

Florida Department of Health
Pandemic Influenza: Discussion and Planning Recommendations
Division of Disease Control Technical Assistance Group

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I. Introduction

In light of the increasing probability of an influenza pandemic caused by avian influenza or other novel influenza strains, the Florida Department of Health (FDOH) has renewed its focus on response planning. Critical to the success of this renewed focus is updating the state's Pandemic Influenza Response Plan (PIRP)¹ to reflect the current FDOH response goals and capabilities.

This white paper, or position paper, is the foundation of the FDOH revision process. Its purpose is to identify and discuss key public health issues directly affecting a pandemic influenza response, and provide Planning Recommendations that will guide the revision of the FDOH Pandemic Influenza Response Plan. The white paper is not intended to develop an overall strategy to pandemic response. The Planning Recommendations serve two principal groups: (1) FDOH Headquarters and CHD leadership, and (2) FDOH state and local public health planners.

The scope of the white paper is limited to those key public health issues that are within the purview of the Florida Department of Health and critical to the success of the Pandemic Influenza Response Plan. The white paper is not intended to be a comprehensive document.

Additionally, the revision process affords the FDOH the opportunity to readdress the Purpose and Scope statements in the PIRP subsequent to the prioritization of the major competing pandemic response goals.

The white paper was developed by the Division of Disease Control Technical Assistance Group (DDC-TAG) under the authority of the Secretary, Florida Department of Health. Future versions of the white paper will be published annually or as warranted by significant changes in planning parameters.

¹ The PIRP is the Pandemic Influenza Appendix to the Florida Department of Health Emergency Operations Plan.

II. History

Influenza pandemics have occurred three times in the 20th century. The first and most deadly was the pandemic of 1918-1919 which is considered the most severe pandemic in recorded history from any cause.²

The staggering cost of human life in 1918 is a story well known by most in public health. Recent historical reviews estimate that a minimum of 50 million people died worldwide during this pandemic.³ In the United States it is estimated that 675,000 influenza related deaths occurred representing 0.68% of our population at that time. The estimated case fatality rate was 2 to 3%. The virus was unusual also in that it attacked young, healthy adults in disproportionate numbers.

The other two pandemics of the 20th century, 1957-1958 and 1968-1969, though not nearly as severe, caused mortality rates to far exceed that of a typical influenza season.

The span of time between influenza pandemics in the 20th century ranged from 11 years to 39 years. It has now been 37 years since the last influenza pandemic. It is believed that another influenza pandemic can occur at any time and possibly well outside of the typical influenza season.

Typical influenza seasons often result in attack rates of 10 to 20% of the population. Closed populations such as nursing homes can experience attack rates of up to 50 percent. The highest attack rate is generally in children of elementary school age.

When they occur, influenza pandemics infect 20 to 40 percent of the world's population in a single year.⁴ Attack rates are usually much higher during a pandemic than a typical season because populations have not had previous exposure to the novel virus. The impact of a pandemic derives from the speed with which it evolves, the high associated mortality rates, and the seriousness of complications due to illness, most notably viral and bacterial pneumonias.

Mortality characteristically occurs in the highest and lowest age groups, i.e., infants and those over age 65, and in the medically high risk.

The CDC estimates that a medium level influenza pandemic occurring in the world today with the same associated morbidity and mortality as that occurring with the 1918 virus would cause illness in one third of the U.S. population (approximately 90 million), death in 0.7% (nearly 200,000), and cost \$166 billion in direct health care costs.

² Barry, 2005.

³ Johnson, 2002.

⁴ Taubenberger, 2005.

III. Influenza Virus Characteristics

The influenza virus is typically highly infectious and demonstrates one of the shortest incubation periods in microbiology (1-3 days). There are three 'types' that cause disease in humans: A, B, and C. All pandemics are caused by sub-types of influenza A.

The antigenicity and often the virulence of the influenza A sub-types are characterized by the two main surface antigens, hemagglutinin (H) and neuraminidase (N).

The seasonal nature of influenza is associated with conferred immunity in an infected population and genetic drift mutations that occur regularly in the influenza virus.

Through recombination of genetic material in a mammalian host co-infected with different sub-types of virus, the phenomenon of genetic shift is thought to occur. This represents a major genetic change as compared to the seasonal genetic drift phenomenon. It is this major change or genetic shift that sets the stage for a pandemic because it represents the introduction of a viral sub-type to which there is no previous human immunity.

The appearance of this new sub-type represents not only a global threat to human health, but also creates challenges to the usual way of formulating vaccine. The usual trivalent seasonal influenza vaccine depends on finding a reference strain which is relatively innocuous in virulence yet can stimulate immunity. Furthermore, the nature of this strain can often be anticipated from season to season to make the vaccine effective. The difficulties in creating a vaccine effective against a pandemic strain are greatly increased for both these factors.

IV. Epidemiology

Discussion

The FDOH Bureau of Epidemiology (BOE) has two primary responsibilities during an influenza pandemic: (1) disease surveillance, and (2) epidemiologic investigations.

1. Disease Surveillance

Surveillance data help to characterize the course of influenza illness through a population during all pandemic periods: Interpandemic, Pandemic, and Postpandemic. In support of this requirement the BOE conducts the following ongoing surveillance programs:

a. Sentinel Medical Practice Program:

There are over 100 physicians throughout Florida who are voluntarily enrolled in the Sentinel Medical Practice Surveillance Program. They provide a composite statewide picture of influenza illness. Two types of surveillance information are collected:

- 1) viral culture results and viral strain determination from submitted specimens.
- 2) proportion of outpatient visits due to influenza like illness.

b. Surveillance of additional influenza virus strains identified by the Bureau of Laboratories (BOL).

c. Monitoring of over-the-counter sales of respiratory disease items at chain grocery stores and pharmacies, through the National Retail Data Monitor System. Over 2,100 Florida sites participate by supplying daily counts of items sold related to respiratory illness in adults and children.

d. Monitoring of respiratory diagnoses associated with outpatient visits at all Florida VA and military treatment facilities through CDC's BioSense program.

e. Monitoring of laboratory orders at LabCorp through CDC's BioSense program for tests related to respiratory disease. Such test-ordering by physicians is another early indicator of the presence of influenza-like illness.

f. Monitoring of emergency department visits for respiratory illness collected through syndromic surveillance systems in selected counties (Hillsborough, Pinellas, Duval).

Although not operational at this time, two additional programs are being developed by the BOE: (1) a Mortality Reporting System from data submitted by County Health Department Vital Statistic Registrars to the BOE based on death certificates information, and (2) a Hospital Data Collection System that will be capable of conducting daily monitoring of:

- 1) Hospital admissions
- 2) Hospital census
- 3) Hospital beds available
- 4) Deaths from all causes and influenza related

Information collected from these two systems is essential for understanding the impact of the pandemic on the state and for describing that impact to elected officials, the media, and our state residents. These data enable the BOE to answer questions such as:

- 1) How many are ill?
- 2) How many are hospitalized?
- 3) How many are dead?
- 4) What age groups are most affected?

It is expected that both systems will be operational by early 2006. Hospital data is currently collected during emergencies by ESF-8 (Health and Medical), State Emergency Operations Center, by the FDOH Office of Emergency Operations.

Planning Recommendations

1. The Bureau of Epidemiology will maintain its existing surveillance systems during all periods of the pandemic:
 - a. Sentinel Medical Practice Program:
 - 1) Viral culture and strain identification
 - 2) Proportion of outpatient visits due to influenza-like illness
 - b. Surveillance of influenza virus strains additionally identified by the Bureau of Laboratories (BOL).
 - c. Monitoring of over-the-counter sales of respiratory disease items through the National Retail Data Monitor System.
 - d. Monitoring of respiratory diagnoses associated with outpatient visits at VA and military treatment facilities through CDC's BioSense program.
 - e. Monitoring of laboratory orders at LabCorp, through the CDC's BioSense program.
 - f. Monitoring of emergency department visits for respiratory illness collected through syndromic surveillance systems in selected communities (Hillsborough, Pinellas, Duval).
2. The Office of Emergency Operations (OEO) will collect the following information daily from acute care facilities in collaboration with the Agency for Health Care

Administration (AHCA) and the Florida Hospital Association (FHA) and report the data to the Bureau of Epidemiology (BOE):

- a. Total number of hospital admissions with influenza and influenza-like illness from all Florida licensed acute care facilities. Detailed patient demographic data on age, sex, and race collected from a representative sample of facilities identified by the BOE.
- b. Hospital census.
- c. Total mortality due to influenza, influenza-like illness, or pneumonia. Detailed patient demographic data on age, sex, and race collected from a representative sample of facilities identified by the BOE.

2. Epidemiologic Investigations

Epidemiologic investigations are designed and conducted to answer specific questions about a disease outbreak that cannot otherwise be addressed through disease surveillance. They can be conducted through state, state and CHD, or state and federal collaborations.

Providing answers to the following epidemiologic questions are priorities during a pandemic:

- a. What is the effectiveness of prophylactic and therapeutic antiviral medication?
- b. What is the effectiveness of disease control measures (e.g. isolation, quarantine, school closures, etc.)?
- c. What population groups are at greatest risk of illness and death?
- d. What is the vaccine efficacy?
- e. What is the basic reproduction rate, R_0 , of the influenza strain?

Planning Recommendations

1. Epidemiology staff assigned to the Bureau of Epidemiology and County Health Departments will be prepared to support state and federal epidemiologic investigations to determine:
 - a. antiviral efficacy
 - b. effectiveness of disease control measures (e.g. isolation, quarantine, school closures, etc.)
 - c. population groups at greatest risk of morbidity and mortality
 - d. vaccine efficacy
 - e. Basic reproduction rate, R_0

3. Laboratory Support

Discussion

The Bureau of Laboratories' (BOL) primary mission during a pandemic is (1) to conduct influenza strain typing during all three periods of a pandemic, and (2) to report pertinent information and testing results in support of BOE surveillance programs.

Laboratory surveillance through influenza strain typing identifies the biological characteristics of the circulating influenza virus. Strain typing is accomplished through rapid screening using molecular biology methods, e.g. real-time polymerase chain reaction (RT-PCR) followed by culture confirmation. The results from these tests are electronically transmitted nightly to BOE.

The process of strain typing helps determine: (1) the proportion of viral influenza illness caused by novel strains, and (2) how far and fast the viral strain is spreading in Florida.

During a pandemic, the significance of surveillance testing does not have the same purpose as clinical diagnostic testing. Early in the Pandemic Period the most critical work for the BOL is to (1) distinguish between infection caused by traditional influenza strains and infections caused by the pandemic strain, and (2) track the occurrence of pandemic virus in the state. It is important to recognize that there are many diseases that cause flu-like symptoms that the BOL must continue to test for such as arboviral, e.g. West Nile Fever, Eastern Equine Encephalitis; or enteroviral illnesses.

During the middle of the Pandemic Period only a select number of samples are tested as most illness will be due to the pandemic strain. Criteria for selecting which samples are appropriate for testing include samples from outbreaks in select groups, sentinel samples, and samples from unusual patient presentations.

In the latter part of the Pandemic Period testing focuses on (1) changes in the virus, e.g. antigenic drift or shift, and on (2) sample testing from second waves of illness in a population.

County Health Departments (CHDs) and private physician's offices use a variety of rapid influenza detection kits which are outside of the scope and purview of the BOL surveillance program.

Laboratory Surge Capacities

The BOL will focus its pandemic response efforts through the Jacksonville, Miami, and Tampa laboratories. Additionally it has the capability at current staffing levels to dedicate 2-4 trained laboratory technicians to surveillance diagnostic testing in the remainder of the five state laboratories (Pensacola, Lantana), if needed. Technicians will be reassigned within laboratories, as needed, to support increased demands for testing.

BOL personnel are expected to become ill at a rate similar to that of the general population. A decrease in laboratory personnel of 10 to 20% due to illness or other

causes will adversely impact the BOL's surveillance support events in its three primary response laboratories. As illness or the volume of specimens increase due to the pandemic personnel in all five state laboratories will shift their attention to influenza testing. As a consequence it may be necessary to suspend or divert to commercial laboratories testing services that are deemed non-critical.

Additional surge capacity is available from the Advanced Capacity Hospital Laboratories (ACHLs) established by the BOL. Currently, five of the ACHLs have instrumentation that can be used to screen for and type influenza viruses (Jackson Memorial Hospital Miami; Shands, Gainesville; Tampa General Hospital; Florida Hospital Cancer Institute, Orlando; DSI Laboratories, Ft. Myers).

Facility Safety

Biosafety Level 3 (BSL-3) rooms capable of handling influenza specimens and instruments for molecular assays such as RT-PCR are available at all five state laboratories.

Planning Recommendations

1. The BOL will organize available assets as required to conduct influenza strain typing during all three Pandemic Periods, and to assure daily electronic data entry.
2. The BOL will submit a daily report of surveillance information and testing results to the BOE in support of FDOH surveillance programs.
3. During a pandemic, laboratory testing services that are deemed non-essential by the Director, BOL, will be suspended or diverted to commercial laboratories as needed.

V. Disease Control Interventions

The following section identifies and discusses primary disease control interventions available to public health officials to control or mitigate an influenza pandemic. Several highly successful measures such as isolation and quarantine have been employed for centuries to protect populations from exposure to infectious agents. More recent advancements in science over the last century have resulted in the development of antiviral medications and vaccines to prevent or treat infection.

Understanding how influenza is transmitted to humans highlights the importance of behavior modification in individuals and societies in order to reduce the risk of exposure to this infectious agent and subsequent illness. Effective ways to minimize exposure and risk of illness include avoiding public gatherings, frequent hand washing, and staying home from work or school if one feels sick.

All of these interventions have their role in disease control; all are valuable and should be employed with realistic expectations and clear communication to the public as to their strengths and weaknesses.

1. Antiviral Medications

Discussion

If antiviral medications are available in sufficient quantity they can play a significant role in protecting a population. Stochastic modeling demonstrates that it is possible to avert a pandemic if antivirals are taken prophylactically by 80% of a population.⁵

There are two categories of antivirals used for treatment and prophylaxis of influenza and each category has two approved medications: (1) the adamantane derivatives (amantadine and rimantadine), and (2) the neuraminidase inhibitors (zanamivir and oseltamivir).

Oseltamivir (Tamiflu) is the only antiviral of the four that has not been rendered ineffective due to viral resistance and continues to be recommended by the World Health Organization.

There are between 3 to 4 million treatment 'courses'⁶ of oseltamivir currently available in the United States for a pandemic response: two million courses are in the Strategic National Stockpile (SNS), and an estimated 1 to 2 million additional courses in the private sector.⁷ According to the CDC, Florida can expect to receive an amount roughly proportional to our population from the SNS in the event of a pandemic.

⁵ Longini, 2004.

⁶ A treatment "course" consists of taking one 75 mg pill, orally, twice a day, for five days.

⁷ Wortley, 2005.

To date, no federal guidance has been provided to the state regarding:

1. National or state control of private sector medications,
2. Whether the state's percentage of elderly and other high risk populations will be factored in determining the amount of medication received from the SNS, or
3. Whether the state's seasonally high number of tourists will be factored in determining the amount of medication received from the SNS.

Treatment

Florida can cautiously plan on receiving 120,000 treatment courses of oseltamivir⁸ based on population of the two million available in the SNS. The DDC-TAG does not envision the State gaining effective control of oseltamivir from the private sector.

Estimating a pandemic influenza attack rate in the United States of 20% to 40%⁹ over one year means that Florida must prepare to treat 3.4 to 6.8 million cases of influenza. The amount of oseltamivir allocated to Florida from the SNS could only treat 1.8 % to 3.5% of Florida's total number of influenza cases.

Prophylaxis

By comparison, if the 120,000 courses of Oseltamivir¹⁰ were used for prophylaxis it would provide only eight weeks of protection for 11,000 Floridians, or four weeks of prophylaxis for 22,000 Floridians.

Group Prioritization

1. Health Care System

Vying for group prioritization for treatment and prophylaxis in Florida are an estimated 278,500 health care providers: over 40,000 certified Emergency Medical Technicians (EMTs) and paramedics; 16,000 public health employees; 50,000 physicians; 5,500 nurse practitioners; 125,000 licensed registered nurses employed in nursing; and over 42,000 licensed practical nurses.

This number does not reflect the additional thousands of health care industry support staff in essential functions such as maintenance, food service, transportation, logistics, administration, security, and communications on which the health care system is critically dependent.

⁸ Treatment with Oseltamivir is approved for ages greater than one year old.

⁹ Longini, 2005.

¹⁰ Prophylaxis with Oseltamivir is approved for ages greater than 13 years old.

2. High Risk Populations

Group prioritization for treatment and prophylaxis includes Florida's medically high risk citizens, estimated at 2.5 million, who are likely to have the highest mortality rates. This includes an estimated 95,000 HIV positive individuals, 1.2 million high risk elderly (40% of Florida's 3 million elderly), and 220,000 high risk children (6% of Florida's 3.7 million children, ages 1-18).¹¹

A draft recommendation identifying priority groups was finalized by the Joint ACIP/NVAC Working Group.¹² However, Florida will not be allocated sufficient quantity of antiviral medications to be effectively employed as a disease control intervention for either treatment or prophylaxis.

Prophylactic use of Florida's current allocation of antivirals will not alter the course of the pandemic, protect a significant number of people in any high risk group, nor prevent transmission of disease, if used by a singular priority group.¹³

An alternative approach would be to use the limited supplies of antivirals as part of a strategy to delay the transition within the state from sporadic cases of the novel influenza virus to sustained human-to-human transmission. Antivirals could be used in combination with isolation and quarantine, and other measures, to increase social distance for local outbreak control.

Future Availability

Although Roche, the sole producer of oseltamivir, has announced plans to open a new plant in North America in the second half of this year, it will be some time before product would be available.¹⁴

Planning Recommendations

1. Oseltamivir will be prescribed as supplies last to treat the highest priority group as identified in CDC ACIP draft guidance.
2. Oseltamivir will not be used for prophylaxis.

¹¹ Huang, 2005.

¹² CDC, 2005.

¹³ Longini, 2005.

¹⁴ Taylor, 2005.

2. Vaccine

Discussion

Vaccination is the primary method of preventing influenza in the world¹⁵ and it is the most effective means of reducing the effects of influenza in persons considered medically high risk for complications.¹⁶ Vaccine is not effective for treatment.

In the early phases of a pandemic vaccine will not be available as a disease control intervention. Vaccine production during a pandemic begins only after the virus has been isolated and identified. A minimum six to eight months are required to develop a vaccine once the virus has been identified.

Vaccine production capabilities are limited in the United States. Vaccine will become available only gradually and may not be available for the entire population for some time. The Department of Health and Human Services estimates that vaccine production may reach 5 million doses a week starting six to eight months after the onset of a pandemic. Florida should plan to receive and distribute an estimated 300,000 doses of vaccine per week based on population.

It is expected that the influenza virus will represent a new strain, such as H5N1, which will require two doses of vaccine rather than one in order to confer immunity. This will further reduce the number of people that can be successfully immunized at a given time with any amount of vaccine the state receives.

Group Prioritization

It is expected that quantities of vaccine allocated to the state will be small and insufficient to stop or quickly alter the course of a pandemic.

¹⁵ WHO, Guidelines, 2004.

¹⁶ CDC, Prev and Control, 2004.

Planning Recommendations

1. Vaccine will not be available for pandemic influenza prophylaxis until six to eight months after the pandemic begins.
2. Vaccine allocation will be based on national guidelines.
3. Vaccine quantity will be regionally allocated by priority group as determined by the Bureau of Epidemiology.
4. Regional vaccine distribution will be executed by the Bureau of Immunization.

3. Behavior Modification: Isolation, Quarantine, Travel Restrictions

Discussion

Isolation and quarantine are basic public health interventions frequently used to protect the public by containing the spread of a contagious disease. Both of these interventions are highly effective in protecting the public from certain diseases and can be voluntary or mandatory.

In April, 2005, the President of the United States amended Executive Order 13295 by adding novel or re-emergent influenza viruses to the list of potentially quarantinable communicable diseases.¹⁷ In Florida, the Secretary of the Department of Health has the authority to declare a quarantine in order to protect the public. These procedures are outlined in the FDOH 2004 Isolation and Quarantine Plan.

Options regarding the degree of emphasis of isolation and quarantine recommendations represent attempts to balance the ethical values of protecting public health and individual liberty in the context of scientific uncertainty, and the desire to take appropriate action that avoids a disproportionate or ineffectual response.

How a “disproportionate” response is assessed is a key issue. Acting disproportionately can cost DOH credibility that would contribute to a perceived lack of effectiveness. The question of how much should be done given scientific uncertainty is an ethical question. There is no scientific answer as to whether it is best to err on the side of either not doing enough or having a disproportionate response. Both choices involve potential for error.

Isolation

Isolation is often thought of as a hospital specific control measure. Patients are isolated in Florida hospitals for many diagnoses including influenza. Isolation also includes staying home and avoiding contact with others when sick.

A public health message advocating voluntary self isolation by staying home from school or work when sick may reduce exposure of disease to others and cut down on the incidence of disease. Self isolation may be one of the few disease control strategies available. Although there is no scientific evidence to suggest that self isolation is a highly effective way of reducing disease incidence or the slope of a disease curve, it is a reasonable and conservative public health recommendation that may result in some benefit.

¹⁷ Executive Order, 2005.

Quarantine

Quarantine can be a highly effective disease control intervention. Several factors are considered before recommending quarantine during an influenza outbreak. The effectiveness of quarantine depends on the characteristics of the disease; not all diseases are contained by quarantine.

As the incidence of influenza increases, interventions that may have been effective and appropriate earlier in an influenza outbreak such as isolation, contact tracing, and voluntary quarantine of contacts, would cease to be effective or feasible during a pandemic.¹⁸ Public health focus then changes to providing preventive guidelines and health care to the ill.

Quarantine may be ineffective in some situations. Factors that contribute include: the overwhelming number of sick, the very short incubation period (2 days) and infectious period (3-4 days), the estimated high basic reproduction number, R_0 (~1.8), and the high number of disease transmissions that occur prior to the development of symptoms.¹⁹

It is possible that a sizeable proportion of all infected people during a pandemic will be asymptomatic but infectious.²⁰ In Florida, this means that many people may be asymptomatic yet capable of transmitting influenza to others.

Severe Acute Respiratory Syndrome (SARS) was contained by effective use of isolation and quarantine. SARS, however, had a long incubation period, small R_0 , and no identified asymptomatic infectious cases.

The WHO does not recommend that quarantine be employed once an outbreak has become a Pandemic.²¹ However, self quarantine is a reasonable and conservative public health recommendation that may result in some benefit.

Travel Restrictions

A strategy of restricting all travel from geographic areas with cases of influenza may be advocated early in the course of an influenza pandemic. Such an intervention strategy will not contain an influenza pandemic due to the characteristics of the disease as described above.

Fever monitoring points at airports or at border checkpoints, similar to that used in Singapore for SARS, may also be advocated. However, this screening tool lacks sensitivity and specificity and would not be an effective intervention.

Planning Recommendations

¹⁸ WHO, 2004 (March), p16-18.

¹⁹ Fraser, 2004.

²⁰ Longini, 2004; Fraser, 2004.

²¹ WHO, 2005.

1. FDOH will recommend and emphasize the following disease control interventions to slow the incidence of disease during an influenza pandemic:
 - a. home, or hospital, isolation of persons ill with influenza.
 - b. home quarantine of persons exposed to a person ill with influenza.
 - c. travel restrictions of persons ill with influenza or exposed to influenza.
 - d. school and work closures, and cancellations of public gatherings to include church and sporting events if indicated by epidemiologic surveillance and analysis.
 - e. extensive public education, social marketing and work with social institutions (schools, employers, churches, etc) to reinforce prevention messages and gain public cooperation with necessary measures to delay the onset of epidemic influenza.

VI. Event Management

Discussion

Homeland Security Presidential Directive 5 (HSPD-5), *Management of Domestic Incidents*, requires adoption of the National Incident Management System (NIMS) to prepare for, prevent, respond to, and recover from domestic incidents regardless of the cause, size or complexity of the event. Individual states are required to formally adopt NIMS prior to September 30, 2005, to continue to be eligible for federal preparedness funding. NIMS compliance includes six components, one of which is the use of the Incident Command System.²² The Incident Command Structure (ICS) is a management system used at all levels of government (Federal, State, local and tribal), by all response partners, as well as many private-sector and nongovernmental organizations.

Florida has adopted NIMS and ICS and is updating our State Comprehensive Emergency Management Plan (CEMP) to reflect these new national requirements. The State Emergency Response Team (SERT) is the operational element when the CEMP is activated and operates under national ICS standards. The CEMP names the FDOH, as a member of the SERT, as the lead agency for the Emergency Support Function 8 (ESF-8), the Health and Medical component of a state response. Under Florida Statute, the FDOH Emergency Coordinating Officer serves as the Secretary's designee on the SERT and is responsible for leading ESF-8.

Consistent with national guidance, FDOH has adopted ICS for the management of public health events which stress our routine business processes but may not require an activation of the SERT. After the 2004 Hurricane Season, FDOH implemented a single structure for management of events regardless of whether or not the event requires an activation of the SERT. The structure is referred to as the FDOH/ESF-8 Structure and is built on national ICS standards.

The Office of Emergency Operations is responsible to identify, train and exercise staff for the FDOH/ESF-8 structure. The 2005 implementation includes the development of job specific materials and just-in-time training. A minimum of 6 persons are being identified and trained pre-event for the leadership positions within the structure.

County Health Departments are in the process of implementing ICS structures within their organizational unit and in concert with their county Emergency Management Agencies.

Once, the DOH EOP, Pandemic Influenza Response Plan is developed, the Disease Control Technical Advisory Group will be tasked to review position specific job-action sheets and training materials to assure the critical elements of a communicable disease response are integrated.

²² (Footnote: National Incident Management System, March 1, 2004 http://www.fema.gov/pdf/nims/nims_doc_full.pdf)

VII. Information Management

Discussion

In the event of a crisis, an information management process must be rapidly activated within the FDOH/ESF-8 Structure to eliminate duplication, maximize use of resources and minimize confusion in the dissemination of information supporting response efforts.

The Information Management framework includes four essential components:

1. Public Information

The primary function of the Public Information component is external communication through the use of the media. This includes responding to media inquiries and developing key public health messages and press releases. During routine business, the FDOH Office of Communications serves this function. Once the FDOH/ESF-8 structure is activated, this function becomes part of the Command Team, by designation of a Public Information Officer. When the SERT is activated, the FDOH/ESF-8 Public Information Officer serves as liaison to the ESF-14 (Public Information) to coordinate Health and Medical external public information activities related to the crises.

2. Organizational Communication

Organizational communications requirements are routinely met within current structures at the division level. During a response this information management responsibility lies with the FDOH/ESF-8 structure, within the Planning Unit. In a pandemic influenza event, subject matter experts must be included in the Planning Unit to assure timely, consistent and accurate communication for the following:

- a. Within the FDOH Central Office:
 - 1) Ensure clear articulation of the Incident Action Plan and Situation Reports. These reports are developed and disseminated, upon approval, by the FDOH/ESF-8 Planning Unit.
- b. Within the statewide FDOH response structure:
 - 1) Develop and facilitate the distribution of concise, clear information to local CHD personnel involved in response activities.
 - 2) Ensure routine updates for FDOH staff supporting other essential public health functions during the event.
- c. Monitor and report communication needs for collaboration with:
 - 1) other state agencies involved in response efforts, e.g. transportation and law enforcement.
 - 2) federal partners involved in response efforts, e.g. FEMA, CDC.
 - 3) private sector partners, e.g., private providers and associations.

3. Communications Logistical Support

The Division of Information Technology (IT) is responsible for oversight and management of the information systems and infrastructure of the FDOH. Connectivity and hardware requirements related to response activities are unique to each situation. Immediate needs may include the institution of electronic distribution lists, shared drives, and event specific web information sites. Additionally, co-location of hardware such as telephones and computers may be necessary along with the designation of toll free information lines.

During a pandemic response the Logistics Unit will be responsible to assure that technology and communications hardware are immediately available to support the information management function.

4. Risk Communication

In addition to organizational structure, the information management components of a response plan should include guidance for general use of risk communication principles and the adoption of a communication matrix to aide in common understanding of communication processes.

Risk communication has been highlighted by recent reviews of successful disaster responses as a critical public health skill. The U.S. Department of Health and Human Services and the Centers for Disease Control and Prevention have established training, curriculum, and guidelines to assist in the development of risk communication strategies during a response effort.²³ Primary goals of risk communication include informing the public, easing their concerns, and providing guidance on how to respond. All personnel working in response activities should have a basic understanding of these principles.

Communications Matrix

The information management structure can be further enhanced by the adoption of a communication matrix which: (1) concisely articulates the decision-making process for the development of key messages during a response effort, and (2) guides the mechanisms for dissemination of those messages.

²³ US Dept of Health and Human Services, 2002.

The following matrix is provided²⁴:

Audience	<input type="checkbox"/> Professional	<input type="checkbox"/> Stakeholders	<input type="checkbox"/> General Public
Urgency	<input type="checkbox"/> Immediate	<input type="checkbox"/> Priority	<input type="checkbox"/> Routine
Sensitivity	<input type="checkbox"/> High	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Non-sensitive

When using this matrix, the following sequential steps are taken for each prospective message:

- a. Determine the audience, urgency, and sensitivity of the message.
- b. Determine the necessary expertise for development of the message.
- c. Determine the needed product. (i.e., website, public service announcement, direct personal communication)
- d. Determine the mechanism for distribution. (i.e., blast fax, blast e-mail, public media, newsletter)

Care to achieve consensus on these decision points prior to development of messages will assist in creating a common understanding of communication for personnel working on the response teams. Development of a common language with regard to communication needs and activities, allows for less uncertainty and ambiguity while fostering common understanding of communication goals and priorities.

Planning Recommendations

1. A Public Information Officer and Planning Chief will be identified within the FDOH/ESF-8 Structure and tasked with coordinating the four component areas of communication and information management during pandemic response efforts.
2. The proposed Communication Matrix will be integrated into the plan for use within the FDOH/ESF-8 Structure to direct the development and dissemination strategies of key communication messages during a pandemic response.
3. The FDOH/ESF-8 Logistics Unit will assure that technical assistance and procurement services for necessary communication hardware such as telephones and related services are immediately accessible
4. All FDOH personnel assigned to leadership positions within the FDOH/ESF-8 Structure will receive training in Risk Communication.

²⁴ Kirkpatrick, 2004.

VIII. Pandemic Influenza Response Plan: Defining the Purpose and Scope

Discussion

1. Purpose

There are three goals of a pandemic response outlined by Health and Human Services (HHS):

- a. minimize morbidity and mortality
- b. decrease economic disruption
- c. decrease social disruption

These goals are not all achievable as success is dependent on prioritized access to limited resources, especially vaccine and antivirals. At best these goals compete with each other for priority, at worst they are mutually exclusive.

Traditionally, public health response efforts have emphasized the core mission of minimizing morbidity and mortality when defining the Purpose and Scope statements within a response plan. In the absence of a national planning directive that prioritizes one of these goals, FDOH has concentrated on staying within its core mission by developing Planning Recommendations that minimize morbidity and mortality, while being conscious of their potential impact on social and economic disruption.

With this awareness, the Pandemic Influenza Response Plan Purpose statement should do the following:

- a. define rational achievable goals
- b. emphasize the public health core mission of minimizing morbidity and mortality
- c. advocate for the welfare of the medically high risk.

2. Scope

Discussion

The plan's statement of Scope defines the limits of the plan's responsibilities and authority in support of the plan's Purpose.

Planning Recommendations

1. The Purpose of the Pandemic Influenza Response Plan is to support the public health core mission of reducing influenza morbidity and mortality.
2. The Scope of the Pandemic Influenza Response Plan is limited to those public health issues that are the responsibility of the Florida Department of Health in support of the public health core mission of reducing influenza morbidity and mortality as described in the plan's Purpose.

IX. The Health Care System

Discussion

Pandemic Influenza preparedness for the state's health care system is part of the ongoing work of the Catastrophic Incident Response Plan (CIRP) planning process. Once completed, the CIRP will become part of the State Comprehensive Emergency Management Plan, which links to the DOH Emergency Operations Plan, thereby, integrating the FDOH Pandemic Influenza Annex (Pandemic influenza Response Plan) to the broader health care system plan.

FDOH will continue to inform and encourage those responsible for the CIRP planning process, including the component pieces, to use Pandemic Influenza Response Plan as the biological scenario for plan development.

IX. Annexes

Annex A. Acknowledgements

The following are members of the FDOH Division of Disease Control Technical Assistance Group:

Dian Sharma, Ph.D., Chief, Bureau of Epidemiology– Team Leader
Bill Tynan, M.D., M.P.H., Medical Director, Office of Public Health Preparedness
Charles Alexander, Chief, Bureau of Immunizations
Phil Amuso, Ph.D., HCLD (ABB), Assistant Chief and Lab Director, Bureau of Laboratories
Tom Belcuore, M.S., Administrator, Alachua County Health Department
Don Bennett, M.B.A., Chief, Bureau of Emergency Management Services
Carina Blackmore, M.S., Vet. Med., Ph.D., State Public Health Veterinarian, Division of Environmental Health
Mark Chan, Associate Webmaster, Bureau of Laboratories
Ming Chan, Ph.D., Chief, Bureau of Laboratories
Sonia Clavijo, M.D., M.P.H., Antibiotic Resistance Program Coordinator, Bureau of Epidemiology
Landis K. Crockett, M.D., M.P.H.
Carol Graham, Ph.D., Training and Research Manager, Infant Maternal and Reproductive Health
Michael Greif, J.D., Senior Attorney, Office of the General Counsel
Jerry Hill, R.Ph., C.Ph., Chief of Pharmacy Services, Bureau of Statewide Pharmaceutical Services
Robert Hood, Ph.D., Assistant Director, Office of Statewide Research
Richard Hopkins, M.D., M.S.P.H., Medical Epidemiologist, Bureau of Epidemiology
David Johnson, M.D., M.S., D.A.B.T., F.A.C.O.E.M., State Epidemiologist, Medical Executive Director, Division of Environmental Health
Page Jolly, M.A., Public Information Officer, North Florida Regional Domestic Security Task Force
Doc Kokol, Communications Director, Office of Health Communications and Program Marketing
Charles McArthur, R.Ph., Pharmaceutical Program Manager, Bureau of Statewide Pharmaceutical Services
Richard McNelis, J.D., Associate, Office of the General Counsel
Alan Rowan, M.P.A., Dr.P.H., Program Manager, Florida EIS Program, Bureau of Epidemiology
Sandra Schoenfisch, R.N., Ph.D., Assistant Director, Office of Performance Improvement
Joann Schulte, D.O., M.P.H., Medical Epidemiologist, CDC Assignee to Bureau of Epidemiology
Phyllis Yambor, R.N., C, B.S., Executive Community Health Nursing Director, Bureau of Immunization

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Annex B. References

- Barry JM. 2005. *Lessons and Suggestions for Further Inquiry*. IOM (Institute of Medicine). *The Threat of Pandemic Influenza: Are We Ready?* Washington DC: The National Academies Press.
- Centers for Disease Control and Prevention. 2005 (July 19). Summary of June 15-16, 2005 Meeting of Joint ACIP/NVAC Working Group on Pandemic Influenza Vaccine Prioritization.
- Harper SA, Fukuda K, Uyeki TM, Cox NJ, Bridges CB; Centers for Disease Control and Prevention Advisory Committee on Immunization Practices. 2004. Prevention and Control of Influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recommendations and Reports* 53 (RR06); 1-40.
- Harper SA, Fukuda K, Uyeki TM, Cox NJ, Bridges CB; Centers for Disease Control and Prevention Advisory Committee on Immunization Practices. 2005. Prevention and Control of Influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recommendations and Reports* 54 Early Release; 1-40.
- Florida Department of Health. 2005. Emergency Operations Plan, Biological Incident Annex, Influenza Pandemic Appendix (Pandemic Influenza Response Plan).
- Florida Department of Health. 2004. Emergency Operations Plan, Annex V: Isolation and Quarantine.
- Fraser C, Riley S, Anderson R, Ferguson N. 2004 (April). *Factors that make an infectious disease outbreak controllable*. Proceedings of the National Academy of Sciences.
- Garrett L. 2005 (July/August). Preparing for the Next Pandemic. *Foreign Affairs*.
- Gostin LO. 2005. *Public Health Preparedness and Ethical Values in Pandemic Influenza*. IOM (Institute of Medicine). *The Threat of Pandemic Influenza: Are We Ready?* Washington DC: The National Academies Press.
- Huang Y. 2005 (June). Personal Correspondence. Bureau of Epidemiology, Florida Department of Health.
- IOM (Institute of Medicine). 2005. *The Threat of Pandemic Influenza: Are We Ready?* Washington DC: The National Academies Press.
- Lipsitch D P. 2005 (April 14). Pandemic Flu: We Are Not Prepared. *Medscape*.
- Longini IM, Ackerman E, Elveback LR. 1978. An optimization model for influenza A epidemics. *Math Biosci* 1978; 38:141-57.

- Johnson NP, Mueller J. 2002. Updating the accounts: Global mortality of the 1918-1920 "Spanish" influenza pandemic. *Bull Hist Med* 76:105-115.
- Kirkpatrick J. 2004. North Carolina Division of Public Health. Unpublished.
- Longini IM Jr, Halloran ME, Nizam A, Yang Y. 2004. Containing Pandemic Influenza with Antiviral Agents. *Am J Epidemiol*; 159:623-633.
- Longini IM, Halloran ME. 2005. Strategy for Distribution of Influenza to High Risk Groups and Children. *Am J Epidemiol* 2005; 161:303-306.
- Meltzer MI, Cox NJ, Fukuda K. 2005. *The Economic Impact of Pandemic Influenza in the United State: Priorities for Intervention*. IOM. *The Threat of Pandemic Influenza: Are We Ready?* Washington DC: The National Academies Press.
- National Vaccine Program Office. 2004. Draft Pandemic Influenza Preparedness and Response Plan. Department of Health and Human Services.
- Osterholm MT. 2005. Preparing for the Next Pandemic. *N Engl J Med* 352;18.
- Osterholm MT. 2005a (26 May). A Weapon the World Needs. *Nature*.
- Osterholm, MT. 2005b (July/August). Preparing for the Next Pandemic. *Foreign Affairs*.
- Pavia AT. 2005. Statement by Andrew T. Pavia, MD, Concerning Pandemic Influenza before the Committee on Energy and Commerce Subcommittee on Health United States House of Representatives. Infectious Disease Society of America.
- Patel R, Longini IM, Halloran ME. Finding optimal vaccination strategies for pandemic influenza using genetic algorithms. *J Theor Biol* (in press).
- Taubenberger JK. 2005. *Chasing the Elusive 1918 Virus: Preparing for the Future by Examining the Past*. IOM. *The Threat of Pandemic Influenza: Are We Ready?* Washington DC: The National Academies Press.
- U.S. Department of Health and Human Services. Communication in a Crisis: Risk Communication Guidelines for Public Officials, Washington, D.C.: Department of Health and Human Services, 2002 and http://www.cdc.gov/communication/emergency/erc_overview.htm
- World Health Organization (WHO). 2004. *WHO Guidelines on the Use of Vaccines and Antivirals during Influenza Pandemics*.
- WHO. 2004a. *WHO Consultation on Priority Public Health Interventions Before and During an Influenza Pandemic*.
- WHO. 2005b. *Avian Influenza: Assessing the Pandemic Threat*.
- WHO. 2005c. *WHO Checklist for Influenza Pandemic Preparedness Planning*.

WHO. 2005d. *WHO Global Influenza Preparedness Plan*.

Wortley P. 2005 (June). Personal Correspondence. Influenza Program, Centers for Disease Control and Prevention.

Annex C. Acronyms

AHCA	Agency for Health Care Administration
BOL	Bureau of Laboratories
CDC	Centers for Disease Control and Prevention
CHD	County Health Department
CIRP	Catastrophic Incident Response Plan
DDC	Division of Disease Control
DIRM	Division of Information Resource Management
ESF- 8	Emergency Support Function - Health and Medical
FDOH	Florida Department of Health
FEMA	Federal Emergency Management Agency
FHA	Florida Hospital Association
HIV	Human immunodeficiency virus: the cause of Acquired Immune Deficiency Syndrome (AIDS)
ICS	Incident Command Structure
ICU	Intensive Care Unit
PIRP	Pandemic Influenza Response Plan
SARS	Severe Acute Respiratory Syndrome
SNS	Strategic National Stockpile
TAG	Technical Assistance Group
VA	Veteran's Affairs
WHO	World Health Organization

Annex D. Glossary

Antigen: A protein, typically foreign, that elicits a specific immune response.

Antigenic drift: Point mutations leading to changes in antigenicity of the major H and N antigen subtypes of an influenza virus.

Antigenic shift: Change in circulating major antigen (H and N) determinants either through exchange and reassortment of genetic material or adaptation to human transmission.

Attack Rate: The proportion of susceptible individuals exposed to a specific risk factor in a disease outbreak that become cases. For an infectious risk factor, the attack rate is the number of secondary cases occurring within the accepted incubation period divided by the number of susceptible individuals in a closed group exposed to the primary (index) case.

Case Fatality Rate: Cumulative incidence of death in the group of individuals that develop the disease over a time period.

Census: A sample that includes every individual in a population or group

Demographic information: The personal characteristics of age, sex, race, residence, and occupation. Demographic information is used in descriptive epidemiology to define the population at risk.

Efficacy: An index of the potency of a drug or disease treatment. Efficacy is the measure of the impact of a treatment e.g. vaccine, under trial conditions (as opposed to effectiveness which is its impact within the population). Thus, efficacy is the percentage reduction in infection or disease caused by a vaccine in a trial group compared to a control group.

Epidemic: (*Syn: outbreak*) The occurrence of more cases of a particular type of disease, chronic condition, or injury than expected in a given area, or among a specific group of people, over a particular period of time.

Epidemic: A rapid increase in the levels of an infection. Typical of the microparasitic infections (with long lasting immunity and short generation times) an epidemic is usually heralded by an exponential rise in the number of cases in time and a subsequent decline as susceptible numbers are exhausted. Epidemics may arise from the introduction of a novel pathogen (or strain) to a previously unexposed (naive) population or as a result of the regrowth of susceptible numbers some time after a previous epidemic due to the same infectious agent.

Epidemic period: The time span of an epidemic.

Epidemiology: The study of the distribution and determinants of health conditions or events in populations, and the application of this study to control health problems.

Exposure: Coming into contact with a cause of, or possessing a characteristic that is a determinant of, a particular health problem.

Hemagglutinin: One of the two major surface proteins. Important for virus attachment to cells of the respiratory epithelium. Subtypes include H1 to H15. H1, H2 and H3 are the only described determinants involved in sustained human-to-human transmission.

High-risk group: A group of people whose risk for a particular disease, health condition, or type of injury is higher than that of the rest of their community or population.

Immunity: 1) A state in which a host is not susceptible to infection or disease, or 2) the mechanisms by which this is achieved. Immunity is achieved by an individual through one of three routes: *natural* or *innate immunity* genetically inherited or acquired through maternal antibody, *acquired immunity* conferred after contact with a disease, and *artificial immunity* after a successful vaccination.

Immunogenicity: The ability of a vaccine to stimulate the immune system, as measured by the proportion of individuals who produce specific antibody or T cells, or the amount of antibody produced, say.

Immunosuppression: A reduction in the capacity of the immune system. Caused by infection (e.g. HIV), drug treatment, pregnancy and malnutrition among others. Immunosuppressed individuals are commonly referred to as *immunocompromised*.

Incidence: A rate that measures the frequency with which a health problem, such as a new injury or case of illness, occurs in a population. In calculating incidence, the numerator is the number of new cases occurring in the population during a given period of time, and the denominator is the total population at risk during that time.

Incubation period: The time that elapses between infection and the appearance of symptoms of a disease.

Infectious period: The time period during which infected persons are able to transmit an infection to any susceptible host or vector they contact. Note that the infectious period may not necessarily be associated with symptoms of the disease.

Influenza-like illness (ILI): The presence of fever $>100^{\circ}$ F, with a cough or sore throat.

Isolation: The separation and the restriction of movement of persons who are ill. Isolation can occur in the home, a hospital, or other facility.

Morbidity: State of ill-health produced by a disease.

Mortality Rate: The proportion of individuals in a population that die in a given period of time, usually a year and usually multiplied by a 10^n population size so it is expressed as the number per 1,000, 10,000, 100,000, individuals per year. These proportions are often broken into cause-specific and age-specific proportions and are often standardized

so different groups can be compared and the population at the middle of the time interval is often used as the denominator.

Mortality rate, age-adjusted: A mortality rate that has been statistically modified to account for the effect of different age distributions in different populations in a study.

Mortality rate, age-specific: A mortality rate limited to a particular age group. In calculating age-specific mortality rates, the numerator is the number of deaths in the age group, and the denominator is the number of people in that age group.

Mortality rate, cause-specific: The mortality rate from a specified cause.

Neuraminidase: One of the two major surface proteins of the influenza virus. Less important for attachment but probably important for propagation and virulence. Subtypes N1 to N9.

Novel virus (strain): A virus that is new to the human population, a mutation from an existing virus.

Outbreak (*Syn: epidemic*): Because the public sometimes perceives "outbreak" as less sensational than "epidemic," it is sometimes the preferred word. Sometimes the two words are differentiated, with "outbreak" referring to a localized health problem, and "epidemic," to one that takes in a more general area.

Outcome(s): Any or all of the possible results that may stem from exposure to a causal factor or from preventive or therapeutic interventions; all identified changes in health status that result from the handling of a health problem.

Pandemic: An epidemic occurring over a very wide area (several countries or continents) and usually affecting a large proportion of the population.

Pathogenicity: The proportion of people who are infected by an agent and then develop clinical disease.

Population: The total number of inhabitants of a given area or country. In sampling, the population may refer to the units from which the sample is drawn, not necessarily the total population of people. A population can also be a particular group at risk, such as everyone who is engaged in a certain occupation.

Prophylaxis: Acting against or preventing a disease.

Proportion: A dimensionless number between 0.0 and 1.0 (if a probability) or, equivalently, between 0% and 100% (if a percentage) consisting of one count as the numerator divided by another count as the denominator.

Public health surveillance: The systematic, ongoing collection, analysis, interpretation, and dissemination of health data. The purpose of public health surveillance is to gain knowledge of the patterns of disease, injury, and other health problems in a community so that we can work toward controlling and preventing them.

Quarantine: The separation and the restriction of movement of persons as yet not ill who have been exposed to an infectious agent and may become ill or infectious. Quarantine can occur in the home or other designated facility.

R₀: The basic reproduction number, R₀, is the number of secondary cases produced by one case in a completely susceptible population. It depends on the duration of the infectious period, the probability of infecting a susceptible individual during one contact, and the number of new susceptible individuals contacted per unit of time. It varies between populations because of different contact rates.

Rate: An instantaneous or "velocity" measure that can range from 0.0 to infinity, has the dimensions of number of individuals per group - unit of time (e.g., 2.5 cases per dog-month), and is the number of individuals in the at-risk group that experience the event during one time unit (per hour, day, week, month, year, ...). A rate is a ratio of the number of events in a group of individuals at risk for the event divided by the total time units contributed by the individuals at-risk of the event and is not a proportion. Proportions are often miss-identified as "rates."

Ratio: A numerator divided by a denominator that usually does not include subjects of the numerator and is not restricted to values between 0.0 and 1.0 as are proportions.

Risk: The probability that an individual will be affected by, or die from, an illness or injury within a stated time or age span.

Sample: A selected subset of a population. A sample may be random or nonrandom and representative or non-representative.

Seasonality: Change in physiological status or in the occurrence of a disease, chronic condition, or type of injury that conforms to a regular seasonal pattern.

Sensitivity: The ability of a system to detect epidemics and other changes in the occurrence of health problems; the proportion of people with a health problem who are correctly identified by a screening test or case definition.

Sentinel surveillance: A surveillance system using a prearranged sample of sources (e.g., physicians, hospitals, clinics) who have agreed to report all cases of one or more notifiable diseases.

Specificity. The proportion of people without a particular disease, chronic condition, or type of injury who are correctly identified by a screening test or case definition.

Stochastic model: A mathematical model, which takes into consideration the presence of some randomness in one or more of its parameters or variables. The predictions of the model therefore do not give a single point estimate but a probability distribution of possible estimates.

Strategic National Stockpile (SNS): A federal cache of medical supplies and equipment to be used in emergency and disaster situations.

Surveillance: The collection, analysis and dissemination of data.

Symptom: A condition of the body reported by an individual when suffering from a disease; here used more loosely to include *signs*: any evidence used in diagnosis or identification of infected individuals.

Syndromic: Based on clinical signs and symptoms.

Test: A test is anything that produces evidence from a patient at any stage in the clinical process. From the clinical epidemiology perspective, the following are examples of a "test": history taking (presence or absence of a component), clinical exam results (presence or absence of a sign), imaging findings (presence or absence of a feature on a radiograph), or response to therapy (as anticipated or not).

Transmission (of infection): Any mode or mechanism by which an infectious agent is spread to a susceptible host.

Vaccine: A drug intended to induce active artificial immunity against a pathogen. Vaccines may be *live* or *dead*. Live vaccines are usually attenuated versions of the wild type pathogen.

Virulence: The measure of severity of a disease, expressed as the proportion of people with the disease who become extremely ill or die.

Annex E. Draft CDC Vaccine Priority Groups

Element and Tier:

- 1A. Health care involved in direct patient contact + essential support

Vaccine and antivirals manufacturing personnel
- 1B. Highest risk group
- 1C. Household contacts children <6 months and Severely immune compromised, and pregnant women
- 1D. Key government leaders +critical public health pandemic responders
2. Rest of high risk

Most CI and other PH emergency responders
3. Other key government health decision makers + mortuary services
4. Healthy 2-64 years not in other groups