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State Preparedness: A Study of State Plans

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Abstract

Non-pharmaceutical interventions (NPIs) have been used since the early years of public health. The Centers for Disease Control and Prevention (CDC) provides a standard definition for NPI and what NPI strategies are contained within the definition. This paper seeks to discover if state pandemic influenza plans use the term NPI and its strategies, and if states' use of NPI strategies in their state pandemic plans is consistent with the CDC definition. To determine how states were defining and using the term NPI and NPI strategies a survey of forty-eight (48) state plans was conducted using each respective states' pandemic plan. The survey revealed that the majority of states do not conform to the CDC definition, and in fact five (5) states do not use the term NPI at all. Furthermore only four (4) of the states surveyed use the NPI definition and NPI strategies as defined by the CDC. I recommend that those states that do use the term NPI and the NPI strategies be a blue-print for other state plans.

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Purpose Statement

Research question: Do state plans adhere to the Centers for Disease Control and Prevention (CDC) definition of non-pharmaceutical interventions (NPI)? Non-pharmaceutical interventions as defined by the CDC are "…interventions outside of healthcare settings focus on measures to 1) limit international spread of the virus (e.g., travel screening and restrictions); 2) reduce spread within national and local populations (e.g., isolation and treatment of ill persons; monitoring and possible quarantine of exposed persons; and social distancing measures, such as cancellation of mass gatherings and closure of schools); 3) reduce an individual person's risk for infection (e.g., hand hygiene); and 4) communicate risk to the public" (CDC, 2008). State plans were analyzed to answer the question of conformity between the CDC definition and what terms and strategies state plans were utilizing. Each plan was surveyed for the use of various terms related to non-pharmaceutical intervention, NPI, and for any reference to any of the four strategies of the CDC definition (i.e., hand hygiene, isolation, and travel restrictions). Each state plan was also surveyed for zoonotic disease reference beyond avian influenza both generally and with specific regard to NPIs. This survey shows which states consider NPI important, and which rely primarily on vaccines.

Background

The basis for the research of this paper began with a general interest of all-hazards preparedness within states. That interest quickly became more focused on H1N1 and the mass prophylaxis approach to disease.

The Department of Health and Human Services (DHHS) in 2003 began an initiative with the help of various other organizations (Department of Agriculture, Food and Drug Administration, and the CDC) to help prepare the U.S. by requiring each state to have a pandemic influenza plan (CDC, 2003). As part of a Presidential Homeland Security Directive

(PHSD) each plan was to be developed in such a way that it could respond to an Avian Flu event, though having an Avian Flu plan was not required (CDC, 2003). Meaning, that each state may have either all hazards plan, a pandemic influenza plan, or a avian specific plan or all three resulting in inconsistency across the spectrum of state plans. As part presidential directive, each state was required to develop a state specific pandemic plan that would meet the unique needs of their state and provide "estimates of the potential impact of a pandemic in their state or locality" (CDC, 2003).

Although the United States relies primarily on vaccine response to influenza, in the event of a novel or emerging infectious disease, a vaccine may not be available. This response can be potential very dangerous as in 1976. While there were no other pandemics during the 20th century, the 1976 influenza outbreak, or as it has been called, the 1976 influenza "fiasco", warrants mention due to the drastic response by the Ford administration and the a potential hazard of vaccine-exclusive approach (Kilbourne, 2006). A $90 million mass vaccination campaign was launched after six soldiers became ill due to H1N1 at Fort Dix, New Jersey. The vaccination campaign itself cost 25 lives, due to a rare reaction to the vaccine. The flu however, never became a pandemic. Only one person is said to have died from the actual flu during the outbreak (Kilbourne, 2006).

Mass prophylaxis is effective only in cases where the vaccine is available, as both the 1976 case and the recent H1N1 pandemic revealed (Kilbourne, 2006). Non-pharmaceutical intervention contains strategies for limiting the spread of infection prior to or in the absence of a vaccine.

From the survey of states and their pandemic plans the findings showed that states did not consistently mirror the CDC definition of non-pharmaceutical interventions within state plans nor do the majority of states reference zoonotic disease at all in their state plans.

Literature Review

NPI Strategies

The strategies contained within the CDC definition of non-pharmaceutical interventions have been the topics of research, articles and debates. The following is a brief overview of the research related to each of the strategies to provide a better basis of understanding for this paper and what it seeks to reveal. Social distancing and absenteeism are common aspects of NPI. Quarantine is perhaps the most potentially controversial of the NPI methods, however, it is also one of the most effective in ultimately limiting the spread of infection. Hygiene, generally includes both hand washing and cough etiquette and is one of the most basic of NPI methods in limiting the spread of infection. The final NPI strategy that will be reviewed is public health communication, which is effectively distributing complete and effective instructions to the public.

The primary aim of NPI strategies is to reduce transmission rates between ill and non-ill people by limiting contact between individuals that could result in infection. For non-pharmaceutical interventions to be successful in response to a disease pandemic requires a ready and informed public to be able to carry out instructions and participate in NPI strategies (Zottarelli, Sunil, & Rider, 2009). These interventions are categorized into the two groups, individual and community level NPIs. Primarily individual and community level NPI strategies only differ in that they are targeted at a person to limit further spread to the population and for that person's individual welfare. Community level NPIs are, as the term implies, are directed at groups or communities of people. These interventions have three primary objectives: 1) delay disease transmission and outbreak peak: this limits the spread of the virus to reduce and eliminate the virus or to delay spread until a suitable vaccine is available; 2) to decrease burden on healthcare infrastructure (in an already strained system, an addition of adding just a small amount of patient load could quickly overwhelm the healthcare system and providers); and lastly

3) to reduce number of cases and as a result, reduce overall morbidity and mortality rates. The reduction of the number of ill persons will result in a decreased the need for healthcare services and minimize the impact of a pandemic influenza outbreak on the economy and society (CDC, 2009).

Both individual and community level strategies include isolation, quarantine, and infection control. Community level NPIs refers to the quarantine of groups or sites, social distancing measures (i.e. school and business closures, voluntary quarantine), and travel restrictions to a specific state, city or travel by or to a group of infected people (District of Columbia Department of Health, 2005).

The implementation of non-pharmaceutical interventions is guided by the CDC's Pandemic Alert Period (Connecticut Department of Public Health, 2006; Pandemic Influenza Expert Group, 2002; Texas, 2008). The Pandemic Alert Period is divided into six phases. Phases one and two are referred to as the inter-pandemic periods, meaning that there is a risk for human infection and that infection should be reported as quickly as possible. Phases three through four represent the growing effort to detect, report, and contain or delay the spread of a new virus. The final phase is to use all resources to minimize the impact of the pandemic (Chertoff, 2006). Both mathematic and historical models of the 1918 pandemic reveal that the death rates within communities are directly related to time of implementation and the duration of NPIs strategies. Initiating NPIs during the proper pandemic stage thus driving the mortality rates down for the duration of implementation, and resulting in a rise if they were discontinued (Markel et al., 2007; Texas, 2008). Zottarelli, Sunil, and Rider (2009) states, "Mathematical modeling suggests that non-pharmaceutical intervention could flatten the overall epidemic peak if implemented early and sustained throughout the outbreak".

Social Distancing and Absenteeism

Blendon et al. (2008) found in a survey that 42 percent of respondents felt they would not be paid in the case of public health ordered isolation or school closures (Gostin, 2009; Blendon et al., 2008). Maintaining an effective workforce is critical to maintaining healthcare and healthcare services as well as other critical infrastructure during any pandemic (Steinhardt, 2009). Absenteeism, particularly in the case of first responders, may result in greater potential for loss of life due to civil unrest, death from infection, or general lack of civil services (Chertoff, 2006). According a survey by Chertoff (2006), the "best case" scenario for workforce absenteeism is 30 to 40 percent during a severe disease pandemic throughout all professions. This appears to be in spite of the belief that they will not be paid for time not worked (Chertoff, 2006).

Social distancing (absenteeism, travel restrictions, snow days) is likely to become an issue during any pandemic (influenza or emerging infectious disease). Both social distancing and isolation, whether voluntary or directed, may require protection from reciprocity for following public health direction to stay home if an individual is ill. Maintaining and protecting employees and workers is critical during any pandemic (Steinhardt, 2009). Absenteeism in these cases may not only be caused by actual illness of the individual, but could also be a result of needing to care for a loved one. Social separation (caused by absenteeism), particularly for long durations can cause loneliness and emotional detachment, disrupt social and economic life (education, trade, business), and potentially infringe on liberties (Gostin, 2009).

In addition, members of the workforce with children are likely to have increased rates of absenteeism due to the need to provide care for sick children and actual school closures, employers would need to plan accordingly for such situations (Blendon et al., 2008). Chertoff (2006) states that "…if disease containment strategies fail, businesses and individuals will find themselves thrust into the frontlines in this public health battle." In the case of school closures,

whether the school is closed due to an influenza pandemic or where parents are forced to miss work in order to care for their children one can see how parents would immediately find themselves on the "frontline" due to an influenza pandemic where they are forced to miss work in order to care for their children (ill or not).

The combination of the high numbers who may need to be absent from the workforce and given the high rate of individuals who feel they would not be paid, the government sector in particular should seek to protect the workforce from unfair economic consequences for compliance to individual or community level NPIs. Businesses and government officials should seek to create an environment that allows the individual to comply without fear of reciprocity from employers (Upshur et al., 2005). The majority of the public is unprepared economically or otherwise for a pandemic to reach its worst-case scenario (Redlener, 2006).

According to a survey of the public response to non-pharmaceutical interventions by Blendon et al. (2008), a small number of sample respondents stated they would be unable to follow public health authorities' direction in the case of workplace or school closure. This small number of the sample could directly translate into millions who may have difficulty with such orders (Blendon et al., 2008). This places a high level of responsibility on Public Health powers to carefully use authority in matters of quarantine and isolation, which should be delicately balanced in the health interests of society and the freedom of the people (Gostin, 2006).

While the effectiveness of closing schools and workplaces to limit the spread of pandemic disease has been debated, it also raises issues of what Gostin (2006) calls "distributive justice". Distributive justice as described by Gostin (2006) results in those of lower socio-economic groups and minorities being potentially hurt more simply due to an already lower economic or underprivileged status. Because of this, protection may be needed for such employees who desire to comply with social distancing or isolation orders against the will of their employer during a pandemic (Steinhardt, 2009; Gostin, 2006).

Absenteeism also puts at risk the critical infrastructure, which is comprised of any physical (power grids, water systems, hospital, fire, police, etc) or virtual system that is so vital to the U.S. that the incapacity or destruction of the system(s) would debilitate national security. Absenteeism within the emergency services agencies and hospitals due to actual sickness or the care of loved ones who are ill could have an acute impact of critical infrastructure throughout the states and the nation as a whole (Chertoff, 2006).

Quarantine

The term quarantine comes from the fourteenth and fifteenth century reference to the 40 day period that certain ships that enter the port of Venice were required to remain to wait isolation before any person or good was permitted to go ashore (Alcade, Elster, & Rothstein, 2003). Today, the CDC only permits quarantine for three business days and the full duration of the quarantine cannot exceed the period of disease incubation and communicability. Incubation refers to the time from exposure to the first signs and symptoms of the disease and communicability refers to the infectiousness of a disease transmissible by direct contact with an infected person or discharges from the infected person. In addition, quarantine only refers to the mandatory isolation of the ill or suspected ill, not voluntary quarantines or isolation (Markel et al., 2007; Gostin, 2009). This modern definition primarily restricts the activities of healthy persons who are suspected to have been exposed to the disease during the "period of communicability" (Hitchcock, 2007; Alcade et al., 2003).

The primary purpose of quarantine, like that non-pharmaceutical intervention strategies in general, is to reduce the number of new cases and reduce the total death rate (Alcade et al., 2003). This concept of quarantine does not reflect this traditional definition conveyed by the term, but rather the "shelter in place" concept, which is defined as " to make a shelter out of (any) place you happen to be" (CDC, 2008; Gostin, 2009). Modern day cases of quarantine are, ideally, to be combined with the use of pharmaceutical intervention as well, if available.

However, in the case of novel pandemic influenza, or emerging infectious disease, pharmaceutical interventions will most likely not be available (Public Health and Law Enforcement Emergency Preparedness Workgroup, 2008).

The legal implications of quarantine are complex, as both the United Nations (UN) charter of human rights and the United States Supreme Court have asserted that travel and free association (freedom of movement) are fundamental rights of humanity (Gostin, 2009). According to Gostin (2006), "The basics characteristics of human rights see that they inherent in all people because they are human; they are universal, so that people everywhere in the world are "rights-holders." And they create robust duties on the state… Universal Declaration of Human Rights Article 1: All human beings are born free and equal in dignity and rights."

All humans have value by international law, but their freedoms can be suspended if there is a true threat to the public (Gostin, 2006). The legal authority to order quarantine or isolation is held by the state and federal government, and therefore must be clear and guided by the law. Based on risk in such cases, decision makers must balance individual freedoms and common good of the people (Gostin, 2009; Gostin, 2006; Upshur et al., 2005). The United States in particular has a culture of individuality that is framed by due process and skepticism towards government. Therefore, according to 2003 study of SARS "securing large numbers of quarantine orders… would severely strain the resources of public health agencies, prosecutors, and the courts" (Alcade et al., 2003).

Hygiene

Another aspect of the definition of non-pharmaceutical interventions is to, "reduce an individual person's risk for infection (e.g., hand hygiene)" (CDC). Hygiene, specifically hand washing and cough etiquette, are strategies that should be used constantly but emphasized greatly during pre-pandemic and pandemic phases. While the CDC non-pharmaceutical intervention

definition does not specifically mention cough etiquette, hand washing and cough etiquette campaigns are closely linked.

The CDC states that there are five common instances where disease and germs can be transmitted by contaminated hands; hand to food, food to hand to food, food to hands to infants, infected infant to hand to other children, and nose mouth or eyes to hand to others (CDC, 2004). This study we are focuses on infection, using the CDC definition for hand hygiene as "hand washing with either plain soap or antimicrobial soap and water or use of alcohol-based products (gels, rinses, foams containing an emollient) that do not require the use of water (CDC, 2007; MMWR, 2002)". Cough etiquette is defined as "covering the mouth and nose while coughing or sneezing; using tissues and disposing in no-touch receptacles; and washing of hands often to avoid spreading an infection to others (CDC, 2007)."

During the H1N1 pandemic, hand washing and cough etiquette were greatly emphasized as a way to curb infection both in the United States and world-wide while a vaccine was being produced and distributed. A survey of studies showed that influenza like illnesses could be reduced by as much as 65 percent over a six week period as a result of the effectiveness of hand hygiene, cough etiquette, and mask use (Elsevier, 2010). The same survey revealed that in Hong Kong a substantial reduction in disease rates were realized if hand washing and protective mask were implemented within the first 36 hours of influenza like illness (Elsevier, 2010).

Public Health Communication

Communicating risk to the public during a pandemic event is essential to limit the spread of disease and in directing public response. During the H1N1 pandemic information was distributed in a variety of ways, most notably by the HHS Secretary herself in conferences to provide information about the severity and spread of the pandemic in the U.S. (CDC, 2009).

Zoonotic Diseases

Zoonotic diseases are those that can be passed from animals, wild or domestic, to humans. The majority of state plans focus on avian disease transmission primarily through poultry and wild birds, although this focus ignores the vastness of disease potential existing between animals to humans (CDC).

The primary aspect of zoonotic disease reporting is biosurveillance, which is the process of detecting, monitoring, and characterizing national security health threats occurring between human and animal populations. This includes food, water, agriculture, and the environment (Nuzzo, 2009). Biosurveillance is necessary for timely and accurate reporting to decision makers for response and mitigation (Nuzzo, 2009; WMD, 2011).

The U.S has not developed a nation-wide disease surveillance system which was mandated by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. President Obama was presented a grade of "F" for the lack of readiness for a large scale contagious disease outbreak based on a recent study (WMD, 2011). In fact, despite some limited advances in biosurveillance there is still no adequate integration of public sector and private sector data concerning zoonoses. While this report was written in response to the nation's ability to respond to a terrorist event, the implications are the same for an event that naturally occurs. "Americans are vulnerable to such an [terrorist] attack, as we are to a naturally occurring disease pandemic" (WMD, 2011). This almost a decade after the act was passed in 2002 with almost no improvement to preparedness or biosurveillance.

Methods

To answer the question of do state plans adhere to the CDC definition NPI and NPI strategies, state plans were analyzed for similarities with the CDC definition. To research adherence to the CDC definition, each plan was checked for the use of the following terms: non-pharmaceutical intervention, nonpharmceutical intervention, intervention, NPI, hygiene,

isolation, quarantine, social distancing, and public health communication. For each of the strategies contained in the definition, and for the use of the term itself, the plan was given a point for each, of which a maximum total of five (5) potential points. Each point corresponded directly with the components of the definition (i.e., travel restrictions would be denoted by "1"), the fifth point for the use of the term NPI itself.

Each state was also surveyed for preparedness for zoonotic and emerging infectious diseases. Each plan was searched for any reference to zoonoses, the search terms were used; zoonotic, zoonoses, emerging, re-emerging, non-avian, epizoonotic and novel. The states were then surveyed for reference zoonotic infections in the non-pharmaceutical interventions section of their plans. The states were then categorized based on references to non-avian influenza or emerging infectious disease, and more specifically the inclusion of the term zoonoses in their NPI section.

A total of forty eight (48) states were surveyed. The two states not cited are Rhode Island and North Dakota. When asked, Rhode Island stated through an e-mailed response that their state plan was confidential. No response was given from North Dakota despite multiple attempts to contact them by both phone and e-mail. This survey was conducted by utilizing the websites of each state's health department or emergency management agency to acquire their state pandemic plan. In the cases where the state plan was not easily accessible, the health department was contacted and the plan or a link to the plan was provided.

The states were only evaluated based on referencing and using the NPI strategies within the NPI section of the plan. For example, a plan might reference hand hygiene as a component of medical response or use of snow days as part of a pre-pandemic planning, but it would not receive a point because it was not applying the strategy in the "spirit" of the CDC definition. This was to ensure that all states were graded equally based upon only their use of the term NPI, its reciprocal terms, and NPI strategies.

Results and Data Analysis

Table 1. ***State Score***
States broken down by score, alphabetically, if they reference CDC guideline, if the use NPI strategies, and which component(s) of the definition for which they received points

State	Points Received (0ut of five)	Reference to CDC	Use of NPI Strategies	Point Distribution
5 points Total 4				
Kentucky	5	Yes	Yes	1,2,3,4,5
Mississippi	5	No	Yes	1,2,3,4,5
Texas	5	Yes	Yes	1,2,3,4,5
North Carolina	5	Yes	Yes	1,2,3,4,5
4 Points Total 10				
Alaska	4	No	Yes	1, 2, 3, 4
Arizona	4	Yes	Yes	1,2,3,4
Arkansas	4	No	Yes	1, 2, 3, 4
California	4	No	Yes	1, 2, 3, 4
Florida	4	Yes	Yes	1,2,3, 5
Kansas	4	Yes	Yes	2,3,4,5
Oklahoma	4	Yes	Yes	1,2,3,5
Maine	4	Yes	Yes	1,2,3,4
Nebraska	4	No	Yes,	1,2,3,4
New York	4	Yes	Yes	2,3,4
3 Points Total 11				
Alabama	3	No	Yes	2,3,5
Louisiana	3	No	Yes	1,2,3
Michigan	3	No	Yes	2,3,4
Minnesota	3	Yes	Yes	1,2,3
Missouri	3	Yes	Yes	2,3,5
New Hampshire	3	Yes	Yes	2,3,5
New Jersey	3	No	No	2,3,5
South Dakota	3	No	Yes	1,2,4
Utah	3	Yes	Yes	2,3,4
Vermont	3	No	Yes	2,3,4
Virginia	3	No	Yes	1,2,5
2 Points Total 12				
Colorado	2	No	Yes	2,3
Connecticut	2	No	Yes	2, 3
Hawaii	2	No	Yes	2,3
Idaho	2	No	Yes	1,2
Indiana	2	No	Yes	2,3
Massachusetts	2	No	Yes	1,2
Montana	2	No	Yes	2,4
New Mexico	2	Yes	Yes	2,4
Ohio	2	No	Yes	2,4
Oregon	2	No	Yes	2,5
West Virginia	2	No	Yes	2,5
Wyoming	2	No	Yes	2,3
1 Point Total 6				
Georgia	1	No	No	3
Illinois	1	No	Yes	2
Nevada	1	Yes	Yes	2
Pennsylvania	1	No	Yes	5
Tennessee	1	No	Yes	2
Wisconsin	1	No	Yes	2

Table 1. ***State Score (Cont'd)***
States broken down by score, alphabetically, if they reference CDC guideline, if the use NPI strategies, and which component(s) of the definition for which they received points

State	Points Received (0ut of five)	Reference to CDC	Use of NPI Strategies	Point Distribution
0 Points Total 5				
Delaware	0	No	Yes	0
Iowa	0			0
Maryland	0	No	No	0
South Carolina	0	Yes	Yes	0
Washington	0	No	Yes	0
Not Available				
North Dakota	No Response			N/A
Rhode Island	Confidential			N/A

State refers to what state is being surveyed. "Reference" refers to if the state does or does not reference the CDC guidance for NPIs. Usage of NPI strategies outlined in the CDC definition. Point distribution refers to which components of the definition were used in the plan 1) Limit the international spread of the disease 2) Reduce spread within national and local populations (e.g., isolation and treatment of ill persons etc.) 3) Reduce an individual person's risk for infection (e.g., hand washing) 4) Communicate risk of disease 5) Use of the term Nonpharmaceutical Interventions within in pandemic plan.

Table 2.
NPI and alternative descriptors by state

State	Use of term NPI
Alabama Arizona Florida Kentucky Kansas Missouri Mississippi New Hampshire New York North Carolina Oklahoma Oregon Pennsylvania Texas Virginia West Virginia	Nonpharmaceutical Intervention, NPI
Alaska	Non-pharmacological
Arkansas	Infection Prevention and Control Practices
California	Non-pharmaceutical Community Containment
Connecticut Iowa Maryland Washington New Jersey	No Common Term Found
Delaware	Contagious Disease Containment Measures Plan
Colorado Georgia Louisiana	Infection Control
Hawaii	Non-medical Public Health interventions
Idaho	Community Disease Control
Illinois	Disease Control Measure
Indiana	Community Containment
Maine Vermont	Community-Based Containment Measures
Massachusetts	Control of Influenza Clusters
Michigan	Nonpharmaceutical measure
Minnesota	Community Disease Containment
Montana	Nonpharmaceutical Control
Nebraska South Dakota	Community Disease Control and Prevention
Nevada	Non-Pharmaceutical Community Containment Measures
New Mexico	Community Containment Strategies
North Dakota	N/A
Ohio	Strategies to limit Transmission
Rhode Island	N/A
South Carolina	Nonpharmaceutical Responses
Tennessee	Non-Pharmaceutical Community Mitigation Interventions
Utah	Community Mitigation Measures
Wisconsin	Nonpharmaceutical Measure
Wyoming	Community Mitigation Activities

- Four (4) states received all five points.
- Seven (7) states reference the CDC guidance directly in relation to the use of NPI strategies (Arizona, 2006; Maine, 2005; Minnesota, 2006; Nevada, 2009; New Mexico, 2008; New York, 2008; South Carolina, 2008).
- Ten (10) states received four points. All but three of those states used all the individual strategies of the definition, but not the term NPI itself (Alaska, 2008; Arizona, 2006; Arkansas, 2005; California, 2008; Florida, 2009; Kansas, 2009; Oklahoma, 2007; Maine, 2005; Nebraska, New York, 2008)
- Eleven (11) states reference the CDC document on NPI for guidance on specific implementation. These states generally have very specific guidelines and parameters for NPI use (Florida, 2009; Kansas, 2009; Kentucky, 2007; Missouri, 2009; New Hampshire, 2007; New York, 2008; North Carolina, 2008; Oklahoma, 2007; Texas, 2008; Utah, 2007).
- Seventeen (17) states use the term non-pharmaceutical intervention directly (Alabama, 2005; Arizona, 2006; Florida, 2009; Kansas, 2009; Kentucky, 2007; Missouri, 2009; New Hampshire, 2007; New Mexico, 2008; New York, 2008; North Carolina, 2008; Oklahoma, 2007; Oregon, 2006; Pennsylvania, 2005; Texas, 2008; Utah, 2007; Virginia, 2009; West Virginia, 2006).
- Thirty-one (31) states that do not use the term NPI (Table 2).
- Five (5) state plans do not use any term for NPI at all, but rather only refer to the strategies (isolation and quarantine) (Connecticut, 2006; Massachusetts, 2006; Mississippi, 2010; Washington, 2006; Iowa, 2006).

- Three states (3) do not reference any NPI strategies at all within the plans (Maryland, 2002; New Jersey, 2006; Georgia, 2006).
- Twenty-five (25) states use a different term to describe NPI strategies: "Community Mitigation Activities", "Non-Pharmaceutical Community Containment Measures", "Infection Control" and "Community Disease Control and Prevention" were the two most common terms among the states (Wyoming, 2009; Nevada, 2009) (Table 2).
- Twenty-three (23) states scored in the two and three point range. The most common point received was for "reducing the spread within national and local populations. The most common component missing among the plans was "communicating risk to the public". While Delaware (2008) did receive four points, it did not use the components within the plans non-pharmaceutical interventions section.

The states with no points may have used components of NPI strategies, but did not include them in an NPI or similar section (i.e., Delaware, 2008). Other states did not have any NPI term or strategies outlined in their plans (Iowa, 2006).

Table 3. ***Zoonoses***
States arranged alphabetically, values given were based on reference any other zoonoses than avian influenza (SARS, emerging infectious disease etc.). Those states highlighted in yellow did reference the importance of NPIs in relation to zoonoses.

State	Reference to Zoonotics other than Avian	Reference to importance of NPI usage for Zoonotic
Alabama	None	No
Alaska	None	No
Arkansas	None	No
Arizona	Yes	No
California	Yes	No
Colorado	None	No
Connecticut	None	No
Delaware	Yes	No
Florida	Yes	No
Georgia	None	No
Hawaii	None	No
Idaho	Yes	No

Table 3. ***Zoonoses (Cont'd)***
States arranged alphabetically, values given were based on reference any other zoonoses than avian influenza (SARS, emerging infectious disease etc.). Those states highlighted in yellow did reference the importance of NPIs in relation to zoonoses.

State	Reference to Zoonotics other than Avian	Reference to importance of NPI usage for Zoonotic
Illinois	Yes	No
Indiana	Yes	Yes
Iowa	None	No
Kansas	None	No
Kentucky	Yes	No
Louisiana	Yes	No
Maine	None	No
Maryland	None	No
Massachusetts	None	No
Michigan	None	No
Minnesota	None	Yes
Mississippi	Yes	Yes
Missouri	Yes	Yes
Montana	Yes	Yes
Nebraska	Yes	No
Nevada	Yes	No
New Hampshire	None	No
New Jersey	None	No
New Mexico	Yes	No
New York	Yes	No
North Carolina	None	Yes
North Dakota	N/A	N/A
Ohio	None	No
Oklahoma	None	Yes
Oregon	None	No
Pennsylvania	None	No
Rhode Island	N/A	N/A
South Carolina	None	Yes
South Dakota	None	Yes
Tennessee	None	Yes
Texas	None	No
Utah	None	No
Vermont	None	No
Virginia	None	No
Washington	None	No
Wisconsin	None	No
West Virginia	None	No
Wyoming	None	No

State refers to what state is being surveyed. "Reference" refers to if the state does or does not reference any other zoonotic event than avian influenza. States were evaluated on if they stress the importance of NPIs during an epizoonotic outbreak.

- Ten (10) states reference the importance and necessity of NPI usage during the onset of a novel infectious disease (Indiana, 2005; Minnesota, 2006; Mississippi,

2010; Missouri, 2009; Montana, 2006; North Carolina, 2008; Oklahoma, 2007; South Carolina, 2008; South Dakota, 2006; Tennessee, 2009).

- Twenty-nine (29) only mention novel influenza in the form of Avian Influenza (H5N1) (Alaska, 2008; Arkansas, 2005; Arizona, 2006; Connecticut, 2006; Georgia, 2006; Hawaii, 2008; Kansas, 2009; Maryland, 2002; Maine, 2005; Massachusetts, 2006; Michigan, 2009; New Hampshire, 2007; New Jersey, 2006; Ohio, 2006; Oregon, 2006; Pennsylvania, 2005; Texas, 2008; Utah, 2007; Vermont, 2006; Virginia, 2007; West Virginia, 2006; Wyoming, 2009).
- Two (2) states had no mention of any novel or emerging infectious disease, as well as two (2) states where the plan was unable to be accessed, Rhode Island and North Dakota (Alabama, 2005; Wisconsin 2007).

Top state models: Both Mississippi and North Carolina state plans reference the importance of NPIs during a zoonotic disease event. Texas and Kentucky do not mention zoonoses within its NPI section of the state's pandemic plan. Realizing the importance of NPI strategies both during pandemic influenza, as well as during a novel or emerging infectious disease outbreak, prepares these states to better respond to an event in a vaccine based system.

Conclusion

This study of state plans reveals the basic lack of unity to the CDC definition of non-pharmaceutical interventions and the strategies contained within it. The majority of states do not use or reference the CDC definition for NPI. Many of those states also fail to utilize all of the NPI strategies, which could be the only means of response in the absence of shortage of or vaccine, particularly in the case of novel or zoonotic diseases.

The lack of a common term across state pandemic plans could lead to a potential break-down in the public health efforts, or could cause delay in a multi-state outbreak situation, due to lack of common definition. State plans as they are now written, use multiple terms (Table 2) to describe NPI and NPI like descriptors. The lack of use of the CDC non-pharmaceutical intervention definition and strategies, reveals a need for better communication between federal government and state planners.

State plans do not consistently mirror the CDC definition of NPI, nor do the majority mention zoonoses, or include zoonoses, in the NPI sections. State plans in their current form leave the public in great danger from, a pandemic event, which is likely to be zoonotic. The U.S. vaccine based approach, will not be able to protect the public, emphasizing the need to make NPI strategies the primary means to limit the spread of infection and lower mortality rates.

SARS (2003) is a prime example of a recent zoonotic event. Emerging infectious diseases (or zoonotic disease), like SARS, that should warrant NPIs to be even more critical in the interim between sentinel cases and the availability of a vaccine (WMD, 2011; Nusso, 2009).

Because of a vaccine based approach to disease, NPIs may be very important in the response to a novel, non-avian flu event. NPI strategies will help prevent the spread of disease during the initial onset when a vaccine will not be available. Despite this fact, only a few states emphasize NPI strategies as a direct response to zoontotic disease acknowledging that a traditional vaccine approach may be completely ineffective in response to pandemic.

Limitations

Further study is needed to find if the implementation of the term NPI and the strategies within these state plans is actually effective in exercises and during true pandemic events. Further study of real world and exercise-based implementation within states would be helpful in

determining and measuring the benefit(s) of using a common definition and strategy for non-pharmaceutical interventions throughout all state plans.

This paper seeks to analyze available written plans; it cannot completely predict or account for what NPI strategies may be in place that are substantive and viable alternatives to NPI, but were not captured by the survey due to establish parameters. Nor can it account for additional plans that states may have written. The presidential directive does mandate that states have a pandemic plan: it does not mandate that the plan should be focused on pandemic avian influenza, or all hazards; and that it should be applicable to avian influenza (CDC, 2003). A state may in fact have a separate plan for each event, or a very basic all hazards plan they intend to utilize regardless of the threat or event.

Recommendations

It is apparent that many states plan fail to prepare to respond to a novel or infectious disease event, where vaccine response will be limited or unavailable and non-pharmaceutical interventions most effective, if not the only effective response.

To better prepare states to adhere to the CDC definition of NPI and its individual components, many steps toward this goal should be mandated. There is already a Presidential Homeland Security Directives requiring an Avian Flu response plan. This should be expanded upon to ensure that all plans include a comprehensive NPI response component, at least within their influenza plan, if not within all state plans.

Avian Influenza, while a type of zoonoses, is not the only, or necessarily the most likely, emerging zoonotic infectious disease to be potentially pandemic. Given the recent report of bio-terrorism preparedness (receiving the grade of "F"), and the level at which states neglected to address any epizoonotic event with in their pandemic plans it would be prudent to ensure

inclusion of non-avian influenza and emerging infectious disease within state plans. This would also bolster the addition of non-pharmaceutical interventions within all plans due to the ineffectiveness or lack of availability of any vaccine for novel diseases.

In order for states to most effectively utilize NPI responses more emphasis should be placed on biosurveillance at national and local levels. As the WMD (2011) report states, much of the funding for biosurveillance has been cut or regularly reduced since 9/11. If the U.S. chooses to maintain a vaccine based approach, biosurveillance will be critical to shortening the time between the initial cases and when the first doses of the vaccine would be available. In the absence of meaningful biosurveillance systems, non-pharmaceutical interventions are the only weapon against a potential novel or emerging infectious disease.

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Appendix A: Public Health Competencies Met

Specific Competencies
Domain #1: Analytic Assessment Skill
Defines a problems
Determines appropriate uses and limitations of both quantitative and qualitative data
Selects and defines variables relevant to defined public health problems
Identifies relevant and appropriate data and information sources
Evaluates the integrity and comparability of data and identifies gaps in data sources
Applies ethical principles to the collection, maintenance, use, and dissemination of data and information
Obtains and interprets information regarding risks and benefits to the community
Applies data collection processes, information technology applications, and computer systems storage/retrieval strategies
Domain #2: Policy Development/Program Planning Skills
Collects, summarizes, and interprets information relevant to an issue
States policy options and writes clear and concise policy statements
Identifies, interprets, and implements public health laws, regulations, and policies related to specific programs
Articulates the health, fiscal, administrative, legal, social, and political implications of each policy option
Develops mechanisms to monitor and evaluate programs for their effectiveness and quality
Domain #3: Communication Skills
Communicates effectively both in writing and orally, or in other ways
Solicits input from individuals and organizations
Effectively presents accurate demographic, statistical, programmatic, and scientific information for professional and lay audiences
Attitudes
Listens to others in an unbiased manner, respects points of view of others, and promotes the expression of diverse opinions and perspectives
Domain #4: Cultural Competency Skills – N/A
Domain #5: Community Dimensions of Practice Skills – N/A
Domain #6: Basic Public Health Sciences Skills
Identifies the individual's and organization's responsibilities within the context of the Essential Public Health Services and core functions
Identifies and applies basic research methods used in public health
Identifies and retrieves current relevant scientific evidence
Identifies the limitations of research and the importance of observations and interrelationships
Attitudes
Develops a lifelong commitment to rigorous critical thinking
Domain #7: Financial Planning and Management Skills – N/A
Domain #8: Leadership and Systems Thinking Skills
Creates a culture of ethical standards within organizations and communities