agencies and community partners to test response capabilities locally. While the plans currently in place were effective in responding to novel Influenza H1N1 and receiving the SNS, local public health agencies need to systematically review and modify those plans in light of inaccurate assumptions made about origin of the source of the virus. It is recommended that plans be adaptable to what is occurring with a realization the data may not be pure and the environment can change rapidly. Revised plans should be scalable with a process and a plan for progression. In order to meet the changing environment, plan revisions should have details on how information will be obtained, connections will be made and new partner or resources will be engaged (Casani, 2009). Recommendations would also include a focused intent to mesh the SNS and Pandemic Influenza plans to assure coordination and cohesion of planning and response. The burdens associated with developing preparedness plans could be lessened by providing local public health agencies with plan templates. However, it is recognized that templates are more appropriate for some health
departments than for others and there needs to be a commitment at the local level to
invest the time to adapt the template to the local needs in consultation with community
partners.

Public health determines and recommends those preventive and treatment options
that will reduce the burden to the community before, during and after an event. To be
effective in that role, local public health agencies need to critically plan for decision
making about public health measures that will reduce risk to the community. Most local
agencies need to begin or fine tune plans with local health care providers and other
community partners about the safest and most effective process and methods for
delivering public health mitigation interventions. Those plans need to include a process
for determining decisions based on the magnitude of the event. Training and plans for use
of respiratory protection equipment need to be put in place. Decision making and
partnering to plan distribution of medication and administration of vaccine to those at
greatest risks needs to be reviewed and become more scalable. Previously written plans
for mass distribution clinics at predetermined sites will not meet the needs in a localized
or smaller event. This could be a role for the PHRST to provide training curricula,
assessment, and planning model templates.

Public health agencies have a significant role in health messaging to provide facts
and data to the citizens. The lessons learned from SARS and Katrina clearly illustrates
the public’s need to hear the extent of the risk from a trusted source. If the public
understands the source of the health threat, the risks, and what they need to do to protect
themselves, the response is much better and lives are saved because interventions are
successful (North Carolina Institute for Public Health, 2003). In today’s information age,
the public expects to have that information immediately in a format that is fast and factual. Clear risk communication plans need to be developed and practiced at the local level. Templates for all levels of communication need to be in place delineating who at the local level is responsible for communicating with the staff, partners, local healthcare providers, and the public at large. Also included in that plan would be the process and method of communication with the various entities encouraging use of multiple electronic communication methods such as texting, e-mail, web based social networking, and hard devices such as radios, fax and phone communication. Training for those designated to be responsible to give public messages on behalf of the agency including how to coordinate those messages with the state, regional and other local agencies is needed. Little time has been spent in preparing for this role that is only visible on an as needed basis in most local public health agencies. Because this has not been a high priority need in most local public health agencies, it is appropriate for the NC DPH to provide guidance, consultation and training to the localities. Certainly it is the responsibility of the state to provide the locality with a consistent message map and health information resources appropriate to the event.

In reviewing the recently completed North Carolina public health assessment (Brogden, L. & Easterling, D., 2009) and the local public health agencies after action reports, drills and meeting reports, respondents agreed there needed to be improved communication and coordination between NC PHP&R, local public health agencies, and PHRSTs. In North Carolina, preparedness and response is only one of many important functions and services provided by local public health agencies. To improve response to public health threats and increase local commitment, reduce preparedness planning
around low-probability, high-impact event such as a bioterrorist event. Instead use this real event to focus planning and preparedness on events more likely to occur. A more balanced relationship/partnership between NC DPH and local health departments would assist in each entity better serving the community. To that end, increase more face-to-face dialogue between local public health agencies, PHRST and DPH personnel to allow for a better understanding between all parties, and the opportunity to maximize resources and reduce duplication of efforts.

**Conclusion**

In the timeframe of April - May 2009, North Carolina public health system was challenged in a real time event that required making the right decisions in surveillance and response to a pandemic influenza threat. Plans were engaged that centered on determining assets, detailed the process of assessing and containing threats, and responding to those threats with an adequate, trained workforce that understood the relevant roles and responsibilities. The North Carolina system was successful in case finding, risk mitigation, and receiving and managing SNS assets. The public health infrastructure was healthy for this event but capacity needs still exist, and the plans in place need revision and modification to become scalable and flexible based on the event and resources available. Also clear is that the public and community partners expect immediate, factual information and clear guidance from trusted public health agencies, a role local public health has not always embraced and needs a clear plan to address. There is much effective in the public health system in North Carolina but whether in these challenging times the system can continue to make the changes needed to fill the identified gaps remains to be seen.
References


A Review of North Carolina Public Health Response to Novel Influenza A (H1N1)


http://www2a.cdc.gov/phlp/quarantine.asp


## Appendix A

### Table 1: Review of 41 NC Local Public Health Agencies

<table>
<thead>
<tr>
<th>Public Health Responsibility</th>
<th>Strengths</th>
<th>Areas of Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhancing disease surveillance:</td>
<td></td>
<td></td>
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<tr>
<td>• Case finding</td>
<td></td>
<td>Eight local public health agencies did not have strong school system infrastructure to track illness and absenteeism in the schools</td>
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<td>• Case investigation</td>
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<td>Three local public health agencies noted a need to improve and enhance communication with pharmacies and local pharmacists</td>
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<tr>
<td>• Monitoring trends in local community</td>
<td></td>
<td>One local public health agency identified a need to provide epidemiological surveillance and case investigation training for staff to improve ability to respond</td>
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<tr>
<td>• Specimen collection and submission</td>
<td></td>
<td>A need for more local staff trained in the use of NC DETECT and NC EDSS with more support for training from the state</td>
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<td></td>
<td></td>
<td>Identified a need to improve communication with the local emergency department and laboratories in terms of specimen collection, processing and testing</td>
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<tr>
<td>Receiving and distributing public stocks of antiviral drugs and vaccines (SNS)</td>
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<tr>
<td>• Identify local receiving sites (LRS)</td>
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<td>Eight local public health agencies identified a need for improved communication and clarity in the receipt process from NC PHR&amp;P. One local public health agency stated the state NC PHP&amp;R needs a QA plan for communication</td>
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<tr>
<td>• Collaborate with local emergency management agencies (EMA) and law enforcement (LLE) for safety, security and distribution</td>
<td></td>
<td>Process and resources needs included:</td>
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<tr>
<td>• Establish a process for receipt and distribution</td>
<td></td>
<td>o An inventory database with consistent naming of products. It was confusing when order documents did not match naming on packaging or common names.</td>
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<td></td>
<td></td>
<td>o Improvements to documentation particularly chain of custody</td>
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<tr>
<td></td>
<td></td>
<td>o Alternative LRS sites that are adaptable for smaller or larger shipments. Updates for LRS agreements with local facility partners (schools, local government, etc.)</td>
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<td></td>
<td></td>
<td>o Long term storage needs.</td>
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<tr>
<td>Public Health Responsibility</td>
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</table>
| Providing local health providers guidance on clinical management and infection control | • Most local public health agencies had established relationships in place with local health care providers  
• Communication methods and contact lists were in place in many local public health agencies including the use of blast fax, 24/7 call lines, and web page posting. Many Local public health agencies made personal calls to the local healthcare providers to share information  
• Local public health agencies had local hospital representatives as members of the response partnership  
• NC PHP&R encourage partners to attend weekly briefings and sent | • Information was overwhelming, an abundance of information that changed rapidly leaving little time to develop a process to disseminate effectively. Difficult to manage messages  
• Clearly delineated clinical guidance was delayed in coming from the state  
• One local public health agency recommended the state provide guidance package to go with SNS that is dispersed to local health care providers  
• Technology for state weekly briefings was not reliable  
• Process and resources needs |

The plan was made to receive and dispense, but this event required receipt and storage.  
- Equipment for off loading and distribution  
- Deeper list of back up personnel in all roles  
- Need for standing orders template to dispense antiviral or vaccines. Adapt to local pharmacy agreements.  
- Training needs for local partners-EMA and LLE  
- Improved call down lists and more methods of reaching partners and staff  
- LOCAL PUBLIC HEALTH AGENCY staff training needs in the SNS plan and ICS identified  
- SNS items were not a good mix for the event  

Plan issues identified;  
- SNS plan needs to reference pandemic influenza plan  
- Plan needs to be modified to include smaller events and non mass distribution events  

One LOCAL PUBLIC HEALTH AGENCY comment: “receiving unrequested, unnecessary, and unused SNS assets still baffles me as it sits in gathering cobwebs in a storage closet”.
### Areas of Improvement

- A need to strengthen established ties and to add other agencies to the list
- Three Local public health agencies indicated a need to develop a list serv to reach providers
- Other suggestions to improve communication included web page access and utilizing the medical society

### Preparing and Training for Containment

- Eight local public health agencies identified a need for training and better understanding of isolation and quarantine by local law enforcement
- Seven Local public health agencies identified a need for a form template to be used by those under isolation in order to document event for their employment or school.
- A need for I&Q templates to be in standardized and in multiple languages
- A need for school systems to develop a policy or process for school closures
- Training needs identified for local schools and health care facilities for custodial and cleaning staff
- Seven Local public health agencies found that local healthcare providers and emergency services providers did not have a respiratory protection plan in place and no documentation of fit testing those that may need respirator protection support
- Two found a need to have maintenance performed on their isolation, reverse airflow rooms

### Providing ongoing communication with the public

- Local public health agencies had media outlets identified pre-event, contacts were in place
- State provided messages in English and Spanish
- Liberal use of technology to disperse message including fax, web based, phone reverse 911

- There was a recognized concern that consistent messages and useful templates were slowed from the State, the local public health agencies could not wait for the state to provide template and message mapping
- Four local public health agencies identified a need to have better coordination of their local information, creation of a joint information command

### Public Health Responsibility

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<tr>
<th>Public Health Responsibility</th>
<th>Strengths</th>
<th>Areas of Improvement</th>
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<tr>
<td>information to provider networks. Provided up dated laboratory and clinical guidance at weekly teleconferences</td>
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<tr>
<td>Preventing local disease transmission using a range of containment strategies</td>
<td>• Isolation and quarantine (I&amp;Q) decision was made at the State level reducing stress on the locality. Templates were provided</td>
<td>• Eight local public health agencies identified a need for training and better understanding of isolation and quarantine by local law enforcement</td>
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<tr>
<td></td>
<td>• Local public health agencies understood their role</td>
<td>• Seven Local public health agencies identified a need for a form template to be used by those under isolation in order to document event for their employment or school.</td>
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<tr>
<td></td>
<td>• Regional Public Health response Teams have developed sub committee to better define roles and to provide tools to localities</td>
<td>• A need for I&amp;Q templates to be in standardized and in multiple languages</td>
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<tr>
<td></td>
<td>• SNS included respiratory protection equipment</td>
<td>• A need for school systems to develop a policy or process for school closures</td>
</tr>
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<td>Providing ongoing communication with the public</td>
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<td></td>
<td>• Liberal use of technology to disperse message including fax, web based, phone reverse 911</td>
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<td>Three specifically identified a need for a risk communication plan</td>
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<td>Need for PIO training for local staff</td>
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<td></td>
<td>More interpreters were needed and good sources of multi language materials. Increase ways of reaching limited English speaking community members</td>
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<td></td>
<td></td>
<td>Ways to improve message delivery included establishing 24 hour hot line capability, better use of child care networks, faith based community sources</td>
</tr>
<tr>
<td>Infrastructure and organizational framework of Local public health agencies</td>
<td>Overall the plans both the SNS and the Pandemic Influenza Plans were effective in helping Local public health agencies respond to the novel H1N1 pandemic event</td>
<td>Three local public health agencies indicated that staff resources were tested by the event, a need to balance ongoing LHD duties/ clinics and the need to respond to the pandemic. Most of the local public health agencies were concerned about staffing and resource availability.</td>
</tr>
<tr>
<td></td>
<td>Cases were identified, SNS received, control measures put in place, information was readily available</td>
<td>Policy needs to indicate consequences of not being available to work during a preparedness emergency</td>
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<td>Resources from the region and state should be evaluated early and placed in the locations they can be most effective rather than shotgun fashion of provision</td>
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<td></td>
<td></td>
<td>Infrastructure needs identified was better radio communication within local public health agency and working with partner agencies</td>
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<td></td>
<td></td>
<td>Influenza plan gaps identified including a need to included isolation &amp; quarantine guidance, decision making process for rationing pharmaceuticals, cohesion between the SNS and Pandemic influenza plans, trigger events were based on the WHO model which was not appropriate for this event</td>
</tr>
</tbody>
</table>