

**PANDEMIC INFLUENZA:  
NON-PHARMACEUTICAL INTERVENTIONS AND BEHAVIORAL CHANGES  
THAT MAY SAVE LIVES**

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## **ABSTRACT**

The outbreak of novel A/H1N1 influenza in early 2009, eventually resulting in the declaration of a pandemic by the World Health Organization, raises the spectre of past pandemics and their devastating effects in terms both of economic consequences and, more important, human mortality. In the United States, individual states are responsible for pandemic influenza preparedness planning. A systematic review of state preparedness plans conducted prior to the 2009 outbreak reveals that a critical component of successful plans – namely, non-pharmaceutical interventions (NPIs) related to hygiene, social distancing, and technology – are incorporated to a far lesser degree than is necessary to ensure that the United States can successfully meet the challenge of pandemic influenza.

## **INTRODUCTION AND BACKGROUND**

In April 2009, cases of influenza caused by a strain of A/H1N1 virus that had not previously been seen in humans began to be reported in Mexico. The strain's genome included material of swine, avian, and human origin and came to be referred to as the "swine flu." By mid-June, this novel H1N1 had spread to more than 70 countries. By June 11, the World Health Organization declared a full-fledged pandemic.

For several years prior to this 2009 event, concern by scientists and medical professionals the world over focused on the potential threat of a form of Influenza A virus subtype H5N1, also known as A(H5N1), which can cause illness in humans and many other animal species. Its bird-adapted strain – HPAI A(H5N1) – is familiar to most as "avian influenza" or "bird flu," and has become endemic in many bird populations, particularly in Southeast Asia. Already, it has killed millions of birds and forced humans to slaughter and dispose of hundreds of millions of others to halt its proliferation. Another strain, Z+, is a growing killing machine among pigs, cats, and mice, and has mutated to become proficient in getting deep into human lung tissue and destroying it – with death a likely result. It has also been found to be a powerful weapon against the human central nervous system. Avian influenza A(H5N1) "is progressively adapting to mammals and becoming more neurologically virulent" (De Jong, 2005). As H5N1 in birds spreads across the globe, the threat of yet another pandemic heightens and accelerates. The strain mutates quickly, making it difficult for researchers developing medicines to keep pace. So, at present we are fighting one confirmed influenza pandemic and face the threat of another much more dangerous one.

The pressing question is whether history will repeat. In the Christmas 1918 edition, the editors of the Journal of the American Medical Association published an ominous comment: “The year 1918 has gone: a year momentous as the termination of the most cruel war in the annals of the human race; a year which marked, the end at least for a time, of man’s destruction of man; unfortunately a year in which developed a most fatal infectious disease causing the death of hundreds of thousands of human beings. Medical science for four and one-half years devoted itself to putting men on the firing line and keeping them there. Now it must turn with its whole might to combating the greatest enemy of all – infectious disease.”

The new enemy was pandemic influenza. Just as World War I was coming to a close, having cost the world 20 million deaths and 21 million wounded (both military and civilian), something far more deadly was emerging. The influenza pandemic of 1918-1919 knew no borders, and no army could be mustered against it in battle. Its brutal reach was far greater than that of the war: upwards of one-third of the world’s population was infected (as many as 500 million people), and the death toll reached nearly 50 million. Hardest hit were people ages 20 to 40, contradicting the history of the disease, which had always primarily killed young children and the elderly.

While our collective consciousness “remembers” the Black Death or Bubonic Plague of 1347-1351, the pandemic of less than a century ago killed more people in a single year. It is likely the most devastating pandemic in recorded human history. A few more of the staggering statistics from that period are worth repeating.

- About 28 percent of all Americans were infected (Tice, 1997).
- The average lifespan in the United States was diminished by 10 years.

- The mortality rate was 2.5 percent, compared with less than 0.1 percent in previous epidemics (Taubenberger et al., 1997).

Why do we speak of those events with such urgency? The statistics will likely pale in comparison to what might occur today, if we are not prepared. The alarm now sounds for the potential effects of pandemic influenza in a world with a far larger and often more densely concentrated urban population and in which the ease of travel, and hence human-to-human contact, makes 1918-1919 look like a prehistoric era.

Faced with even the possibility of any sort of viral pandemic, most attention is typically paid to medical interventions, including vaccines and anti-viral medications. Vaccines and drugs, which take time to discover and produce, are little match for pandemic influenza if the objective is to slow the spread of the sickness.

Considerable experience has been gained in developing vaccines for a seasonal outbreak of influenza. A vaccine is only useful if it corresponds to the strain of influenza by which we come under attack. No one can predict with perfect accuracy the strain we will be fighting because viruses constantly mutate. Thus, we cannot count completely on any of the coming vaccines being exactly what we need. The technical solution of vaccines, available before the influenza hits, involves guesswork. By the time the dominant strain has been fully characterized, it is already producing human cases. And it will take, typically four to six months to manufacture it, and even longer before it can be distributed to those at risk. If the experts guess incorrectly, the population gets little protection from the vaccine. When the threat is an impending flu pandemic and the viral culprit had not been seen before, the vaccine will first become available late in the progression of the disease.

There is a role for anti-viral drugs in treating novel influenza, as long as the flu strain is not resistant to them. Even if adequate supplies of these medications are available, the logistics of distributing them are complex. And the very short time window within which symptomatic individuals must ingest these medicines in order to receive benefit will greatly limit their value in preventing spread of the disease throughout the population.

There are, however, other critical steps that can be taken that are powerful, effective, relatively inexpensive, and do not correspond to gambling on vaccines and drugs. These non-pharmaceutical interventions (NPIs) involve either hygiene or social distancing measures. Since influenza is transmitted through the respiratory emissions of ill individuals when they cough, sneeze, or talk, there is widespread agreement that hygiene measures such as proper hand washing, wearing of masks, and particular ways of covering the mouth when coughing or sneezing can be effective ways to reduce the spread and severity of a pandemic. Social distancing measures have the potential to minimize the spread of influenza from person to person by keeping people apart and especially by avoiding having people congregate in large groups where transmission of influenza to large numbers of people by one infected person would be quite easy. Such steps include closing schools, canceling public events, limiting access to public transit, and having people work from home. Social distancing measures fall into two general categories: those that are mandated or recommended by government decision-makers, and those that individuals adopt on their own.

The near pandemic of severe acute respiratory syndrome (SARS) from November 2002 to July 2003 illustrates the very real risk of a rapidly spreading disease wreaking havoc among a populace.

While the *statistical probability* of any of us witnessing a scenario like that of 1918-1919 may be low, the *possibility* is quite real. Most experts also agree that the low probability refers to *when* the pandemic will hit, not *whether* it will. Dr. Scott Santibanez of the Centers for Disease Control and Prevention did not have the benefit of knowing what we now know when he said, at the fifteenth annual National Voluntary Organizations in Disaster conference (Albuquerque, New Mexico) in April 2007, “We need to prepare because at some point there will be another pandemic. We just don’t know exactly when” (quoted in Heller, 2007).

The bottom line, then, is that a new, influenza virus could strike at any time and anywhere in the world, and one thing is certain: nearly every human on the planet could be susceptible. While this paper is not about the 2009 swine flu that originated in Mexico nor the H5N1 avian flu, the notoriety of these viruses stimulates us to address the broader issue of *any* influenza pandemic.

What are the stakes? In the SARS outbreak, there were a little more than 8,000 known infected cases worldwide and 774 deaths – a mortality rate of 9.6 percent. Even though the ultimate SARS death toll was far lower than anticipated, these individual actions “led to an immediate economic loss of perhaps 2% of East Asian regional GDP in the second quarter of 2003” (Brahmbatt, 2005). That relatively small epidemic had broader, more profound *economic* and *social* consequences as it swept across parts of Asia and later appeared in North America.

A virulent influenza pandemic would likely have consequences of far greater scope. Consider the United States alone. Health services would be overwhelmed as huge numbers of people sought medical attention. Staggering economic losses would result from high rates of worker absenteeism and decreased productivity. Global commerce would grind to a halt. As the flow of raw materials and supplies was compromised, industry would suffer, followed by the

financial sector. Travel restrictions and the closing of shipping depots would, if implemented, severely compromise transportation, as well as shipments of medical supplies and food. No essential service would be immune from the effects: law enforcement, communications, the provision of energy – all would be interrupted to some degree. In short, an influenza pandemic could severely curtail the daily functions of our society and possibly shatter them. Imagine the potential for public panic. Imagine the test for our leaders. A World Bank report suggests that it will be the “uncoordinated efforts of private individuals” that produces devastating economic results, more so than actual death or sickness” (Brahmbatt, 2005).

The SARS outbreak saw people in Asia trying to “avoid infection by minimizing face-to-face interactions, resulting in a severe demand shock for services sectors such as tourism, mass transportation, retail sales, hotels and restaurants, as well as a supply shock due to workplace absenteeism, disruption of production processes and shifts to more costly procedures” (Brahmbatt, 2005). What might happen with an influenza outbreak in the United States? A survey of a nationally representative sample of nearly 1700 Americans was conducted in 2006 of the public’s likely response to non-pharmaceutical mitigation strategies for pandemic influenza. The researchers found that barely more than 40 percent of respondents understood what was meant by “pandemic flu,” although as many as 90 percent would be willing to cooperate, once the needs were explained to them. Specific concerns were about the impact on employment if forced to stay at home for significant time periods, and about the risks of contracting illness from family members who were already sick at home (Blendon et al., 2008).

Governments play a key role in promoting non-pharmaceutical interventions. Both federal and state governments can empower individuals, families, and communities to engage in suitable behaviors to mitigate the threat of pandemic flu. It is the responsibility of these



governments to ensure that members of the population have the information they need to decide what behaviors to follow. Further, government needs to encourage employers to a) be accommodating when workers opt to stay at home to stymie the spread of infection and b) ensure that methods are in place to reduce transmission should employees who are ill come to work.

In the United States, individual states have primary authority for public health emergencies, and since 2002 Congress has provided some funding to enhance state planning and required that states develop plans for pandemics as a condition of this funding. In November 2005, the U.S. Department of Health and Human Services issued recommendations for such planning, but also left it up to each state to produce its own specific plan. The recommendations even suggested that states should plan as if federal assistance would be wanting in the event of an emergency.

## **NON-PHARMACEUTICAL INTERVENTIONS**

Absent any evidence to the contrary, particularly about medical interventions, it appears that non-pharmaceutical interventions (NPIs) stemmed the SARS tide. Influenza's consequences would quickly trump the SARS experience. In all likelihood, influenza will be impossible to confine within geographic borders because of the asymptomatic infectious period – that is, a person is infectious before symptoms are recognized or a diagnosis is established, as shown by the worldwide spread of H1N1. Not even travel restrictions can stem the tide, and there is a long delay in finding and producing vaccines.

With vaccines unavailable and anti-viral drugs in limited supply, changing individual behaviors is key to mitigating an influenza pandemic. As an epidemic or pandemic progresses,

each person who becomes ill is capable of infecting other people. The object is to keep this phenomenon to a minimum. Previous research has documented that the progression of the disease through the population is a function of the rate of social contacts and the probability of becoming infected, given contact (Larson, 2007). It follows that behaviors that reduce these would be effective in slowing the pandemic.

Models of flu transmission show that NPIs, implemented quickly and effectively, can decrease the number of sick (Nigmatulina and Larson, 2008) These benefits result from reducing the number of social contacts per day, particularly among highly active groups of people, and from reducing the person-to-person infection rate. A study of the 1918-1919 influenza pandemic revealed that among nineteen cities, locations that implemented NPIs had less prevalence of influenza (Hatchett, Mecher and Lipsitch, 2007.). Mounting evidence of NPI effectiveness has compelled government policymakers to embrace the need for plans to include these measures. In February 2007, for instance, the Centers for Disease Control and Prevention (CDC) widely disseminated a report that highlights the importance of community measures (U.S. Department of Health and Human Services, 2007a).

In order for individuals and families to adopt the appropriate behaviors (which we discuss below), they need to have information about what they should do, and understand why they should do it. They need to be willing to engage in those behaviors. If they have concerns, the substance of these needs to be addressed well in advance of a pandemic event. And there needs to be a spirit of community cooperation in working to mitigate the common threat. The ideal would be for basic hygiene measures that can combat the flu to become as reflexive as, say, stopping, dropping, and rolling if you catch on fire.

In the following subsections, we discuss representative NPIs in more detail.

## **Hygiene**

We begin with hand hygiene. Hands are the midway point between infectious surfaces, objects, and infected people and the vulnerable entryways into the body of a healthy person. Therefore, hand washing is one of the most effective ways to prevent infection. Studies have shown that *proper* hand washing can reduce infections by very significant percentages in controlled environments such as daycare centers and schools (Carabin et al., 1999; Dyer, Shinder and Shinder, 2000). It takes 15 to 30 seconds of scrubbing with regular soap and water to begin prevention. If hands are otherwise clean, using hand sanitizers with 60 to 95 percent alcohol kills viruses and bacteria on contact (Centers for Disease Control and Prevention, 2002).

Cough and sneeze etiquette is even simpler, requiring no supplies. It is a matter of educating the public that coughing and sneezing should be done into one's sleeve, rather than the hand, to contain the transmission of infectious droplets.

The use of masks, too, should be easy to incorporate into preparedness plans. While it may be true that data on the effectiveness of wearing masks to reduce the transmission of viruses are inconclusive, the theories are plausible. An average surgical mask may block large droplets (but perhaps not smaller aerosol particles) that are expelled when a sick individual coughs or sneezes. One study shows that masks reduce the speed of the air coming out of the mouth when an infected individual coughs or sneezes, which in turn limits how far infectious droplets will travel and thus reduces the number of people who will be exposed to the virus (Inouye, Matsudaira and Sugihara, 2006). Further, masks may have a secondary infection control benefit by preventing a well person from making contact with his or her vulnerable nose and mouth area with hands that may have been infected by touching a public surface (U.S. Department of Health

and Human Services, 2007b; Collignon and Carnie, 2006). Recommendations generally support use of masks in situations where people are in very close proximity to one another, such as on public transportation and in other crowded areas. In order for the use of masks to be feasible, they need to be made available in adequate supply.

### **Social Distancing**

In rural India during the 19th and early 20th centuries, a local tradition provided self-protection for the people of each village. Subsistence farm families that lived together in villages but worked separate plots of land outside the village would leave their homes and live separately on those plots whenever they heard from a trusted messenger that a “plague” was “in the vicinity” (Larson, 2007).

These Indian peasants were practicing social distancing. Combined with proper hygiene procedures, social distancing measures can effectively prevent even the most virulent influenza virus from becoming a pandemic. The objective of such measures is to reduce overall contact between people.

Of course, in modern times, we belong to many more social groups than did these subsistence farmers, our society is highly networked and interdependent, and we rely on others to provide virtually all essential services and products for living. We cannot easily cut connections and live completely separately from others, but faced with a life-threatening influenza pandemic, we may have no choice. And we will need a “trusted messenger” to inform us of what needs to be done.

Our “trusted messenger” will have to be government and its designees, who will deliver the message that social distances measures – either strict or voluntary, depending on the level of

threat and enforcement – are necessary. To counter the mistrust of government that may be common among some populations, community leaders need also to be on board.

Strict social distancing, while especially effective in containing influenza, are often difficult to implement quickly. Steps such as isolating the sick are typically undertaken only after a disease is confirmed as highly virulent, at which point it is likely too late to be effective on a mass scale. There are, of course, issues of individual rights and liberties associated with government measures to enforce strict social distancing measures. Nevertheless, voluntary social distancing can be undertaken quickly if people are educated as to its importance.

There is a wide variety of strict social distancing measures available for preparedness planning. Community-wide measures can include closing schools and other public buildings, canceling public events, enforcing quarantines, and imposing travel restrictions. Done properly and in a timely manner, school closures may be one of the most effective measures, since children are often extremely efficient transmitters of infectious disease. But school closings are not a panacea. What children do when schools are closed is often problematic, with some older ones socializing in compact groups at shopping malls and related places. Working parents of young children face the burden of childcare when schools are closed. School closings and related top-down social distancing measures are almost useless if done too late. Decision-makers must have an early trigger or else “the horse has left the barn.” Travel restrictions may be beneficial if emphasized early in a pandemic or potential pandemic; they can help delay but rarely prevent the introduction of the virus from one place to another.

Voluntary social distancing measures are typically taken at the individual level – a person reduces his or her contacts with other people on a daily basis. These steps can include encouraging work from home (telecommuting) or staggering hours to avoid congestion and thus

reduce the level of contact between people. In addition, sick people can be encouraged to stay home when they are sick, to reduce the likelihood of spreading the infection; this can be encouraged when there are no employment or financial penalties for not coming to the workplace. Ideally, a preparedness plan will maximize the proportion of workers that can work from home when pandemic risk is high. Schools can take similar measures with the preparation of electronic learning environments.

There is a prevailing belief that social distancing measures can change the pattern of attack rates, flattening the peak and consequently bringing the demand for health services closer to its capacity (Heymann et al., 2009). Our work shows that NPIs offer additional benefit by reducing the total number of people who eventually become infected. By extension, then, diligent employment of NPIs might reduce the proportion of the population that would need protection from the infection (through vaccinations) in order for the spread of the influenza to abate.

### **Technology-based NPIs**

In addition to personal hygiene and social distancing, some technology-based NPIs could also offer benefits in reducing the spread of disease. The first involves air filters and exhaust fans. Specialized air handling – including ventilation, exhaust fans, and high-efficiency particulate air (HEPA) filtering – is effective in reducing the potential transmission of influenza through the air (Li et al., 2007). HEPA filters can be particularly effective; they filter out 99.97 percent of particles that are .3 microns or greater in size, which includes airborne viruses such as influenza (Centers for Disease Control and Prevention, 2003). HEPA filters could thus be

particularly useful as an NPI in contained rooms with re-circulating air and little ventilation, including schools, office buildings, and even patient care rooms.

Using an exhaust fan can be effective for preventing a sick individual in a home or hospital from spreading the illness to others in close vicinity in the same building. A fan placed blowing out in the window of, for instance, a patient care room creates a slight pressure differential and keeps air containing potentially infectious material from circulating out.

Another technology-based NPI that may be effective in reducing transmission is ultra-violet light irradiation. Ultra-violet light, specifically UV-C, has been demonstrated as a potential air disinfectant by deactivating virus-containing aerosols. One hospital study showed that a building with UV lights installed had a 2 percent rate of influenza illness compared to 19 percent in the control building (Tellier, 2006). While there are humidity and circulation conditions that must be met for ultra-violet irradiation to be effective, this NPI shows considerable promise.

## **REVIEW OF STATE PANDEMIC FLU PLANS**

NPIs are critically important to any preparedness plan; measures cannot be limited to those that would be undertaken by public health officials, hospitals, and other institutions, but must involve all at risk of infection. Individual behavioral changes, early in a pandemic, are essential. Fortunately, as we have shown above, following NPIs requires no unique abilities; they are within the reach of all, though special considerations will need to be addressed for vulnerable populations.

Yet, while a report by the National Governors Association Center for Best Practices suggests that many states are rapidly improving their preparedness for a pandemic outbreak, it is

notable that hygiene and social distancing are not mentioned in the report (National Governors Association, 2008).

We conducted an initial study of the existing influenza pandemic preparedness plans of all fifty U.S. states that had been made public as of Summer 2007, well before the 2009 pandemic. It should be noted that in many states, updating plans has become a regular occurrence. Hence, our assessment of the 2007 plans must be treated as a snapshot in time that serves to illustrate how NPIs have been viewed. In the aftermath of the 2009 influenza outbreak, many states have taken actions, some of which were not necessarily in their plans; we report on some of these later in this paper.

Focusing specifically on content related to non-pharmaceutical interventions, we recorded in our 2007 evaluation whether states mentioned specified personal hygiene practices and social distancing interventions, and if sufficient “user-friendly” detail (subjectively determined) was provided to be actionable by individuals and families.

We uncovered a great deal of variation among plans, with tremendous strengths in some and gaping holes in others. Some states appeared to have expended very little effort on their plans, while others have even attempted to forecast the many complex challenges a pandemic would present. Common sense dictates that it should be easy to identify which organizational entity has primary responsibility for influenza planning in each of the fifty states, but we did not always find this to be the case. And our study also revealed that non-pharmaceutical interventions, a critically important element of any plan that can make or break the fight against an influenza outbreak, are often overlooked or given short shrift, as the National Governors Association has suggested (National Governors Association, 2007).



We found that all state plans were lacking in the detail of how to implement social distancing measures to a greater or lesser degree. Hygiene – a time-honored public health concern – did receive more attention, but still, we believe, insufficient consideration in plans.

As we strongly believe that empowering individuals to adopt and practice non-pharmaceutical interventions is key to effective pandemic flu mitigation, our discussion will focus on the NPI categories, presenting a brief review of how various state plans treated this material.

### **Hygiene**

Hygiene plans are multi-faceted, and include practices such as hand washing, using hand sanitizers, proper cough etiquette, and wearing masks, among other steps. Effective hygiene requires that the public be educated and that necessary supplies be provided. Florida’s plan, for instance, emphasizes proper hygiene, respiratory etiquette, and the use of personal protective equipment in the community and in hospital settings. The plan provides a detailed chart to guide the use of specific personal protective equipment during each phase of a pandemic, and also discusses communicating the hygiene “message” to the public.

Other state plans, while emphasizing hygiene, limit interventions to distributing brief educational fact sheets to the public. Thirty-nine states have hand washing education materials prepared; forty-one have cough etiquette education materials; and twenty-five have mask usage education materials. Many state plans, though, lack any provision for supplies.

There are some location-specific hygiene protocols in various state plans, ranging from hygiene promotion in hospitals and schools to homes and workplaces. Many state planners will rely on posters to disseminate the improved hygiene message. Hygiene promotion, however, is

deemphasized as plans move away from the medical setting. Nine states make no mention of hygiene promotion within the community as a whole, and fourteen make only a brief reference. Surprisingly, fifteen states have no plan to alter hygiene protocols in school settings, while fifteen other states have identified regular hand washing and disinfection of classroom objects as a top priority (the latter being of questionable effectiveness). Another fifteen states have no strategy for improving workplace hygiene, despite that the simple recommendation of a hand sanitizer could prove very helpful.

The pie charts in Figure 1 provide a snapshot of state preparedness plans in Summer 2007 with respect to hygiene. They depict the percentages of state plans that include hand washing, cough etiquette, mask usage, and hand sanitizers. Our interpretation of inclusion was most generous: a simple *mention* of one of these hygiene NPIs warranted being in the “yes” category – even if there were no specific implementation plans. Still, there is a spread across the four NPIs, with hand sanitizer and mask usage not covered as much as the other two.

In the wake of the 2009 H1N1 outbreak, many states began to implement their plans for hygiene measures, including communicating to the public at large. All public buses in the Phoenix, Arizona area, for example, had their handrails and seats cleaned daily with germicidal solution, and some bus drivers asked for protective masks. Some U.S. Customs agents on Arizona’s border with Mexico also began to wear protective masks, and were authorized to hold travelers with flu symptoms for quarantine (Rough and Wagner, 2009). In North Dakota, news channels broadcast short video clips with detailed instructions on effective hygiene practices to avoid contracting the virus, and the state’s health department set up a website specifically aimed at disseminating information about swine flu in the form of press releases, educational pamphlets, and guidance for the general public (KXNet.com, 2009a, 2009b).

## **Social Distancing**

State plans we reviewed fall well short of what is necessary in the social distancing category to ensure success in stemming an influenza pandemic. One state had absolutely no mention of social distancing. Others provided for employment of strict social distancing in isolated instances of influenza. Many mention supporting temporary changes in social behavior to reduce face-to-face interactions between people, but often without any specificity with respect to how this will be accomplished and often only after infection is widespread, which may well be too late.

The pie charts in Figure 2 provide a snapshot of state preparedness plans in Summer 2007 with respect to social distancing. They depict the degree of attention paid in state plans to school closures, public event cancellations, and working from home as social distancing measures that can help stem the tide of pandemic influenza.

In light of the 2009 outbreak, states took many more social distancing measures. One of the most common was the closing of schools. In Connecticut, for example, all three schools in one small school district were closed when a family in the area reported two possible cases of H1N1 influenza. The schools were thoroughly cleaned and then reopened. State public health officials also instructed school nurses to be on the lookout for flu-like symptoms among students in preparation for possible future closings (Medical News Today, 2009). In North Carolina, public health officials first urged that people with mild flu-like symptoms remain at home and follow a treatment routine similar to that for seasonal flu, and not to seek professional medical attention unless symptoms escalated. Later, the state encouraged anyone with flu-like symptoms to self-isolate (Associated Press, 2009).

### **Technology-based NPIs**

Unfortunately, few state plans addressed the technology NPIs described earlier.

## **CONCLUSION AND NEXT STEPS**

Changing behavior is likely to be our best hope of reducing death and disease, particularly in early stages of a flu pandemic. Public officials at all levels need to recognize that public health preparedness plans are a critical first step to ensuring that individuals, families, and communities get the information that will empower them to adopt behaviors that will help to reduce the spread of disease, particularly in the absence of vaccines and drugs.

It is clear that across the country, weaknesses exist in state pandemic plans; however, without access to the resources and expertise necessary to improve upon existing plans, states will be less likely to address the gaps. There have been significant financial investments at the federal and state levels for pandemic planning, but minimal guidance on plan creation.

Recommendations from the federal government regarding state pandemic plans should improve state planning and ensure integration of plans across state lines. State health departments should also work with neighboring jurisdictions to ensure integration prior to plan implementation. Additionally, states that provided less detail in some areas can learn from states offering more. Health departments should also consider focusing on additional training for staff to improve knowledge of the pandemic threat and potential impacts. Inter-departmental and inter-agency trainings can assist responders in understanding the various roles necessary for an effective pandemic response and may increase the comprehensiveness of pandemic plans. The

findings of this study lend support for state legislatures to increase access to financial and personnel resources to improve upon existing plans.

State public health officials, policymakers, and others responsible for these plans need to understand that we will not succeed in stopping the spread of an influenza pandemic only by adopting “top down” medical policies and centering on healthcare institutions. They must recognize that ordinary people – at the individual, family, workplace, school, neighborhood, and community levels – must be engaged in meeting the threat.

Prior to the April 2009 outbreak of swine flu, the World Health Organization worried, “flu fatigue” had set in (Bennet and Gale, 2008). We have now seen recent evidence that the threat of devastation from a flu pandemic is real. Vaccines and drugs will not be available soon enough to prevent the spread of disease. By engendering the best behaviors in people faced with life-threatening pandemic influenza, we have an opportunity to greatly reduce the progression of a pandemic by working to minimize social contacts and reducing the probability of contracting the disease from someone already infected. We must do all we can to take advantage of opportunities to reduce illness by changing our patterns of behavior (Larson, 2008). Non-pharmaceutical inventions are key to empowering our citizenry to be the authors of their own survival in the event of a pandemic.

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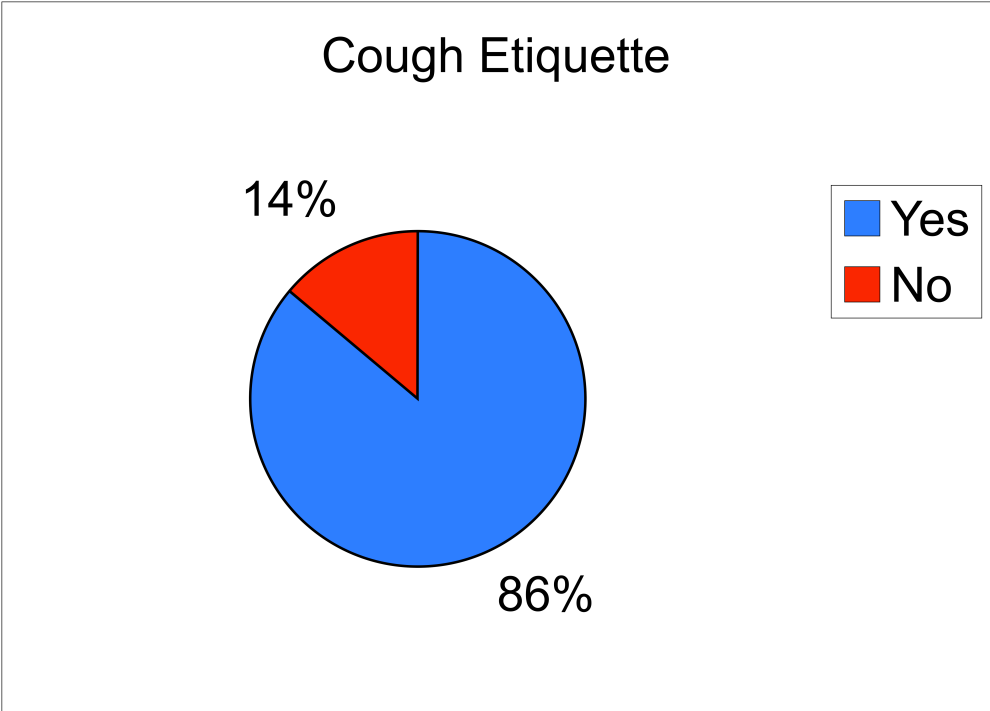
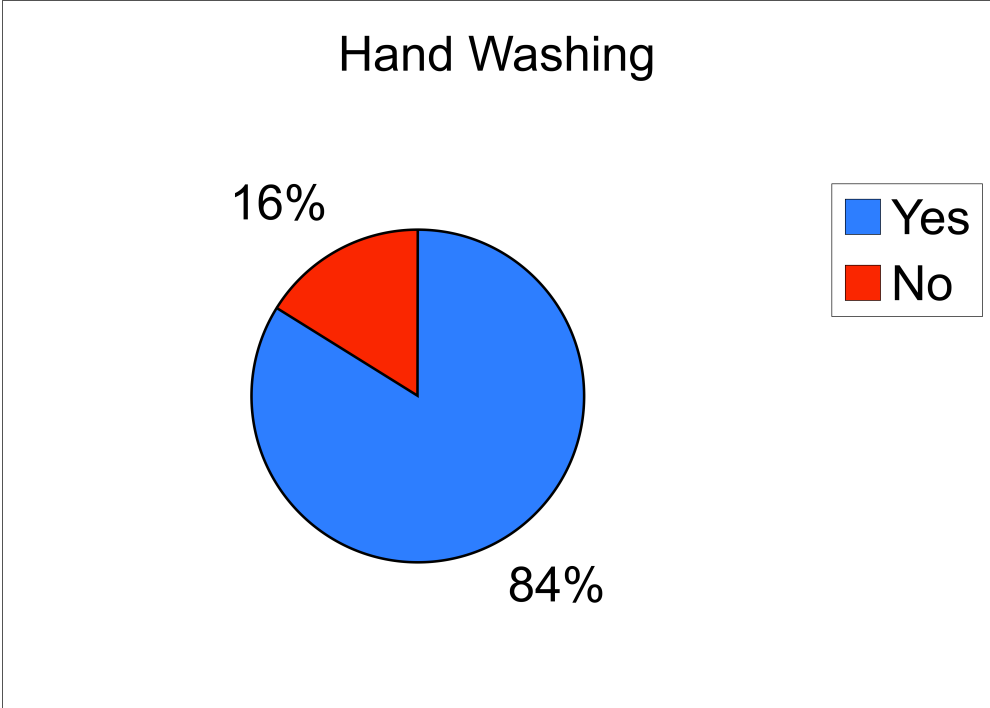
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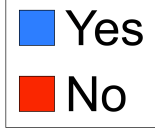
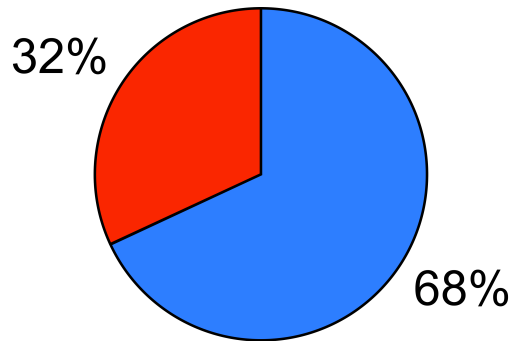
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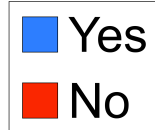
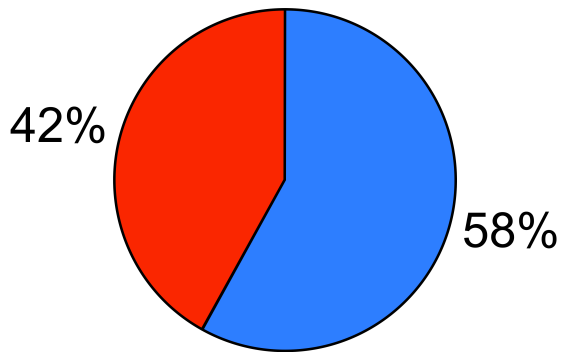
**Figure 1. Percentage of State Preparedness Plans that Include Hygiene Measures**



### Mask Usage

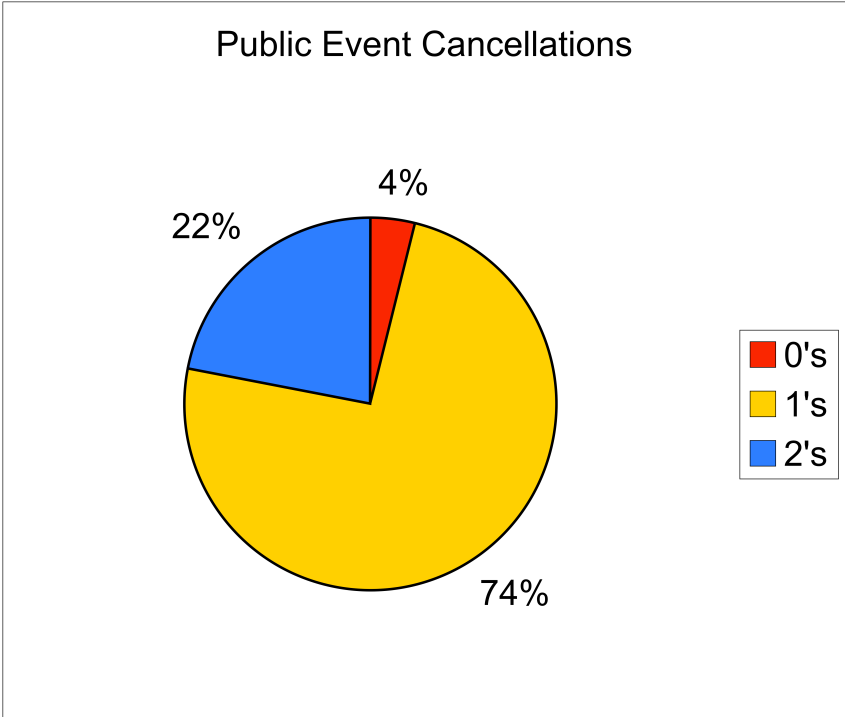
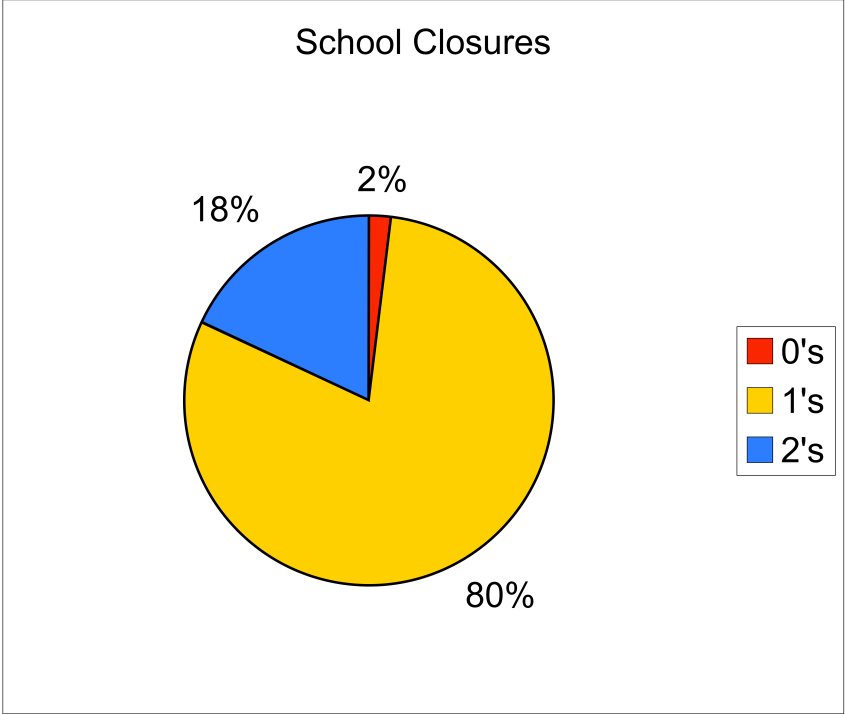


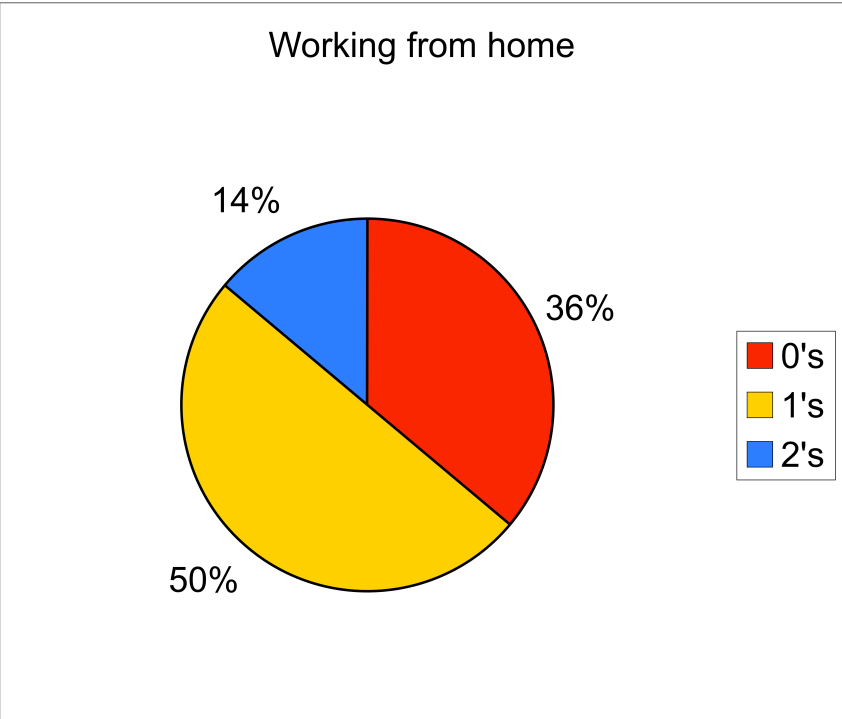
### Hand Sanitizer



*Note:* A simple *mention* of one of these hygiene NPIs warranted being in the “yes” category – even absent any specific implementation plans.

**Figure 2. Degree of Attention Paid in State Preparedness Plans To Social Distancing Measures**





**Legend**

0 = no mention in plan

1 = measure mentioned, but plan included no implementation details

2 = measure was described in detail, accompanied by a coherent implementation strategy

*Note:* Only a rating of “2” should be considered acceptable for a state pandemic influenza plan.