



South Carolina Responds to Pandemic Influenza

Public Health Preparedness Report, 2010

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Table of Contents

Executive Summary.....	3
Introduction.....	4
Outbreak: The First Wave in South Carolina, April-May 2009.....	4
Pandemic: The Second Wave in South Carolina, August-November 2009..	5
Response in South Carolina.....	10
The Importance of Pandemic Preparedness.....	13
What More Should Be Done?.....	16
Online Resources.....	18
Chronology of Key Events in the H1N1 (2009) Influenza Pandemic Outbreak in South Carolina	19

This is the fifth annual Pandemic Influenza Preparedness report written for the South Carolina Legislature by the Office of Public Health Preparedness of the South Carolina Department of Health and Environment Control.

Executive Summary

In March 2009, an influenza pandemic began in Mexico and the southwest United States. For the first time in forty years a new strain of influenza, H1N1 (2009), spread worldwide. The first cases reached South Carolina in late April 2009. This report summarizes the events and response in South Carolina from April 2009 through October, 2010. Two waves of disease occurred, the first lasting from April 2009 to June 2009 and the second from August 2009 to November 2009, with the second wave reaching its peak in October 2009. The U.S. Public Health Emergency for 2009 H1N1 Influenza expired on June 23, 2010. On August 10, 2010, the World Health organization (WHO) International Health Regulations (IHR) Emergency Committee declared an end to the 2009 H1N1 pandemic globally.

From September 1, 2009 through June 26, 2010 in South Carolina, there were 1,091 hospitalizations and 49 laboratory confirmed deaths due to the pandemic influenza reported to the South Carolina Department of Health and Environmental Control (SC DHEC). Nationwide, the Centers for Disease Control estimated a total of 61million H1N1 cases, 274,000 hospitalizations and 12,470 deaths between April 2009 and April 2010. Based on the CDC estimate that 20% of Americans were infected with H1N1, approximately 927,000 South Carolinians have had the H1N1 flu since the initial outbreak.

The priority focus of public health efforts were the surveillance and response to cases and outbreaks of H1N1 in order to identify geographic spread, severity and populations being impacted in order to assist in the determination of community mitigation measures and to prevent the spread of the disease through vaccination and public information. Initially, the vaccination effort was targeted to the groups who are at greatest risk from the disease, using the very limited quantities of vaccine that were available. All H1N1 vaccine supplies were purchased and distributed by the federal government. By December 2009, the State received sufficient vaccine from the Centers for Disease Control and Prevention to offer vaccination to all persons who wanted to be vaccinated. Public and private sector vaccination efforts continued until March 2010, although demand for the vaccine dropped off sharply after January 2010.

In South Carolina, major vaccination campaigns were implemented to vaccinate children and other high priority groups as identified by CDC (including pregnant women, health care workers, children and young adults 6 months to 24 years, and persons aged 25 to 64 with medical conditions). The Centers for Disease Control estimated that 37.6% of South Carolina children ages 6 months to 17 years were vaccinated and that 30.9% of persons in the initial target groups were vaccinated. Overall, 20.6% of the state's population ages 6 months and older were vaccinated for H1N1.

A total of 1,668,700 doses of H1N1 vaccine were shipped to South Carolina. Of these, public health departments received 656,100 doses and administered 460,164 vaccinations. Private providers received 1,012,600 doses and reported administering 304,342 vaccinations; however it is evident that there was significant under-reporting of

the number of vaccinations administered. Based on CDC vaccine coverage estimates and South Carolina telephone survey information, between 939,616 and 1,049,085 people were vaccinated in South Carolina.

The Department of Health and Environmental Control continues to monitor influenza illnesses closely through disease surveillance and laboratory testing; to support front-line health care providers with guidance and stockpiled supplies of medicine and infection control supplies; and to communicate information to the public. With the end of the pandemic, public health and private providers have returned to “business as usual” and are promoting seasonal influenza vaccination (that includes vaccination for H1N1, H3N2, and B strains).

Introduction

Historically, about three times a century, an outbreak of influenza occurs with a virus that is new to the human immune system resulting in a pandemic: the rapid worldwide spread of the disease. In March 2009 the novel strain of H1N1 (2009) influenza began circulating in Mexico. In April 2009 the new strain was found in two children in California. Within days of the first cases in California, school children returning from a spring trip to Mexico brought the first cases to South Carolina. By June 2009 it had spread around the world and a pandemic was declared by the World Health Organization.

This report presents an overview of the pandemic in South Carolina and the response efforts to the present time. Based on the history of past pandemics, we must expect that the new influenza will occur in repeated waves over a period of months and years. Based on WHO reports from Southern Hemisphere countries, the H1N1 (2009) strain has largely replaced the seasonal H1N1 strain from recent years, and is co-circulating with influenza type A H3N2 and influenza B strains: thus last year’s pandemic strain is the new seasonal flu for Winter 2010-2011. In a typical flu season, the peak of the epidemic occurs in February or March. As of the end of October 2010, few cases of influenza have been reported in South Carolina since the start of the flu season on September 1. Current public health efforts focus on promoting seasonal flu vaccination, especially among high risk groups.

South Carolina was well prepared to respond to the H1N1 influenza pandemic, thanks to years of planning for a severe influenza pandemic. It was widely recognized by the U.S. Department of Health and Human Services and the World Health Organization that the world was facing a potential pandemic influenza with the appearance of the H5N1 avian influenza virus in Asia and Europe. The sporadic human cases affected with H5N1 suffered from a high mortality rate, about 60%. If this virus became easily transmissible between humans, it was feared that the impact on human life would be substantial -- even greater than the impact of the 1918 “Spanish Influenza” that killed millions worldwide.

In 2006, DHHS provided funds to states to formalize pandemic influenza planning. From 2006 to 2008, South Carolina received \$4,782,750 in federal funding to plan and prepare for a pandemic influenza. The DHHS, the Centers for Disease Control and Prevention, and the U.S. Department of Homeland Security provided many planning documents and much guidance including the “National Strategy for Pandemic Influenza Implementation Plan,” the “Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States – Early, Targeted, Layered Use of Non-pharmaceutical Interventions,” and “Guidance on Allocating and Targeting Pandemic Influenza Vaccine.”

The focus for planning and exercising for a pandemic during these years, however, was on preparing for a severe pandemic. The “Pandemic Severity Index” described in the “Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States,” classified the possible impact of a pandemic influenza into five pandemic severity levels. The highest severity level was a Category 5 with a case fatality ratio of >2.0% and the lowest severity level was a Category 1 with a case fatality ratio of < 0.1%. Because the H5N1 avian influenza appeared to have the potential impact of Category 5 severity, much of the planning and exercising for a pandemic was based on a very severe pandemic, as this level of pandemic would have a greater effect on communities.

When 2009 H1N1 appeared, the impact of the disease was not known immediately and it took weeks before the nation began to get a better picture of the impact it might have. Although a Public Health Emergency was declared by the federal government, a pandemic severity index category was never assigned to 2009 H1N1. The State’s Pandemic Influenza Plan, Annex 2 of the South Carolina Mass Casualty Plan, which is Appendix 5 of the SC Emergency Operations Plan, had been developed and exercised with funding received from 2006 through 2008. The plan addressed actions to be taken in the case of a pandemic in the areas of Communication and Medical Information, Disease Surveillance, Vaccine Programs, Distribution of Medications, Public Health Authority and Disease Control, and Mass Fatality Management. Response steps had been outlined and exercised, so the agency was prepared to respond to a public health emergency of this type. What had not been planned for, though, was the fact that the H1N1 disease appeared in South Carolina much earlier than in other areas of the country, and before much was known about the disease.

A pandemic was not declared by the World Health Organization until June 11, 2009. Many of the actions taken by the agency had to be based on the limited information provided by the CDC, what was detected in surveillance, laboratory and epidemiology activities in South Carolina and what was written in the plan, as well as the agency’s past experiences in responding to other communicable diseases.

In August 2009, the first of close to \$20 million in Public Health Emergency Response funding from the CDC was received. This funding was specifically appropriated to respond to the disease and to implement a mass vaccination program. The funding enabled the agency to hire additional personnel to implement a major mass

vaccination campaign, hire additional epidemiological personnel, and implement a public information program related to the vaccination campaign. This report summarizes the tasks and challenges faced in implementing, in a very short time frame, a response to address the continuing waves of the 2009 H1N1 pandemic influenza and a public mass vaccination campaign unlike any other implemented to date by the agency.

Outbreak: The First Wave in South Carolina, April-May 2009

On April 21, 2009, the Centers for Disease Control and Prevention released a special dispatch article of the Morbidity and Mortality Weekly Report that described two cases of swine-type H1N1 influenza infection in children residing in southern California. On April 24, DHEC sent a Health Alert Network message to physicians, hospitals and other health care providers that provided guidance to clinicians about symptoms to look for and how to report suspect cases to DHEC. On Saturday, April 25, a clinician at Lexington Medical Center Urgent Care in Chapin saw a patient with the symptoms described in the Health Alert, and immediately called DHEC to report the situation. The DHEC Region 3 epidemiology nurse on call received the report and initiated investigation of a cluster of influenza-like-illness among a group of high school students that had recently returned from a spring break trip to Mexico. Sixteen students and three adults returned from a trip to Cancun, Mexico on April 20. Of these individuals, 14 experienced fever and respiratory symptoms. These were the first cases of novel H1N1 (2009) influenza in South Carolina.

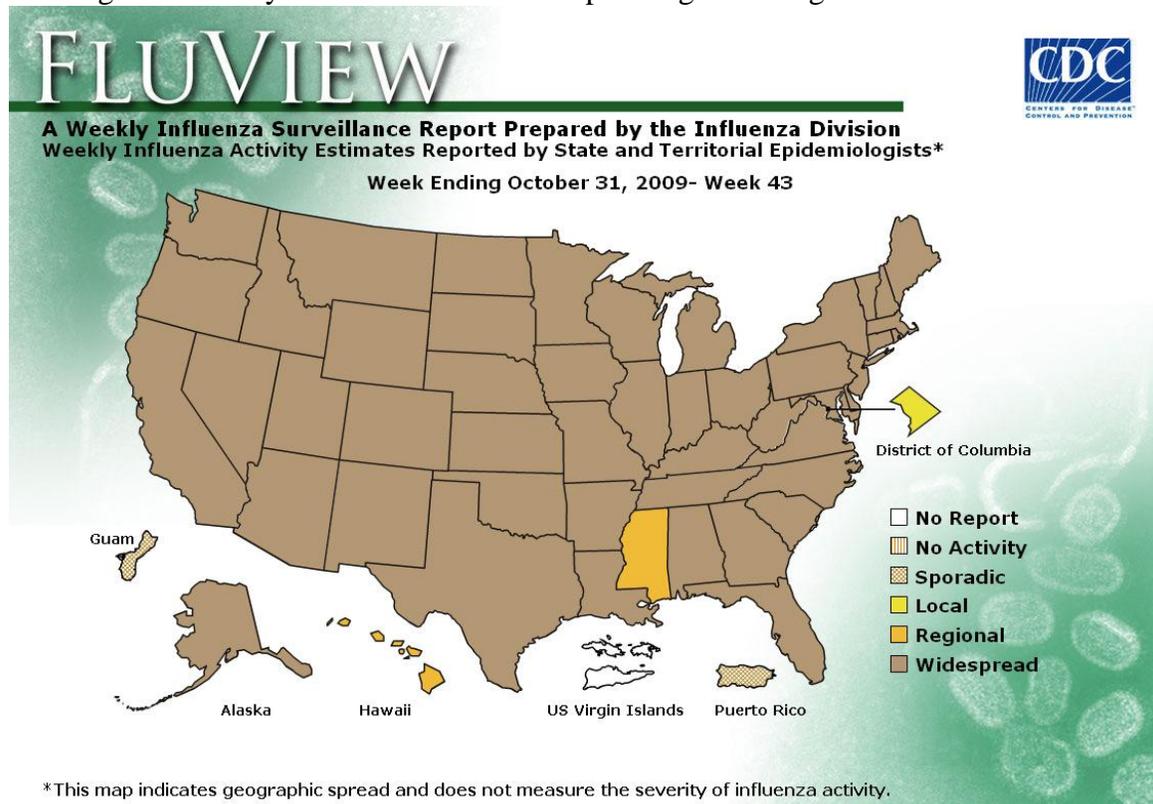
Over the days and weeks that followed, DHEC conducted full-scale disease investigation and control efforts to find cases of the new flu, treat those who were ill, and give preventive antiviral prophylaxis to people who had been exposed. Outbreak response teams were mobilized across the state. Voluntary isolation of cases and voluntary quarantine of contacts were implemented, as at that time the virulence of the disease was not known. Supplies of antiviral medicine were sent from the state Emergency Pharmaceutical Stockpile to each of the eight public health regions for use in treating the ill and controlling the spread of the disease. A large shipment of antiviral medicines and infection control supplies was received from the Strategic National Stockpile in preparation for emergency use as needed. Frequent media briefings were held to inform the public about H1N1 (2009) influenza and what they could do to protect themselves from the flu. A state-wide call center was activated and DHEC web pages were updated to provide the latest information to the public. Disease surveillance and reporting were stepped up to identify suspect cases early. Extensive laboratory testing was done on many suspected cases. Health Alert messages were sent to doctors, hospitals and health care providers to keep them up-to-date on the latest guidance from CDC and DHEC. Conference calls were held with hospitals, state and county emergency managers and government agency leaders. DHEC worked closely with the Governor's Office, Lieutenant Governor's Office, Department of Education, Department of Corrections, Emergency Management Division, State Law Enforcement Division and city and county authorities to respond to specific situations and address issues such as school closure, visitation at correctional facilities, and quarantine measures. Frequent contact was maintained with CDC and national organizations like the Association of State and

Territorial Health Officials to report on the situation in South Carolina and to keep current with guidance and the national situation.

By mid-May 2009 the public health response to the initial outbreak shifted away from the disease containment strategy of attempting to stop the spread of H1N1 (2009) by identifying cases and contacts. At this time, CDC stated that the pandemic was out of containment nationwide and spreading widely throughout many communities. Enhanced disease surveillance continued with sentinel health care providers sending information about the numbers of patients they saw with influenza-like-illness. DHEC continued epidemiological investigation and laboratory testing of clusters of H1N1 (2009) cases, hospitalized cases, and deaths. On June 11, 2009, after the disease had spread to 74 countries with over 30,000 cases reported, the World Health Organization declared a pandemic. Over the summer months, the novel H1N1 (2009) influenza virus continued to circulate at low levels in South Carolina. From April to mid-August, 560 laboratory confirmed cases were reported but it is likely that there were many more cases, as few individuals were tested for the disease.

Pandemic: The Second Wave in South Carolina, August-November 2009

The second wave of the H1N1 (2009) infection began to spread rapidly as schools and colleges resumed classes in August. Widespread H1N1 (2009) influenza in all parts of the state was reported to the CDC throughout September, followed by a few weeks with regional activity. The disease was widespread again during the last week in October.



By October 2009 the current wave of the H1N1 (2009) pandemic was reaching levels of illness that are normally seen at the height of flu season, typically in February or March when the disease is widespread across the country. The Centers for Disease Control and Prevention conducted a survey in early October 2009. Findings indicated that approximately 7% of adults and 20% of children reported having an influenza-like-illness during the month preceding the survey. Influenza-like-illness can be caused by a variety of infections, including the common cold, so it is difficult to estimate the number of actual influenza cases. Data from the national sentinel physician surveillance system indicated that 7.7% of patients seen by the physicians had influenza-like-illness during the week ending October 31, 2009.

During the week of November 1 through 7, when the disease was categorized as “widespread,” 87 hospitalizations and five deaths were reported in South Carolina. In November 2009, sufficient vaccine was received to implement mass vaccination clinics in schools and community settings for persons in the CDC-defined high risk groups. Reported levels of disease dropped sharply in December 2009 after the targeted vaccination program was implemented. On December 21, 2009 vaccination was made available to all people who wanted to receive it. Reported cases of illness continued to decline in January. During the last week of January 2010 (January 24 – January 30), the disease was categorized as “local” and six hospitalizations and no deaths were reported.

The trends observed in SC were similar to those seen nationally. More than 74% of specimens tested by WHO and CDC labs were 2009 H1N1. Another 25% were influenza A viruses that were either unsubtype or unsubtypeable. Less than 0.5% of positive specimens were seasonal H1N1, H3N2, and B.

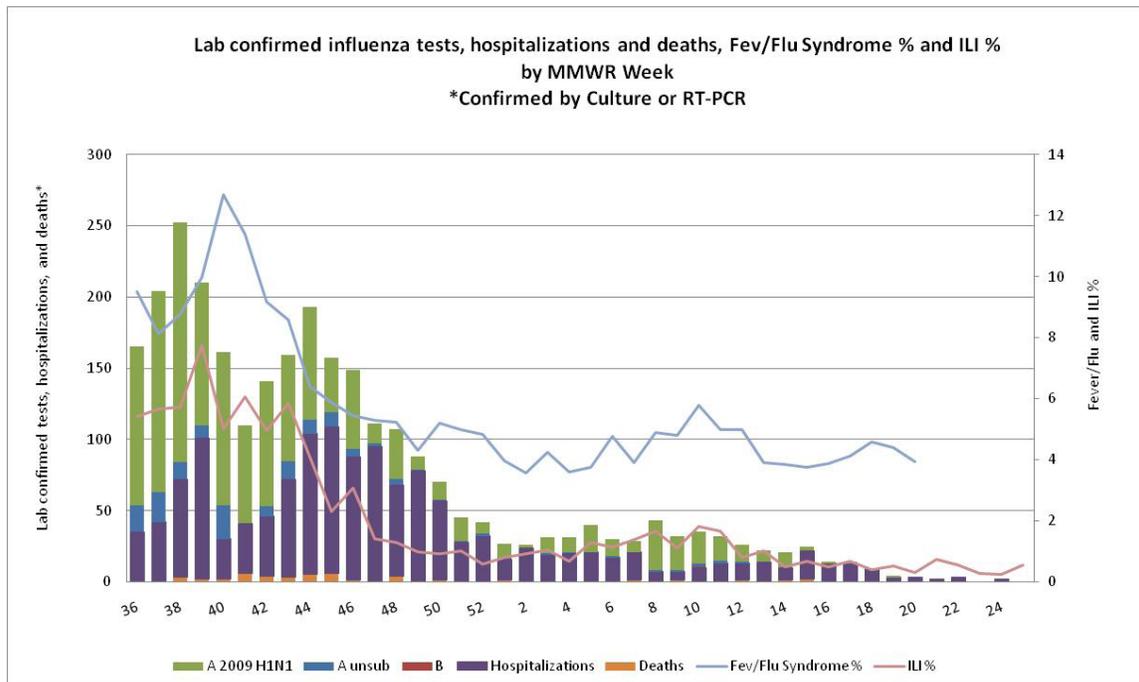


Figure 1 shows the number of lab confirmed influenza cases, hospitalizations and deaths, and the percentage of ILI and fever/flu syndrome for SC by MMWR week.

During the 2009-10 influenza season, an average of 70 providers were enrolled in ILINet. Providers may enroll or de-enroll at any point during the season. Forty seven providers (67%) reported at least once during the season. Twenty three (32.9%) providers reported at least half of the season (19 weeks). Sentinel providers reported 318,341 total patient visits. 5,306 of these visits were for ILI. Of these, 1,061 reports were in 0-4 yr olds, 3,048 in 5-24 yr olds, 859 in 25-49 yr olds, 281 in 50-64 yr olds and 57 in individuals older than 64 yrs.

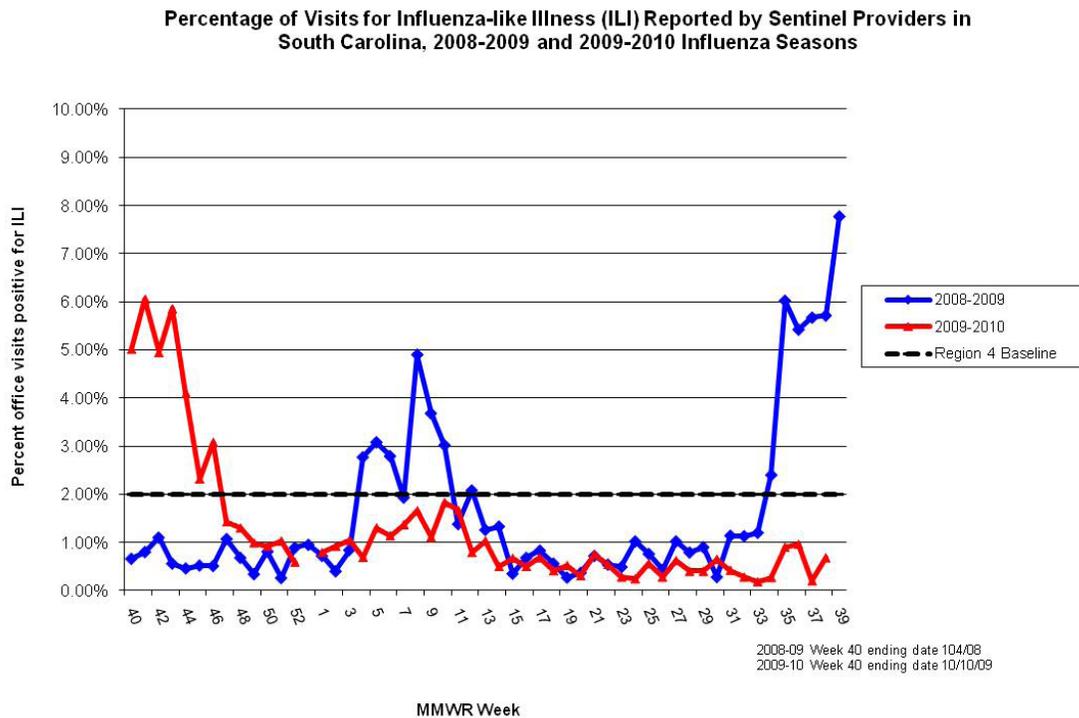


Figure 2. compares the 2008-09 and 2009-10 influenza-like-illness percentages by MMWR week.

Of the total visits for ILI, 30.4% were in student health centers, 24.8% in pediatricians’ offices, 23% in urgent care centers, 18.1% in family practice centers, 3% in emergency medicine facilities, and less than 1% in internal medicine clinics. Laboratory confirmed influenza associated hospitalizations are reportable within 7 days. Laboratory confirmation includes culture, RTPCR, DFA, IFA, and rapid test. From September 1, 2009 to June 26, 2010, 1,091 lab confirmed influenza hospitalizations were reported. Nearly 22% of these were in children under the age of 5. The number of weekly influenza hospitalizations peaked at 103 during the first week of the season. Figure 3 shows the distribution of hospitalizations and deaths by MMWR week. The case rate by age group is shown in Figure 4. The 0-4 year old age group had the highest hospitalization rate (78.21), followed by 5-18 year olds (22.49).

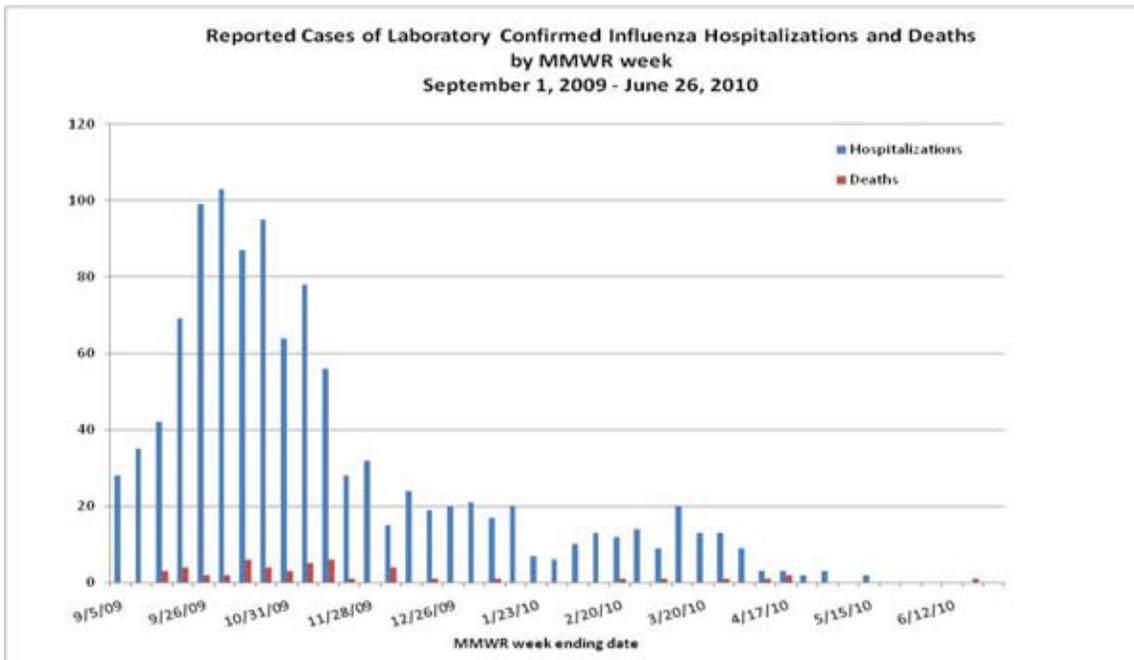


Figure 3. Distribution of hospitalizations and deaths by MMWR week.

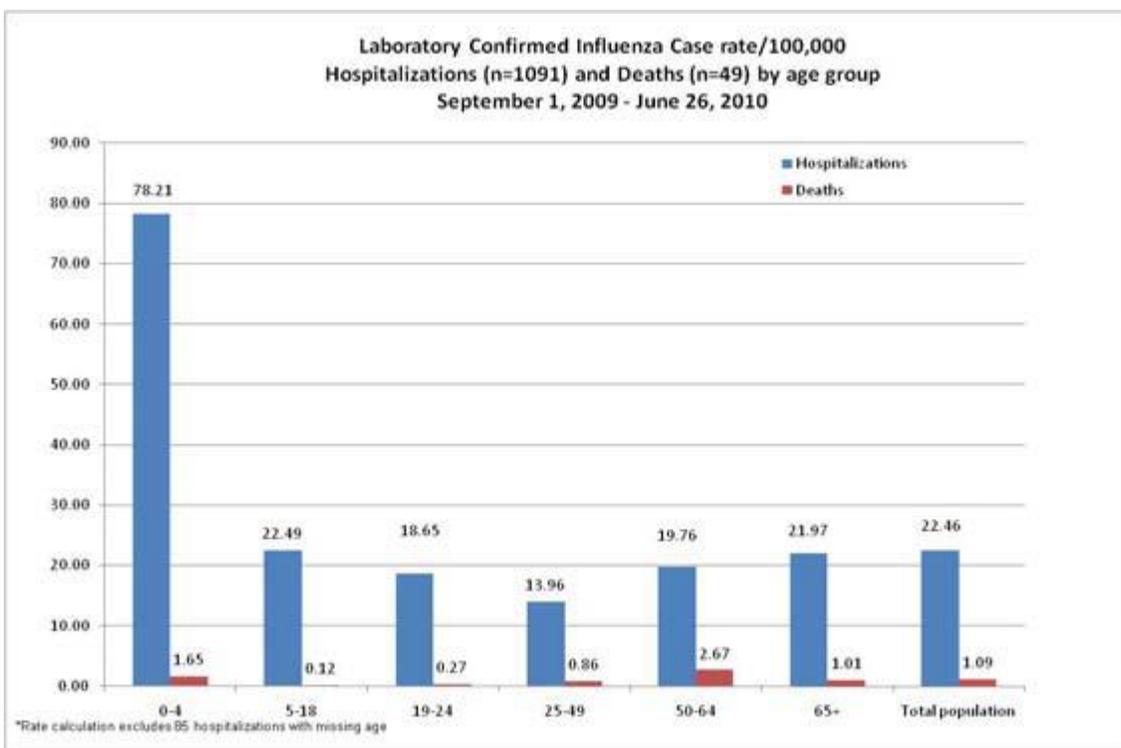


Figure 4. Laboratory Confirmed Hospitalization and Death Rates by Age Group

Laboratory confirmed influenza associated deaths in all age groups are reportable within 7 days. Laboratory confirmation includes culture, RT-PCR, DFA, IFA, rapid test, or autopsy results consistent with influenza. From September 1, 2009 through June 26, 2010, 49 influenza associated deaths were reported. The majority (46.9%) of these were

in adults age 50-64 years. Another 26% of deaths occurred in adults age 25-49. Figure 4 shows the hospitalization and death case rate by age group. The death rate was highest (2.67) in the 50-64 age group. The 0-4 age group had the second highest death rate (1.65).

Response in South Carolina

The primary goal of DHEC's H1N1 (2009) pandemic response was to vaccinate all South Carolinians who desired vaccination. The H1N1 (2009) vaccine was safe and effective. It was fully licensed by the Food and Drug Administration. It was tested, manufactured and inspected using the same processes used to make seasonal influenza vaccine and represented only a change in the strain of influenza virus used to make vaccine. Vaccination represented the best approach to protecting individuals from the disease, and preventing its spread.

The focus of the Fall 2009 response to H1N1 was on conducting the H1N1 Mass Vaccination Campaign. Nearly \$20 million was provided to the state by the federal government to implement an immediate and large scale vaccination campaign. In order to conduct a campaign of this size, many response elements had to be developed, organized and implemented. The scale of this program was too large to be conducted only by DHEC, especially in the light of the reduction of the size of the public health work force over the last few years. It was determined that the best way to implement this campaign was to develop a private and public partnership, enlisting the aid of non-traditional vaccination providers, such as obstetrician's offices. In order to conduct the campaign, private providers had to be recruited and enrolled, legal agreements had to be developed and reached, a system to distribute vaccine had to be developed and implemented, additional DHEC temporary staff had to be identified and hired or contracts put into place, and a statewide school vaccination campaign had to be developed. This process involved implementing contracts, expanding information technology capabilities and managing the vaccine distribution process between the CDC, the private providers, and DHEC.

South Carolina relied on a joint public-private sector approach to making vaccination available to all. By the end of October 2009, over 650 private providers registered with DHEC and agreed to participate in the vaccination program under the Centers for Disease Control and Prevention provider agreement. All supplies of H1N1 (2009) vaccine were purchased by the federal government and were distributed to the states based on population. A central distributor, the McKesson Company, handled shipping of the vaccine to approximately 150,000 ship-to-sites across the nation. Shipments of vaccine were made directly to the participating providers, public and private, with allocation amounts coordinated by the state health departments. South Carolina ordered and received 1,668,700 doses of H1N1 vaccine.

The CDC's Advisory Committee on Immunization Practices reviewed epidemiologic and clinical data to determine which population groups should be targeted initially for vaccination. ACIP also considered the projected vaccine supply likely to be available when vaccine was first available and the expected increase in vaccine

availability during the following 6 months. These recommendations were intended to provide vaccination programs and providers with information to assist in planning and to alert providers and the public about target groups comprising an estimated 159 million persons who were recommended to be first to receive the H1N1 (2009) influenza vaccine. The priority target groups included: 1) pregnant women, 2) persons who live with or provide care for infants less than 6 months of age, 3) health-care and emergency medical services personnel, 4) children and young adults aged 6 months to 24 years, and 5) persons aged 25 to 64 years who have medical conditions that put them at higher risk for influenza-related complications.

In South Carolina, the priority target groups made up 68% of the state's population, approximately 3,037,440 persons of the state's population of 4,479,800. The specific estimates for the target groups include:

Pregnant women:	57,282
Parents and caregivers for infants:	43,896
Health care workers:	99,476
Children and young adults:	1,786,848
Persons 25 to 64 with health care conditions:	1,049,938
Total:	3,037,440

Not all persons seek vaccination. In a typical year, approximately 24.8% of the target groups' population seeks seasonal influenza vaccination. Based on CDC assurances that sufficient vaccine would be available, DHEC's planned vaccination campaign was implemented from October 2009 through March 2010, with the goal of reaching all South Carolinians who want to be vaccinated. South Carolina's vaccination efforts were successful in reaching approximately 1,000,000 people. In April 2010, the Centers for Disease Control estimated that 37.6% of South Carolina children ages 6 months to 17 years were vaccinated and that 30.9% of persons in the initial target groups were vaccinated. Overall, 20.6% of the state's population ages 6 months and older were vaccinated for H1N1.

The focus of the initial phase of the vaccination campaign was on reaching the priority target groups through their customary health care providers and on conducting school-based and large-scale community mass vaccination clinics. When sufficient vaccine supplies become available in December 2009, vaccination efforts were expanded to reach people who wanted to be vaccinated by making vaccine supplies widely available through pharmacies and other large-scale vaccinators.

A major activity of the South Carolina H1N1 mass vaccination campaign was the implementation of H1N1 clinics in school settings. The rapid wave of the H1N1 pandemic caused an urgency to vaccinate as many high risk target groups as possible. Among those target groups were school-aged children in South Carolina. DHEC staff worked closely with school districts to keep school personnel as well as students and parents and guardians aware of the status of the pandemic. Based on an awareness of the pandemic and the benefits of flu vaccination, all public school districts eventually agreed to partner with DHEC to offer the H1N1 vaccine in schools as a service to the families

that they serve. The goal at DHEC was to immunize as many children as possible by allowing parents and guardians to have their children immunized in a convenient, readily accessible location.

The majority of the school-located vaccination clinics were held during school hours. In school-located vaccination clinics held during the school day, the 2009 H1N1 flu vaccine was offered to students only in an injectable formulation. The 2009 H1N1 flu shots were offered free of charge. Regional and local health department staffs were responsible for receiving, storing and transporting the vaccine to the school sites on the day of the school-located vaccination clinic. DHEC established vaccination teams, called “strike teams,” to implement mass vaccination clinics which included the school-located vaccination clinics. The strike teams varied based on the size of the school and number of children to be vaccinated and included nurse vaccinators as well as administrative staff. School nurses assisted in the organization and oversight of clinics and were responsible for distributing and collecting parent and guardian consent forms, but were not usually vaccinators.

The H1N1 school-located vaccination initiative was a new experience for South Carolina. In order to facilitate the H1N1 vaccination clinics in the school setting, many processes were quickly developed, new partnerships were forged, and existing partnerships were solidified. This effort took coordination and cooperation at many levels. Under the guidance and leadership of DHEC Central Office staff, Regional DHEC staff worked with local health departments, local public school districts, private schools, contractors for nursing services, and others to offer the H1N1 vaccination to as many school-aged children as possible.

The H1N1 illness peak occurred during October 3 through October 17, 2009. The date of the first H1N1 school-located clinic was November 2, 2009. Most H1N1 school-located vaccination clinics ran concurrently and simultaneously across the eight regions. H1N1 school-located vaccination clinics concluded in February 2010. Overall, there was a strong uptake of H1N1 vaccines in school-located vaccination clinics. Approximately 28% of students enrolled in public schools received their first H1N1 vaccination in a school-located clinic. A second school-located vaccination clinic was offered in most elementary schools for students under the age of 10 years who required a second dose. The percentage of students receiving their second dose in school is unclear because students who had not received a first dose were also vaccinated at the second dose clinic.

Other key public health activities in response to the H1N1 (2009) influenza pandemic include:

- **Disease surveillance and outbreak response:** DHEC conducted year-around influenza surveillance through a network of health care providers who report on cases of influenza –like-illness and findings from rapid flu tests. In addition, a system was implemented to monitor school absenteeism. Five hospitals were added to the syndromic surveillance network to rapidly identify clusters of patients with flu-like symptoms. Disease investigation and follow-up were

conducted for hospitalized cases and major disease clusters at 69 institutions (to include daycares, military bases, long-term care facilities, camps and schools). Medical record chart reviews were performed on over 640 individuals hospitalized with influenza symptoms, with the goal of classifying the impact of H1N1 on South Carolinians to assist with mitigation measures and communication of critical information to at-risk populations.

- **Laboratory testing:** Approximately 120 laboratory tests were done each week to confirm H1N1 (2009) virus in disease clusters, hospitalized cases and deaths. Due to the expense of testing, not all cases of influenza were tested to confirm that the virus is H1N1 (2009) influenza.
- **Health Alert Network:** Frequent communications were sent to physicians, hospitals, pharmacies and other health care providers through the Health Alert Network. This was an important method for distributing the latest clinical guidance and epidemiological findings to health care providers. During this response, over sixty-five HAN notifications were distributed, examples include guidance on the use of N-95 respirators to protect health care workers, guidance on the use of antiviral medicines for treatment, instructions for the collection and submission of specimens for testing by SC DHEC, and guidance on the treatment of children and youth.
- **Managing public and school-based vaccination clinics:** Hundreds of clinics were conducted across the state to assure that the public had access to H1N1 (2009) vaccination. A tremendous effort was made by the public health regions in preparing for school-based and community mass vaccination clinics. The public health departments hired and trained over 800 temporary and hourly nurses and administrative support staff to conduct vaccination clinics. For the first time in decades, children received vaccinations in schools in a voluntary program that required parental consent. In addition, arrangements were made to offer mass vaccination clinics for the public at convenient times, including nights and weekends, so that people could receive their vaccinations through the public health departments. As noted above, private sector providers worked closely with DHEC to see that vaccination was available through many public and private providers. All of these activities required a major investment of time and energy from regional and county health departments, at a time when these departments were suffering from the effects of state budget reductions.
- **Public information:** Information and interviews were provided daily to media in order to keep the public well informed of influenza issues. A series of public service announcements was run to promote vaccination and preventing the spread of influenza. The “Wash Hands” video was widely distributed through schools and community organizations to promote hand washing among children. (<http://www.sctv.org/education/etvkids/grownups/index.html>) Additional public service announcements were produced to promote H1N1 (2009) vaccination and

effective use of medical services. Thousands of posters and brochures on influenza prevention and care for the sick were distributed.

- **Antiviral medicines and infection control supplies:** South Carolina received multiple shipments of antiviral medicine and personal protective equipment from the Strategic National Stockpile. Significant quantities of medicines were distributed to physicians and pharmacies through the public health regions. Over 30,000 antiviral treatment courses were distributed to physicians and pharmacies. The state pharmaceutical stockpile and regional pharmacies have over 550,000 treatment courses remaining, available in the event of widespread illness in a future wave. The state stockpile of personal protective equipment was also available to support health care providers as shortages of N-95 respirators, surgical masks, gowns, and other infection control supplies occurred in the commercial supply chain.
- **Vaccines and ancillary vaccination supplies:** DHEC managed the registration of vaccination providers and the ordering system for distributing the vaccine supplies allocated to the state by the federal government. Separate shipments of vaccine and ancillary supplies (syringes, needles, wipes, sharps containers) were sent directly from the federal distributor to the vaccination providers. The DHEC Immunization Program monitored the allocation of the various types of vaccines available for ordering and coordinated the ordering process so that each provider received a share of the limited supplies available to the state.
- **Supporting South Carolina hospitals in their response:** On August 25, 2009, a Hospital Preparedness Summit was held to provide 205 hospital leaders with an overview of pandemic response activities and to coordinate plans for the ASPR hospital preparedness program. The South Carolina Hospital Association conducted training opportunities and hosted weekly conference calls to keep hospital executives up-to-date on developments in the pandemic. Emphasis was placed on vaccination of health care workers, infection control measures, and appropriate use of personal protective equipment in accordance with CDC and Occupational Safety and Health Administration guidance. The SC Hospital Association offered training opportunities and consulting services to hospitals on medical surge and patient care issues. In addition, DHEC worked through the public health regions to assist with offering stockpile medicines and protective equipment supplies to hospitals. Hospitals reported their bed availability status and other key emergency response information through the internet-based South Carolina State Medical Asset Resource Tracking Tool (SMARTT) information system. A conference was held with hospital representatives on June 15, 2010 to review the state's response and identify key issues for hospitals for pandemic preparedness.
- **Coordinating plans and response activities with public and private sector partners:** On October 20, 2009, DHEC hosted a state H1N1 (2009) Vaccination Summit for leaders in business, community and faith-based organizations, and

government agencies. There were 245 participants representing a wide variety of organizations from across the state. The program reviewed the current situation and described the public health measures and plans for the vaccination campaign. Another summit was held on October 21, 2009, for nursing home officials to present an overview of H1N1 (2009) response issues and vaccination plans, and to address specific issues that nursing homes face in responding to the pandemic. A summit for assisted living facility officials was held December 3, 2009. Other workshops were conducted, including one for the hospitals and one for the SC Medical Association. In addition, weekly conference calls were held with emergency management officials and state agency leaders to present situation updates and share information about the response activities. After action conferences were held in June 2010 with hospitals and in July 2010 with public health regions to identify areas for improvement of plans and response activities.

The Importance of Pandemic Preparedness

The state's pandemic response efforts since April 2009 show the value of planning and preparedness. Since the beginning of the Public Health Emergency Preparedness Program and the Hospital Preparedness Program in 2002, much energy has been devoted to preparing for an influenza pandemic. These preparations were very important during the response to the actual pandemic. Public health staff were prepared to respond quickly and effectively to the initial outbreak, to monitor the course of the pandemic, to inform the public, and to coordinate with other organizations. Previous reports in this series have documented the plans and activities that were undertaken to prepare for a pandemic. Some of the key preparations included:

- The State Pandemic Influenza plan was prepared and updated each year.
- A Mass Fatality Plan was developed in cooperation with the Coroner's Association and other partners.
- Each year, DHEC has a seasonal influenza vaccination campaign to encourage people in high risk groups to get flu shots.
- Each year, DHEC conducts disease surveillance for influenza and influenza-like illnesses. <http://www.scdhec.gov/health/disease/acute/flu.htm>
- Laboratory testing capabilities and capacity have been increased to confirm cases of the H1N1 (2009) virus.
- DHEC maintains a Health Alert Network to quickly provide alerts and detailed information to health care providers about disease outbreaks or important health problems, including influenza. <http://www.scdhec.gov/health/disease/han/notifications.htm>
- A State Public Health Emergency Pharmaceutical Stockpile was established in FY 2006-07. Under a federal match program, South Carolina ordered 435,000 treatment courses of antiviral medicines for influenza, at a total cost of \$8.9 million (of which \$6.7 million were non-recurring state funds for match.) In addition to the state stockpile, the federal Strategic National Stockpile has allocated 618,000 treatment courses for South Carolina. In April 2009 a shipment of antiviral medicines was received from the Strategic National Stockpile,

amounting to roughly 154,000 courses. Medicines were sent to the public health regions and many physicians and pharmacies for treatment of H1N1 (2009) patients.

- The State Pandemic Influenza Ethics Task Force published a report in September 2009 to provide guidance on public health and medical care ethical issues. Their recommendations have been endorsed by the South Carolina Hospital Association, South Carolina Medical Association, South Carolina Nurses Association, Doctor's Care, South Carolina Obstetrical and Gynecological Society and South Carolina Area Health Education Consortium.
- State and regional exercises were held each year to test Pandemic Influenza response plans with community planning partners.
- Public health regions conducted mass seasonal influenza vaccination clinics.
- Exercises of the Strategic National Stockpile program were done at the state and regional level.
- State and regional exercises were held to test procedures to close schools and daycares during a severe pandemic.
- A Speaker's Bureau was established to promote widespread public awareness among community and business leaders. There have been over 1,000 training events across the state since 2006.
- The public information campaign, "What Do You Do to Prevent the Flu?" began airing on television and radio in October 2007. The purpose is to increase public awareness and knowledge of ways they can prevent the spread of influenza. The messages promote vaccination, hand washing, cough etiquette, and staying home when sick.
- The Department published the informational materials for the public and health care providers.
- A hand-washing video for school children was released in 2008 and has been widely distributed through schools, Parent-Teacher Associations, and health care providers.
- South Carolina has coordinated pandemic planning with southeastern states and regional federal officials. South Carolina has hosted meetings of the eight southeastern states to address interstate issues related to pandemic influenza.

Non-recurring federal funding was used to support state preparedness efforts. Federal funding for pandemic preparedness was provided from 2006 through 2008. Over this period, South Carolina received approximately \$7.5 million for public health pandemic influenza preparations. The federal funding supported surveillance, stockpiling, planning, exercising and education efforts. An additional one-time grant of \$1,098,346 supported hospital stockpiles of ventilators, medical supplies and medical surge exercises.

The 2009-2010 pandemic response efforts were entirely supported by federal funds. The CDC Public Health Emergency Response program provided nearly \$20 million in one-time funding to support all aspects of the public health response. Most of this funding was dedicated to local public health departments for the vaccination campaign. Nearly \$10 million was expended during the grant year ending July 31, 2010.

The remaining balance of funds is available during GFY 2010-11 to support pandemic planning, disease surveillance, and an additional \$1.2 million in one-time funding was provided for hospital response through the ASPR Hospital Preparedness Program Pandemic Influenza Healthcare Preparedness Improvement for States cooperative agreement.

What More Should Be Done?

As noted above, the pandemic response efforts were entirely supported by approximately \$20 million in non-recurring federal funds. The remaining balance of the Public Health Emergency Response funds was extended until July 31, 2011 to allow the states to close down H1N1 pandemic response activities, update and test pandemic preparedness plans, and continue disease surveillance efforts for one more year. No state funds have been appropriated to continue public health preparedness efforts for pandemic influenza. This means that any future pandemic preparedness or response activities must be funded by the state unless new federal funds become available.

Federal programs for public health preparedness and hospital preparedness have requirements for state matching funds. Federal authorizing legislation requires a 10% state match in 2010-2011. The state will be required to provide \$1 in match to receive \$10 in federal funds. The imposition of match requirements mean that state funding for public health preparedness is essential. Federal match requirements are projected to be approximately \$1,100,000 (10% of federal funds) for FY 2011-12. In addition, federal funding for preparedness has been significantly reduced. The federal CDC Public Health Emergency Preparedness base grant that has supported emergency preparedness capacity throughout DHEC has been severely reduced, from \$14,497,322 in FY 2002-03, to \$9,233,414 in FY 2009-10, a reduction of \$5,263,908 or 36% in the base annual funding over the seven years of the program. Base funding was slightly increased to \$9,279,791 in FY 2010-11, and additional categorical funds for the state's level 1 Chemical Laboratory were increased to \$1,436,849. The ongoing reduction in base funding for public health preparedness has caused cut-backs in program personnel and jeopardizes preparedness efforts.

- **The state should support seasonal influenza vaccination in 2010 and 2011 in order to protect our citizens against the H1N1 influenza virus.** It is likely that H1N1 (2009) influenza will become the new seasonal flu and return each year until a new influenza pandemic occurs. The public health seasonal influenza program has no state funding and limited federal funding: the very limited public health program to offer seasonal influenza vaccination is done primarily through earnings. As a consequence, DHEC provides only a small percentage of seasonal flu vaccinations and many low-income citizens do not get vaccinated. Most seasonal flu vaccinations are accomplished through the private sector with funding from Medicaid, Medicare, private insurance or out-of-pocket payments by consumers. Typically, fewer than 36% of South Carolinians receive a seasonal flu vaccination. It is important that a stable publicly-funded influenza vaccination program be established to promote vaccination and see that vaccinations are made available at low cost or no charge to people who cannot otherwise afford vaccination. The response to H1N1 demonstrated the value and effectiveness of school-located vaccination clinics: an investment in protecting children against flu pays off for the entire population.

- **State funding is needed to replenish, expand and support the Public Health Emergency Pharmaceutical Stockpile.** Recurring funds are needed to replenish stockpiles of medicines, vaccines and infection control supplies, to rotate stock when medicines and vaccines expire, and to operate the stockpile facility. The stockpile represents an ongoing program to assure that South Carolina has resources on hand to treat its citizens in the event of a pandemic influenza or other major disease outbreak and to support medical surge and emergency response. Secure receipt, storage and shipping facilities must be built, with the capacity to serve as a receiving and distribution site for the federal Strategic National Stockpile. The first phase of construction, the State Public Health Emergency Pharmacy stockpile facility was completed in April 2008. Funding is needed for the second phase of construction: the 15,320 square foot Strategic National Stockpile Receipt, Storage and Staging Site. This facility is designed to provide a secure site for the storage of emergency equipment and supplies, and emergency trailers and response vehicles currently stored in an open air site at State Park with limited security. In the event of a major disaster, the building will serve as the Receipt, Storage and Staging (RSS) Site and distribution center for supplies and equipment sent by the Strategic National Stockpile. The entire building must meet federal specifications in order to qualify as a Strategic National Stockpile Receipt, Storage and Staging Site. During emergency operations, this site will be a distribution center for large quantities of emergency medical supplies and medicines and will function as an extension of the Public Health Emergency Pharmacy.
- **Federal funding for public health preparedness will be sustained only with additional matching state funds and maintenance of state effort.** DHEC is designated as the primary agency for Emergency Support Functions (ESF) 8 - Health and Medical Services and 10 - Hazardous Materials in the state Emergency Operations Plan. The agency is responsible for planning and response to all state emergencies. This includes providing response in the state emergency operations center, coordinating the provision of medical care, public health and sanitation, behavioral health, deceased identification and mortuary services in its role as lead agency for ESF-8. Additionally, DHEC is the lead agency in the ESF-10 response to the release of hazardous materials into the environment, including response to disasters involving nuclear facilities, laboratories, hazardous waste sites, and spills in railway, air or roadway mishaps. State funding to provide the staff to plan and coordinate DHEC's response is currently limited to one employee. Federal funding has supported additional personnel at both the state and regional level to coordinate emergency response and planning functions for health and environmental protection of South Carolinians. Federal programs require a 10% state match each year: reductions in state funding for DHEC means that it is very difficult to identify sufficient state match for the grant.
- **Disease surveillance and response activities were provided via Federal funds.** A vast majority of staff engaged in surveillance and response activities in response to pandemic influenza, were supported via federal funds provided by the Centers for Disease Control Emergency Preparedness Cooperative Agreement. Without either this continued source of funding and/or State sources, the ability to

replicate this response on either a novel strain of influenza or another large-scale infectious disease event of public health significance would be severely limited. The ability to identify, classify and determine populations at-risk to a newly emerging pathogen depends upon a robust public health infrastructure capable of providing timely disease surveillance and response information to decision-makers. This capacity for performing effective biosurveillance at the local and state level is a gap in our current capacity to protect the citizens of South Carolina. Currently, much of disease surveillance is still a paper-based system, with few healthcare facilities reporting disease-specific information via more rapid electronic methods. Inroads have been made, however even with the advent and renewed focus on electronic medical records; little focus has been on ensuring that data elements that would be of public health importance are included in this data exchange.

Online Resources

South Carolina Department of Health and Environmental Control Flu in South Carolina Website:

<http://www.scdhec.net/flu/novel-h1n1-flu.htm>

South Carolina Department of Health and Environmental Control Flu Vaccination Clinic Finder:

<http://www.scdhec.net/flu/clinics.asp>

Pandemic Influenza Ethics Task Force:

<http://www.scdhec.gov/administration/ophp/pandemic-ethics.htm>

South Carolina Legislature Online Reports:

South Carolina Responds to Pandemic Influenza: Public Health Preparedness Report, 2009

<http://www.scstatehouse.gov/reports/dhec/PandemicInfluenzaProgressReport110609Final.pdf>

South Carolina Prepares: Pandemic Influenza Preparedness Progress Report, 2008

<http://www.scstatehouse.gov/reports/dhec/PandemicInfluenzaProgressReportDecember2008.pdf>

South Carolina Prepares: Pandemic Influenza Progress Report, 2007

http://www.scstatehouse.gov/reports/dhec/pandemicinfluenzaprogressreport2007_1.pdf

South Carolina Prepares: Pandemic Influenza Report, 2006

<http://www.scstatehouse.gov/archives/dhec/pandemicinfluenza.pdf>

U.S. Department of Health and Human Services Pandemic Influenza website:

<http://www.pandemicflu.gov/>

Chronology of Key Events in the H1N1 (2009) Influenza Pandemic Outbreak in South Carolina	
April 17, 2009	CDC confirms two cases of infection due to a swine-type H1N1 influenza virus in southern California.
April 20, 2009	16 high school students and 3 adults return to South Carolina from a spring break trip to Cancun, Mexico. 14 experience fever and respiratory symptoms after their return. First cases of H1N1 (2009) come to South Carolina.
April 21, 2009	CDC publishes a report on the two cases in a special edition of Morbidity and Mortality Weekly.
April 24, 2009	DHEC distributes a Health Alert message to healthcare providers that gives guidance on what to look for and how to report suspect cases.
April 25, 2009	First cases of H1N1 (2009) in South Carolina are reported to DHEC by an alert clinician. Disease outbreak investigation initiated immediately. Laboratory testing initiated for suspect cases. Voluntary isolation of cases and quarantine of contacts initiated to control spread.
April 26, 2009	US Department of Health and Human Services declares a national public health emergency. DHEC releases a Health Alert Network message regarding the appearance of the H1N1 influenza. DHEC emergency operations initiated. School closure at the affected private school announced.
April 27, 2009	Supplies of antiviral medicines and personal protective equipment distributed to all public health regions for outbreak response.
April 30, 2009	First lab confirmation of H1N1 received from CDC. South Carolina begins receiving shipments of antiviral medicines and personal protective equipment supplies from the Strategic National Stockpile.
May 1 through 11, 2009	Full disease outbreak control measures undertaken to limit the spread of H1N1 (2009) statewide. Measures include case investigation, voluntary isolation and quarantine, school closure at superintendent's discretion, laboratory testing of suspected cases, extensive public information and daily media briefings, conference calls with hospitals and emergency management officials.
May 12, 2009	End of the initial emergency phase of operations. DHEC ends use of voluntary isolation and quarantine measures. DHEC Emergency Operations Center closed. Individual case containment efforts wind down and return to normal disease surveillance and outbreak investigations. Emphasis shifts from testing individual suspected cases to laboratory testing of clusters and hospitalized patients.
June 11, 2009	World Health Organization announces that H1N1 (2009) influenza has become a pandemic
May – July 2009	H1N1 (2009) influenza cases continue at a local or regional level in South Carolina.
July 24, 2009	South Carolina submits application for Phase 1 Public Health Emergency Response program funds totaling \$3,696,593 for planning and implementing an H1N1 (2009) vaccination campaign, distributing antivirals, providing public information, and conducting disease surveillance and laboratory testing.

August – September 2009	Number of H1N1 (2009) cases in South Carolina increases as children and youth return to school and college. H1N1 (2009) becomes widespread in the month of September.
August 3, 2009	Phase 1 Public Health Emergency Response funds are approved for use.
August 13, 2009	South Carolina submits application for Phase 2 Public Health Emergency Response program funds totaling \$3,831,697 for implementing the H1N1 (2009) vaccination campaign.
August 24, 2009	Hospital Preparedness Summit held with a focus on the H1N1 (2009) pandemic and response activities.
August 31, 2009	First lab confirmed H1N1 death in South Carolina
September 15, 2009	South Carolina submits application for Phase 3 Public Health Emergency Response program funds totaling \$12,471,312 for implementing the H1N1 (2009) vaccination campaign.
September 22, 2009	Phase 2 Public Health Emergency Response funds are approved for use.
September 28, 2009	Phase 3 Public Health Emergency Response funds are approved for use.
October 5, 2009	First shipments of vaccine arrive in South Carolina. Initial shipments were primarily the Live Attenuated Influenza Virus, suitable for healthy individuals ages 2 to 49. For the month of October 2009 a total of 186,000 doses of all types of vaccine were received by public and private sector providers.
October 20, 2009	H1N1 Influenza State Summit
October 23, 2009	US President Barack Obama declares a national emergency as “the potential exists for the pandemic to overburden health care resources in some localities.”
November 2009	School-based, public health and private sector mass vaccination clinics begin.
December 21, 2009	Vaccine availability open to all South Carolina citizens
February 2010	School-located vaccine clinics conclude