

## Perspectives on the Evolving H1N1 Influenza Pandemic

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**Introduction.** Only those South Carolina healthcare providers who were already in practice in 1968-69 have had prior experience with a global influenza pandemic. That was the year that Influenza A H3N2 abruptly replaced the H2N2 strain, which had been circulating since the 1957-58 flu season. Those of us who have entered practice since then are familiar with the usual "winter flu season" in general and with numerous faces of clinical influenza in particular, but have never had to practice in a pandemic setting. Even though the current novel H1N1 pandemic strain has fortunately (to-date!) been associated with a relatively low case-fatality rate (CFR) (just a fraction of 1% of cases have died), the effects of H1N1 on medical practice and on society may be considerable this coming flu season. Indeed the coming of cooler weather and the start of the school year have already combined to facilitate transmission, and there is surely more to come!

The virus first appeared in the United States and in South Carolina in April after cases had already been reported

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from Mexico. The virus, was initially referred to as the "Swine Flu" virus, then came to be known by a variety of names, but is now commonly called the "Novel H1N1" virus or more simply as "H1N1".

This name is ambiguous in a formal sense as "ordinary seasonal H1N1" viruses have been circulating worldwide for several decades. This new virus was quickly found to be so novel

genetically and antigenically that most humans were susceptible to it, and indeed its pandemic potential was soon confirmed when it spread in just a few weeks not only to all 50 states in the USA but to over 150 countries as well! This was in sharp contrast to the avian H5N1 "bird flu" strain which, because of its frighteningly high CFR (~70%) has been of great concern for several years but has never demonstrated ability to sustain transmission in human populations. On June 19, the World Health Organization raised its pandemic influenza phase alert to level 6 (the highest phase) which signified that transmission with this novel virus was ongoing worldwide. Fortunately, elsewhere, as here, the virus has not proven to be exceptionally virulent.

**INSIDE THIS ISSUE**

<b>Perspectives on the Evolving H1N1 Pandemic</b>	<b>Page 1</b>
<b>Thanksgiving Food Safety (Reproducible Patient Handout)</b>	<b>Page 13</b>

In any case, the pandemic has evolved so quickly that even infectious disease and public health specialists have found it difficult to keep up with the flood of information and the nuances of ever evolving guidelines as are, for example, posted on CDC's extensive website devoted to H1N1 ([www.cdc.gov/h1n1flu](http://www.cdc.gov/h1n1flu)). In this article, we touch only on selected aspects of the pandemic, both from the clinical and population-health points of view, while recognizing that essentially everything that can be said on the subject must be considered as incomplete and as part of an evolving story.

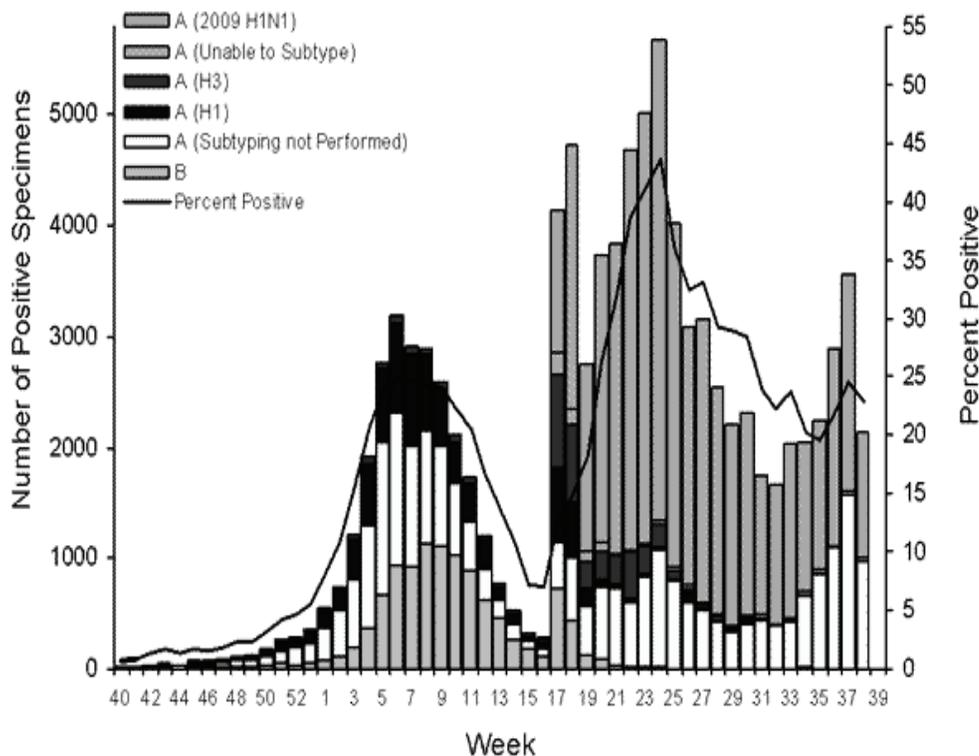
*(Continued on page 2)*

## Perspectives on the Evolving H1N1 Influenza Pandemic

(Continued from page 1)

### Figure 1: Influenza Positive Tests Reported to CDC by U.S. WHO/ NREVSS Collaborating Laboratories, National Summary, 2008-2009

(From: <http://www.cdc.gov/flu/weekly/>, as accessed October 5, 2009)



**Course of the 2008-2009 Flu Season.** In a sense the story to date can be seen in **Figure 1**. By week 16 of 2009 (mid-April) it appeared that the 2008-2009 flu season was over. However, pandemic H1N1 then arrived leading to an unusual summertime influenza epidemic as depicted. The figure also shows that essentially all summer influenza was due to novel H1N1 as seasonal H1N1 and H3N2 strains had essentially vanished from circulation by July. The figure shown is updated weekly on the CDC web site at [www.cdc.gov/flu/weekly/](http://www.cdc.gov/flu/weekly/), where it, along with other informative data, can help inform clinical practice for primary care physicians, showing, for example, just "which virus is going around," and the latest trends in the extent and severity of illness seen in clinical settings around the country.

Data summarized in the figure also inform decisions regarding antiviral therapy. Thus, as long as novel H1N1 is the predominant circulating strain, oseltamivir – when indicated -- can be used with confidence because, to

date, novel H1N1 has shown only occasional resistance to the drug. On the other hand, if and when seasonal H1N1 strains start to appear in important numbers, then decisions about antiviral therapy will become more complex as that seasonal strain exhibited high level oseltamivir resistance last year and can probably be expected to do so in the coming 2009-2010 flu season as well. In any case, these points illustrate the fact that in the current context, the key to certain clinical decisions making lies not in the "lab report" of a single patient, but on information posted on CDC's web site which summarizes the collective experience of healthcare providers and patients from around the country.

### Evolution of Public Health and Clinical Care Approaches to Novel H1N1: April to October 2009.

When novel H1N1 first appeared, little was known about the virus, its virulence, or the extent to which it would spread. In South Carolina then, as in many other states and indeed in many countries

around the world, initial attempts were made to see if the virus could be totally "contained." One precedent for thinking this might be possible came from the SARS experience in 2003 when the SARS coronavirus did spread to numerous countries but, due in part to inherent characteristics of the virus itself, and in part to vigorous isolation and other public health measures, proved to be incapable of sustained transmission. These factors led to the SARS epidemic "dying out" by June of that year.

Unlike SARS, Novel H1N1 quickly exhibited transmission characteristics of seasonal influenza viruses and thus spread around the world, rendering "containment" attempts moot. Thus, by late May, South Carolina transitioned from "containment mode" to "mitigation mode" with the more modest, but still important objective of diminishing the impact of the virus in terms of morbidity, mortality, and social disruption.

(Continued on page 4)

## Perspectives on the Evolving H1N1 Influenza Pandemic

**Table 1: Evolution of Perspectives and Practices as the Novel H1N1 Pandemic has Unfolded: April – October 2009. Part A: Broad Societal and Public Health Issues**

Item	Initial "Containment Phase"	Current (and still evolving) "Mitigation Phase"
Situational assessment	Possible start of a "category 5" pandemic.	Ongoing evolution of a "category 1 or 2" pandemic.
General societal / public health objectives	Interrupt transmission. Abort the outbreak.	Mitigate / moderate medical and social impact of the pandemic. Favorably modify epidemic curve in each community (see Fig 2)
Community attack rate (AR) expected	Unknown. Possibly catastrophic if category 5 pandemic. Possibly limited if transmission aborted	Unknown but likely high (e.g. ~30+% of population might become infected.)
Case fatality rate (CFR)	High CFR feared (cf. Global H5N1 experience to date with CFR~70%)	Low CFR observed( <1.0% or even<0.2%?)
Eventual no. of deaths expected.	Function of community attack rate (AR) and case-fatality rate (CFR)	Function of AR and CFR. Even low CFR may result in many deaths if AR is high. However, vaccine can reduce deaths if coverage and vaccine efficacy are high (see Table 3 for sample calculations)
Attempt to identify every case	Yes, (initially very few cases e.g. dozens)	No longer possible or desirable ( many thousands of cases)
Aggressive isolation of all cases and quarantine of all contacts attempted/considered	Yes	No (though common sense (stay home when sick etc.) certainly applies
Some key objectives of public health surveillance	Focus on individuals: (a) detect arrival of virus in the community (b) monitor efficacy of "containment strategy" (c) early local characterization of pandemic according to time, place and person	Focus on overall impact: (a) monitor progression of the pandemic and its eventual relation to "regular seasonal flu" (b) monitor "severity" through reports of hospitalizations and deaths
Vaccine available	No (but the need to produce one was apparent from start)	Yes (but just starting to be released, and time is needed before all needed doses will be available)
Stress on health care providers/ facilities	Limited because of small numbers of cases	May increase as flu-season progresses (e.g., great demand "to be seen" + HCWs themselves absent + possible shortage of beds, ICU spots or respirators
Understanding of the pandemic	Little insight (too early), course not predictable	Ever improving, but detailed course still not predictable
Constantly evolving /unresolved issues.	Yes	Yes
Guidance from CDC ( <a href="http://www.cdc.gov/h1n1flu">www.cdc.gov/h1n1flu</a> )	Flood of complex ever-changing documents	Flood of more complex, more numerous ever-changing documents
Media attention	Focus on arrival of a new novel virus	Potential focus on deaths, vaccine side effects, social disruption, as well as on general course of the pandemic.
Social disruption	Focused, limited to small number of persons and institutions	Potentially widespread (e.g., waves of school absenteeism; occasional school closures; workplace absenteeism, etc.)

## Perspectives on the Evolving H1N1 Influenza Pandemic

**Table 1: Evolution of Perspectives and Practices as the Novel H1N1 Pandemic has Unfolded: April – October 2009. Part B: Clinical Issues**

Item	Initial "Containment Phase"	Current (and still evolving) "Mitigation Phase"
Recommended that all possible "Swine Flu" cases seek medical care	Yes: important early on to try to identify all cases	No. Persons with mild ILI and with no "high-risk" factors typically need not seek care, and should NOT go to ER/EDs
Rapid Flu Tests (RFTs) for Influenza A helpful	Positive tests most likely indicate Influenza A. Test specificity reasonably good, ~85% in some reviews. Negative tests do not rule out Influenza A (Poor sensitivity, e.g., ~50%)	
Specific viral diagnosis (real-time RT-PCR or viral culture) sought for every suspect case	Yes	No, confirmation now sought for subsets of cases such as hospitalized or died from ILI; part of cluster or outbreak (e.g., in a residential care facility), exceptionally for others of special consequence
Emphasis on antiviral treatment for all confirmed or suspected cases.	Yes	Not necessarily. Emphasis for example on treating patients with severe symptoms; clinical deterioration; or in groups at high-risk of severe disease or death with reasonable clinical judgment for others (See <a href="http://www.cdc.gov/h1n1flu/recommendations.htm">www.cdc.gov/h1n1flu/recommendations.htm</a> )
Emphasis on antiviral post-exposure prophylaxis (PEP) for all contacts.	Yes	No. PEP emphasis for example for close contacts at higher risk for influenza-related complications. Early treatment is an emerging emphasized alternative to PEP after a suspected exposure. (See <a href="http://www.cdc.gov/h1n1flu/recommendations.htm">www.cdc.gov/h1n1flu/recommendations.htm</a> )
Focus and importance of Physician Reporting	Every suspect case of interest (e.g., ILI in April after return from trip to Mexico)	Focus no longer on every ILI or even every "confirmed case", but now shifted to: (a) <b>patients hospitalized with ILI</b> in whom influenza is suspected as cause of illness; (b) <b>patients deceased or dying of ILI illness</b> (with or without bacterial co-infection or super-infection) (cf. MMWR Sept 25, 2009 re Bacterial co-infections.) Reporting of such cases requested; and culture for influenza virus suggested for all such patients, especially for those for whom a Rapid Flu Test (RFT) was also obtained, regardless of results of the RFT

(Continued from page 2)

**Table 1** (pages 3 & 4) presents a summary of how the approach to novel H1N1 has evolved accordingly since those "early April days." The table is schematic in nature, presenting issues in "broad strokes," and is not meant to prejudge every and all clinical encounter (or public health situation) where many factors must be taken into account when decisions are made. Nonetheless, the table provides a broad sense of the manner in which issues and practice have generally evolved in the last six months.

**Antiviral Therapy for Novel H1N1.** While Table 1 presented some of the issues surrounding evolution of

approaches to antiviral therapy in broad strokes, Table 2, excerpted from the most recent CDC postings ([www.cdc.gov/h1n1flu/recommendations.htm](http://www.cdc.gov/h1n1flu/recommendations.htm)) provides finer grained detail. It should be noted that this posting, like all others related to novel H1N1, should be taken as "interim" and subject to modification as the flu season unfolds. Periodic (e.g. weekly) consultation of CDC's web site is highly recommended for healthcare providers whose practice includes management of patients with influenza-like illnesses.

(Continued on page 6)

## Perspectives on the Evolving H1N1 Influenza Pandemic

**Table 2: USPHS (CDC) Recommendations for the Use of Influenza Antiviral Drugs**

- ◆ Most healthy persons who develop an illness consistent with influenza, or persons who appear to be recovering from influenza, do not need antiviral medications for treatment or prophylaxis. However, persons presenting with suspected influenza and more severe symptoms such as evidence of lower respiratory tract infection or clinical deterioration should receive prompt empiric antiviral therapy, regardless of previous health or age.
- ◆ Treatment with oseltamivir or zanamivir is recommended for all persons with suspected or confirmed influenza requiring hospitalization.
- ◆ Early empiric treatment with oseltamivir or zanamivir should be considered for persons with suspected or confirmed influenza who are at higher risk for complications (\*) including:
  - ◇ Children younger than 2 years of age;
  - ◇ Persons aged 65 years or older;
  - ◇ Pregnant women;
  - ◇ Persons of any age with certain chronic medical or immunosuppressive conditions; and
  - ◇ Persons younger than 19 years of age who are receiving long-term aspirin therapy.
- ◆ Children 2 year to 4 years old are more likely to require hospitalization or urgent medical evaluation for influenza compared with older children, although the risk is much lower than for children younger than 2 years old. Children aged 2 years to 4 years without high risk conditions and with mild illness do not necessarily require antiviral treatment.
- ◆ Treatment, when indicated, should be initiated as early as possible because studies show that treatment initiated early (i.e., within 48 hours of illness onset) is more likely to provide benefit. (\*\*)
- ◆ Actions that should be taken to reduce delays in treatment initiation include:
  - ◇ Informing persons at higher risk for influenza complications of signs and symptoms of influenza and need for early treatment after onset of symptoms of influenza (i.e., fever, respiratory symptoms);
  - ◇ Ensuring rapid access to telephone consultation and clinical evaluation for these patients as well as patients who report severe illness;
  - ◇ Considering empiric treatment of patients at higher risk for influenza complications based on telephone contact if hospitalization is not indicated and if this will substantially reduce delay before treatment is initiated.
  - ◇ Treatment should not wait for laboratory confirmation of influenza because laboratory testing can delay treatment and because a negative rapid test for influenza does not rule out influenza. The sensitivity of rapid tests in detecting 2009 H1N1 has ranged from 10% to 70%. Information on the use of rapid influenza diagnostic tests (RIDTs) can be found at [www.cdc.gov/h1n1flu/guidance/rapid\\_testing.htm](http://www.cdc.gov/h1n1flu/guidance/rapid_testing.htm).
  - ◇ Testing for 2009 H1N1 influenza infection with real-time reverse transcriptase-polymerase chain reaction (real-time RT-PCR) should be prioritized for persons with suspected or confirmed influenza requiring hospitalization and based on guidelines from local and state health departments.
- ◆ Consideration for antiviral postexposure chemoprophylaxis should generally be reserved for persons at higher risk for influenza-related complications who have had contact with someone likely to have been infected with influenza. However, early treatment is an emphasized alternative to chemoprophylaxis after a suspected exposure. Household or close contacts (with risk factors for influenza complications) of confirmed or suspected cases can be counseled about the early signs and symptoms of influenza, and advised to immediately contact their health care provider for evaluation and possible early treatment if clinical signs or symptoms develop.
- ◆ Currently circulating 2009 Novel H1N1 viruses are susceptible to oseltamivir and zanamivir, but resistant to amantadine and rimantadine; however, antiviral treatment regimens might change according to new antiviral resistance or viral surveillance information.

*(Excerpted from [www.cdc.gov/h1n1flu/recommendations.htm](http://www.cdc.gov/h1n1flu/recommendations.htm) as updated 9/22/2009 and accessed 10/4/2009)*

### DHEC Notes from Table 2:

(\*) In some clinical settings "higher risk conditions" may be more common than might be expected. Thus, in the setting of an influenza-like illness it is useful to question the patient specifically about the presence of such conditions as may influence decisions about prescription of antivirals.

(\*\*) On another web page ([www.cdc.gov/H1N1flu/antiviral.htm](http://www.cdc.gov/H1N1flu/antiviral.htm)) CDC provides additional guidance as follows: "However, some studies of oseltamivir treatment of hospitalized patients with seasonal influenza have indicated benefit, including reductions in mortality or duration of hospitalization even for patients whose treatment was started more than 48 hours after illness onset."

## Perspectives on the Evolving H1N1 Influenza Pandemic

(Continued from page 4)

### Morbidity and Mortality from Novel H1N1: What Can We Anticipate?

If the 1918 influenza pandemic may be considered to have been a "Category 5" (Katrina-like) pandemic, the current pandemic might so far be characterized as a "Category 1 or 2" (see **Table 7** below). But pandemics, like hurricanes, can lose or gain strength and their final outcomes are not always foreseeable. Further, in this pandemic, there has been time to prepare a vaccine against the offending strain.

In a broad sense, we can anticipate that the number of South Carolina deaths that may eventually be attributable to H1N1 will depend on four parameters:

- The attack rate (percent of the population which will be infected);
- The case-fatality rate (percent of cases which will have a fatal outcome);
- Vaccine coverage (percent of the population which will receive H1N1 vaccine); and
- Vaccine efficacy (percent vaccinated persons who will be "protected").

This line of argument is somewhat simplified, but is conceptually helpful, and outcomes under various scenarios are shown in **Table 3**.

for a vaccine that would not be 100% protective. It is easy to see that deaths might be considerably higher if the attack rate were higher and/or, if the case-fatality rate were higher than the relatively low value used in these examples.

**H1N1 Vaccine and Pregnancy.** This flu season, we can expect to see considerable attention paid to

prevention of influenza in pregnancy. Although the pandemic is still in its early stages, the special risks of H1N1 and pregnancy have already been documented in the literature (CDC, 2009a; Jamieson, et al, 2009). Even though severe H1N1 illness and death have in general been relatively rare, certain sub-groups – including pregnant women -- have already been found to be at higher risk of complications, such as pneumonia, and even death. In addition to these dangers for the mother, the hyperthermia that accompanies influenza in pregnancy places fetuses at risk for complications such as birth defects or preterm birth.

**Periodic (e.g., weekly) consultation of CDC's web site is highly recommended for healthcare providers whose practice includes management of patients with influenza-like illnesses**

**Table 3: Cases and Deaths from novel H1N1 under illustrative scenarios**

Parameter	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E	Scenario F
a SC Population	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
b H1N1 Attack Rate as %	20%	30%	30%	30%	30%	30%
c H1N1 Cases (a x b)	800,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
d H1N1 Case Fatality Rate as %	0.01%	0.05%	0.05%	0.05%	0.05%	0.05%
e Deaths if no vaccine (c x d)	80	600	600	600	600	600
f Vaccine coverage as %	0%	0%	50%	80%	50%	80%
g Vaccine efficacy as %	0%	0%	50%	50%	80%	80%
h Deaths (e - (fxgxe))	80	600	450	360	360	216

The scenarios differ according to the hypothetical values assumed for the four parameters. For example, scenarios A and B assume no vaccine, but differ in the mortality estimates because of different assumed values for attack rates and case-fatality rates. Scenarios C, D, E, and F assume the same initial conditions as Scenario B, but add then various combinations of high and low values for vaccine coverage and vaccine efficacy. The arithmetic presented via these model scenarios demonstrates the life-saving value of achieving high-vaccine coverage even

In recent years there has, in any case, been a gradual evolution in use of trivalent inactivated influenza vaccines (TIV) in pregnancy. For example, in 1993 vaccine was recommended only for pregnant women with medical conditions known to increase risk for complications from influenza. By 1998, indications had broadened to include any women who would be in the 2<sup>nd</sup> or 3<sup>rd</sup> trimester of pregnancy in the flu season. More recently, recommendations have further broadened so that

(Continued on page 7)

## Perspectives on the Evolving H1N1 Influenza Pandemic

(Continued from page 6)

**vaccination is now advised for all women who are pregnant during the flu season - regardless of the trimester of gestation.** This approach has been reaffirmed in the recently published ACIP recommendations regarding both seasonal flu vaccine (CDC, 2009b) and novel H1N1 vaccine (CDC, 2009c). Thus, **Table 4** shows the American Committee on Immunization Practice's (ACIP) initial target groups for receipt of H1N1 vaccine with pregnant women leading the list. In addition, **Table 6** (page 8) presents a number of "take home messages" concerning influenza, influenza vaccine and pregnancy as recently posted on the American College of Obstetrician and Gynecologists (ACOG) web site and as endorsed not only by ACOG but also by a coalition of seven other professional organizations including the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP).

### Simultaneous administration of the two 2009-2010 influenza Vaccines.

Two influenza vaccines will be available this year: (a) typical trivalent seasonal influenza vaccine incorporating, as in recent years (i) non-pandemic influenza A H1N1, (ii) influenza A H3N2, and (iii) influenza B strains. At the time this was written (in early October) seasonal vaccine was already gradually becoming available in South Carolina and within a few weeks, the novel H1N1 vaccine should also be arriving. Both will be available (i) as injectable inactivated virus vaccines, and (ii) as live-attenuated influenza vaccine (LAIV) for intranasal administration. Because of production and delivery schedules, many or most patients are likely to receive

**Influenza vaccination is now advised for all women who are pregnant during the flu season – regardless of the trimester of gestation**

**Table 4: ACIP Initial target groups for novel influenza A (H1N1) 2009-2010 vaccination programs (CDC, 2009b)**

- ◆ **Pregnant women** because they are at higher risk of complications and can potentially provide protection to infants who cannot be vaccinated;
- ◆ **Household contacts and caregivers for children younger than 6 months of age** because younger infants are at higher risk of influenza-related complications and cannot be vaccinated. Vaccination of those in close contact with infants less than 6 months old might help protect infants by "cocooning" them from the virus;
- ◆ **Healthcare and emergency medical services personnel** because infections among healthcare workers have been reported and this can be a potential source of infection for vulnerable patients. Also, increased absenteeism in this population could reduce healthcare system capacity;
- ◆ **All people from 6 months through 24 years of age;**
- ◆ **Children from 6 months through 18 years of age** because we have seen many cases of novel H1N1 influenza in children and they are in close contact with each other in school and day care settings, which increases the likelihood of disease spread,
- ◆ **Young adults 19 through 24 years of age** because we have seen many cases of novel H1N1 influenza in these healthy young adults and they often live, work, and study in close proximity, and they are a frequently mobile population; and,
- ◆ **Persons aged 25 through 64 years who have health conditions associated with higher risk of medical complications from influenza.**

**Table 5: Possible Simultaneous Administration of the 2009-2010 Influenza Vaccines**

Influenza vaccine combinations	Simultaneous administration approved
Injectable seasonal + injectable H1N1	Yes
Injectable seasonal + intranasal H1N1	Yes
Intranasal seasonal + injectable H1N1	Yes
Intranasal seasonal + intranasal H1N1	No

(Continued on page 8)

## Perspectives on the Evolving H1N1 Influenza Pandemic

**Table 6: Urgent Joint Statement for Pregnant Women about Influenza (\*\*) (ACOG, 2009)**

**The normal changes of pregnancy make pregnant women at increased risk of the harmful effects of flu infection. For the health of pregnant women and their developing babies, please take this message seriously.**

**Pregnant women are at increased risk for serious disease and even death from pandemic H1N1 influenza infection.**

**Pregnant women, who have flu-like symptoms such as fever, cough and sore throat should contact their pregnancy care provider immediately so that flu medications can be started and further instructions can be given by their provider. They may also begin treating their fever with acetaminophen (i.e., Tylenol).**

**Pregnant women should also speak to their pregnancy care provider if they have come in close contact with someone who has flu-like symptoms.**

**We strongly recommend all pregnant women receive immunization for seasonal flu NOW and H1N1 flu as soon as this vaccine becomes available. The immunizations pregnant women receive are safe and provide flu protection for both themselves and their newborns.**

**Pregnant women can protect themselves from the flu by washing their hands frequently, by encouraging their family to do the same, and by avoiding contact with sick people.**

(\*\*) Endorsed by American Academy of Family Physicians; American Academy of Pediatrics; American College of Nurse-Midwives; American College of Obstetricians and Gynecologists; Association of Women's Health, Obstetric, and Neonatal Nurses; Infectious Disease Society for Obstetrics and Gynecology; March of Dimes Foundation, and Society for Maternal-Fetal Medicine.

(Continued from page 7)

seasonal vaccine first and only receive H1N1 vaccine later in the year as this second vaccine gradually becomes available. Nonetheless, as summarized in **Table 5**, except for simultaneous use of both LAIV preparations, which is NOT recommended, it would be possible, if necessary and/or convenient, to vaccinate patients against both the seasonal and pandemic H1N1 strains at the same visit.

**Table 7: Pandemic Severity Index**

Pandemic Severity Category	Case Fatality Rate	Projected No. US Deaths
5	≥2.0%	≥1,800,000
4	1.0 to <2.0%	900,000 to <1,800,000
3	0.5 to <1.0%	450,000 to <900,000
2	0.1 to <0.5%	90,000 to <450,000
1	<0.1%	<90,000

Source: DHHS, 20078

**Community Mitigation Perspectives.** Tools available to control influenza include "pharmaceutical interventions" such as vaccines and antivirals but also an entire panoply of "non-pharmaceutical interventions" ranging from simple education about "cough-etiquette" to more socially invasive interventions such as isolation of cases, quarantine of contacts, school closings, and cancellation of large public gatherings.

*Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States— Early, Targeted, Layered Use of Nonpharmaceutical Interventions* is an extensively thorough and fascinating document concerning non-pharmaceutical interventions. It was prepared by the CDC, has been widely used for public health planning purposes, and is available on-line from the Department of Health and Human Services (DHHS) at the link indicated in the reference list (DHHS, 2007). The extent to which such interventions might be used can depend on the pandemic's severity category as measured by the case-fatality-rate according to the schematic scale (reminiscent of the familiar hurricane category scale) as shown in **Table 7**. Thus, more dramatic societal measures such as closing schools or cancelling large collective events (e.g.,

(Continued on page 9)

## Perspectives on the Evolving H1N1 Influenza Pandemic

concerts or graduations) might be appropriate in some settings for category 4 or 5 pandemics, but would typically not be appropriate for Category 1 or 2 pandemics.

As presented in **Table 1** (Part A, page 3), when H1N1 emerged in April, DHEC initially adopted a containment strategy including isolation and quarantine. Containment strategies can be applied:

- ◇ shortly after introduction of a novel virus as part of attempt to “contain” and hence totally interrupt transmission, and thus literally abort an outbreak or epidemic, or
- ◇ as part of aggressive initial public health efforts to “gain time” for the public and the health care system by slowing the otherwise rapid initial expansion phase of an outbreak, even though it may not be possible to totally abort it.

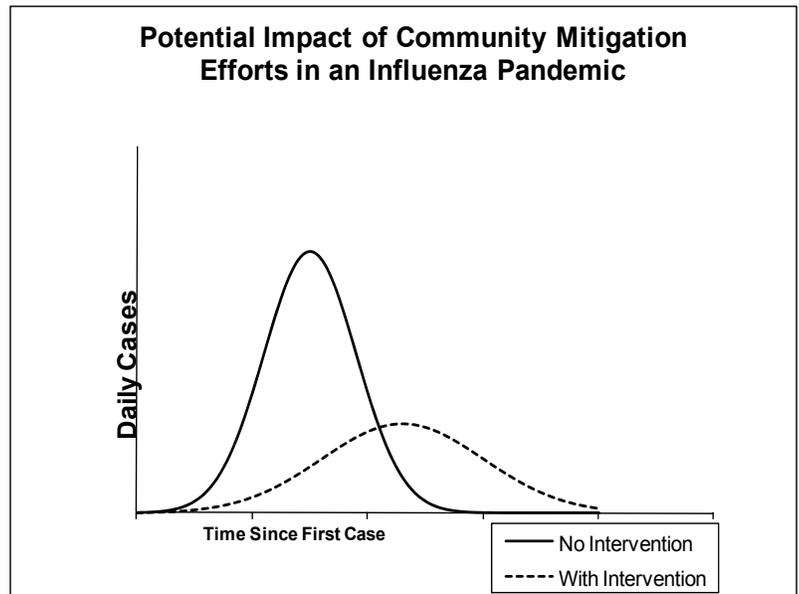
The value of containment and mitigation in this sense are shown schematically in **Figure 2** where the goals of such efforts can be interpreted geometrically as they seek to:

- 1) Diminish overall morbidity and mortality (reducing the area under the epidemic curve)
- 2) Decompress peak burden on waiting rooms, doctor’s offices, hospitals (lowering the height of the peak)
- 3) Delay the outbreak peak (pushing the epidemic curve to the right, ideally until such time as vaccine becomes available which, with good coverage and even reasonable efficacy can then further reduce the “area under the morbidity curve”).

From one perspective, the general common sense advice given to the public (stay home if you are ill; cover your cough; etc.) or even the procedures used in EDs or some physician’s offices (having separate waiting areas for persons with ILI with cough, etc.) appear to affect only the few individuals concerned in each instance or setting. From a broader perspective, however, the sum of all such gestures, policies and procedures taken collectively can, and does, have an impact on the shape of the influenza Epi-curve in a community and thus in a real sense helps to achieve the three goals listed above.

**School Closures.** This fall it will be inevitable that H1N1 will circulate in schools as well as in the wider community, and in some situations (e.g., when school absenteeism is very high) questions will arise about whether a particular

**Figure 2**



school ought to close for a number of days. CDC has helpfully addressed this issue in some detail and provides guidance for colleges and universities, K-12 schools, and child care programs. Guidance is continuously updated at [www.cdc.gov/h1n1flu/schools](http://www.cdc.gov/h1n1flu/schools). The general sense of the guidance is that

“... decisions to dismiss students should be made locally and should balance the goal of reducing the number of people who become seriously ill or die from influenza with the goal of minimizing social disruption and safety risks to children sometimes associated with school dismissal. ... the potential benefits of preemptively dismissing students from school are often outweighed by negative consequences, including students being left home alone, health workers missing shifts when they must stay home with their children, students missing meals, and interruption of students’ education.” (CDC, 2009d)

DHEC has provided guidance along similar lines in Health Advisories for Schools, stating:

“School closure is not advised for a single or small number of suspected or confirmed cases of influenza (including Novel H1N1 Influenza) and, in general, is not advised unless there is a magnitude of faculty or student absenteeism that interferes

(Continued on page 10)

## Perspectives on the Evolving H1N1 Influenza Pandemic

with the school's ability to function" (DHEC, 2009a).

Any decisions made about school closings will naturally have advantages and disadvantages. DHEC continues to work both at the state level with the Department of Education and at the local level with district superintendents and school principals and school nurses who are on the front-lines of such issues. Further guidance for schools may be found at [www.cdc.gov/h1n1flu/schools/schoolguidance.htm](http://www.cdc.gov/h1n1flu/schools/schoolguidance.htm) and [www.dhec.sc.gov/flu/swine-flu.htm#sch](http://www.dhec.sc.gov/flu/swine-flu.htm#sch).

**Influenza Surveillance Notes.** Unlike what is done for most diseases of public health importance (e.g., tuberculosis, meningococcal meningitis, or pertussis), no attempt is made to tally or report every case of influenza. The number of cases in the community is so large that it would be neither possible nor useful to attempt such a tally. Rather, a good picture of influenza trends is pieced together from sources of information regarding:

- ◇ positive influenza cultures (see **Table 1, Part B, line 3**);
- ◇ consultations for influenza like-illness (ILI) from a network of sentinel out-patient providers;
- ◇ numbers of positive rapid flu tests from other selected collaborating providers;
- ◇ influenza hospitalizations; and
- ◇ influenza deaths.

Data regarding hospitalizations and deaths are particularly important this pandemic season. Healthcare providers can assist with the completeness and quality of these surveillance data by ordering an influenza culture for all patients admitted to a hospital because of ILI for whom there is a high suspicion or probability that the illness is in fact related to influenza. If influenza is high on the differential diagnosis, then a useful rule of thumb is that for patients for whom a rapid flu test (RFT) has been ordered as part of the admission evaluation – and regardless of the result of this RFT – a specimen should also be obtained for real-time RT-PCR and/or culture.

In general, the DHEC laboratory functions as a reference and public health surveillance laboratory rather than as a diagnostic laboratory for large numbers of patients. The DHEC laboratory does, however, have some capacity to perform real-time RT-PCR tests and/or viral cultures for ILI patients who are ill-enough to be hospitalized. Within limits of its testing capacity, DHEC will be able to provide such testing. DHEC also monitors the "positivity rate" of specimens submitted by different sources. If DHEC's testing capacity should be exceeded, for example by exceptionally high influenza hospitalization rates as might be seen later in the flu season, then providers will be so notified via the Health Alert Network (HAN), and hospital microbiology laboratories will also be so advised. Fortunately, a number of private diagnostic laboratories (LabCorp, Quest, TriCore and Focus) are now also offering testing which can identify the novel H1N1.

Finally, specimens should also be obtained pre-mortem or post-mortem for patients dying from, or having succumbed to, an illness that may be influenza associated. Prior recovery of a bacterial pathogen (e.g., *Streptococcus pneumoniae*, Group A streptococcus (*S. pyogenes*), *Staphylococcus aureus*) does not obviate the utility of obtaining viral cultures in the right clinical or post-mortem setting, as co-infection with influenza and bacterial pathogens is well recognized and has already been well documented this pandemic season (CDC, 2009e).

**Conclusion.** We have reviewed a number of clinical and public health aspects of the current Novel H1N1 pandemic. Numerous other aspects merit attention in different settings (e.g., issues related to infection control in hospitals, residential care facilities, or other practice settings). Extensive additional information is available from the CDC and DHEC web sites. Pandemic H1N1 remains a moving target. All guidance offered may therefore be regarded as interim and a great challenge for all of us in the coming months will be to try to keep "up-to-date."

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# Need the latest on H1N1 (swine) flu?

Refer frequently to these sites

- SC DHEC website on Novel H1N1 Influenza: [www.scdhec.gov/flu/swine-flu.htm](http://www.scdhec.gov/flu/swine-flu.htm),
- SC DHEC Flu Surveillance Page: [www.scdhec.gov/health/disease/acute/flu.htm](http://www.scdhec.gov/health/disease/acute/flu.htm),
- The CDC's H1N1 page: [www.cdc.gov/h1n1flu/](http://www.cdc.gov/h1n1flu/),
- The DHHS flu resource page: Flu.gov: [www.flu.gov/](http://www.flu.gov/), and
- DHEC Health Alerts: [www.scdhec.gov/health/disease/han/index.htm](http://www.scdhec.gov/health/disease/han/index.htm)).

If you are a public health professional interested in receiving health notifications from the South Carolina Health Alert Network, please contact Shana Dorsey, HAN Coordinator at 803.898.0431 or email [DADE-OC@dhec.sc.gov](mailto:DADE-OC@dhec.sc.gov).

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**FOR DISEASE REPORTING**

For immediately reportable conditions, call your local county health department or, for after hours, call 1-888-847-0902. Routine reports may be phoned in to your local health department or mailed on a completed DHEC DISEASE REPORTING CARD (DHEC 1129.) Local county health

department numbers are listed on the Official List of Reportable Conditions. For a copy of the current Official List of Reportable Conditions, call 803-898-0861 or visit [www.scdhec.gov/health/disease.index.htm](http://www.scdhec.gov/health/disease.index.htm).

**THE EPI NOTES NEWSLETTER IS AVAILABLE ONLINE AT**  
[www.scdhec.gov/health/disease/index.htm](http://www.scdhec.gov/health/disease/index.htm).

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### Thanksgiving Food Safety

The following information can help you make sure your traditional turkey dinner is prepared safely for the upcoming holiday. Happy Thanksgiving!

**Thaw safely.** Frozen turkey must be thawed safely to avoid foodborne illness. There are several options:

- ◆ **In the refrigerator:** Place frozen bird in original wrapper in the refrigerator (40 °F or below). Allow approximately 24 hours per 4 to 5 pounds of turkey. A thawed turkey can remain in the refrigerator for 1-2 days.
- ◆ **In cold water:** If you forget to thaw the turkey or don't have room in the refrigerator for thawing, don't panic. You can submerge the turkey in cold water and change the water every 30 minutes. Allow about 30 minutes defrosting time per pound of turkey. Cook immediately after thawing.
- ◆ **In the microwave:** Microwave thawing is safe if the turkey is not too large. Check the manufacturer's instructions for the size turkey that will fit into your microwave, the minutes per pound, and the power level to use for thawing. Cook immediately after thawing.

**Cook safely.** Use a food thermometer to check the internal temperature of the turkey. A whole turkey is safe cooked to a minimum internal temperature of 165 °F throughout the bird. Check the internal temperature in the innermost part of the thigh and wing and the thickest part of the breast. All turkey meat, including any that remains pink, is safe to eat as soon as all parts reach at least 165 °F. The stuffing should reach 165 °F, whether cooked inside the bird or in a separate dish.

### Frying?

If you plan to fry your turkey, here are some special considerations:



- ◆ The turkey should be 12 pounds or less in size.
- ◆ Do not fry a stuffed turkey, or one that has not been completely thawed. Be sure to remove the giblets before frying.
- ◆ Submerge the turkey completely in oil; oil should cover the turkey by 1 to 2 inches.
- ◆ Select a safe outdoor location and heat the cooking oil to 350 °F. Slowly monitor the temperature of the oil with a thermometer constantly during cooking. Never leave the hot oil unattended. Allow approximately 3 to 5 minutes per pound cooking time.

Check the temperature of turkey with a food thermometer before eating. It must be a minimum internal temperature of 165 °F in the innermost part of the thigh and wing and the thickest part of the breast.

### Store Leftovers Safely.

Cut the turkey into small pieces; refrigerate stuffing and turkey separately in shallow containers within 2 hours of cooking. Use leftover turkey and stuffing within 3-4 days or freeze these foods. Reheat thoroughly to temperature of 165 °F or until hot and steaming.

Sources: [www.fsis.usda.gov/fact\\_sheets/Countdown\\_to\\_the\\_Holiday/index.asp](http://www.fsis.usda.gov/fact_sheets/Countdown_to_the_Holiday/index.asp)  
[www.fsis.usda.gov/factsheets/Turkey\\_Alt\\_Routes/index.asp#7](http://www.fsis.usda.gov/factsheets/Turkey_Alt_Routes/index.asp#7)

