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Pandemic Influenza Preparedness: Adaptive Responses to an Evolving Challenge*

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Abstract

In the United States, preparation for a potential influenza pandemic is receiving heightened media coverage and scrutiny. Scientific attention is focused on the potential for the current Southeastern Asian avian flu virus, influenza A (H5N1), to become a pandemic threat through genetic mutation and viral reassortment. It is imperative that we act now, as we face an evolving and advancing disease state with insufficient national preparation. Existing preparedness plans address laboratory and disease surveillance, community containment and border protection, and mass dispensing and vaccination strategies. However, little attention has been directed to identifying and managing psychological and social factors likely to influence human behavior during a pandemic. All of our health and medical strategies require people to behave in prescribed ways to avoid exposure, prevent infection, or halt disease transmission. This article provides timely expert panel recommendations for pandemic influenza response and recovery by addressing human behavior and adaptation.

KEYWORDS: influenza, pandemic, behavior, mental health, emergency, public health, preparedness, behavioral health

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Evolution of another influenza pandemic

Most infectious disease experts agree that an influenza pandemic will occur at some point (WHO, 2005; U.S. Department of Health and Human Services, 2005). Pandemic influenza has the potential to pose disease control challenges unmatched by any other natural or intentional infectious disease event. Pandemic influenza viruses have demonstrated their ability to spread worldwide within months, or weeks, and to cause infections in all age groups. There are three essential epidemiological conditions that must be met to generate a pandemic influenza. Fortunately they rarely converge; unfortunately they are impossible to predict, but the requirements are clear.

- A new flu virus must emerge from the usual animal reservoirs that produce and harbor such viruses. By definition, most people will not have pre-existing immunity.
- The virus has to actually make humans sick (most do not).
- The virus must be able to spread efficiently between people through coughing, sneezing, or a hand-shake.

For the Southeastern Asian avian influenza A virus (H5N1), transmission from poultry to people has been documented with significant mortality; however, the transmission rate is relatively low and transfer between people isn't clearly established (World Health Organization, 2005). Health scientists are increasingly concerned that the H5N1 virus is mutating in ways that could lead to efficient person-to-person spread (Butler, 2006). Effective transmission between humans may cause the virus to spread around the globe and initiate the next influenza pandemic. The Secretary of the U.S. Department of Health and Human Services recently stated that "There is a time in the life of every problem when it is big enough to see and small enough to solve. For influenza preparedness, the time is now" (Leavitt, 2005).

The ultimate number of infections, illnesses, and deaths is unpredictable, and could vary tremendously depending on multiple factors. Without adequate planning and preparations, an influenza pandemic in the 21st century has the potential to cause enough illnesses to overwhelm current public health and medical care capacities at all levels, despite the vast improvements made in medical technology during the 20th century. While certain modern trends have provided for increased communication and coordination in response to an infectious disease outbreak, increasing globalization could increase the potential for pandemics to cause more illnesses and deaths than occurred in earlier pandemics:

- Globally, human populations are more urbanized, which may allow viruses to be transmitted within populations more easily.
- International travel is more frequent and may allow viruses to spread globally more quickly than in the past.
- In many countries and depending upon the characteristics of the virus and disease, increasing percentages of elderly persons and those with chronic medical conditions or suppressed immune systems may elevate the potential for more complicated illnesses and deaths to occur.

This combination of factors suggests that the next pandemic may progress rapidly and overwhelm countries and health systems that are not adequately prepared.

Current pandemic influenza preparedness

United States Government agencies are currently developing, testing, or refining their plans in case of pandemic flu. Published plans from the United States and the World Health Organization have primarily focused on detection and disease control through (1) surveillance and early detection (2) community containment strategies (movement restrictions, facility closure, and health care service continuity) that would serve to decrease disease transmission and (3) mass prophylaxis strategies using vaccines and antiviral medication, as available and appropriate. While these aspects are mainstream components in the public health and medical preparedness toolkit, relatively little attention has been paid to identifying and managing psychological and social factors likely to influence human behavior during a pandemic. Mass fatality and economic impacts also need to be addressed from this perspective. All of our health and medical strategies require people to behave in prescribed ways to avoid exposure, prevent infection, or halt disease transmission. Containment measures may also impact religious or cultural rituals surrounding burial and grieving for those who perish. Furthermore, leaders in the public and private sectors must be attuned to the behavioral health of constituents to maintain continuity of business and government operations throughout the pandemic or we will not be able to preserve our ways of life. Therefore, applied behavioral science will play a critical role in the success or failure of these strategies.

In the event of pandemic flu, the public will demand information, reassurance, and guidance about what they can do to protect themselves, their families, and their economic well-being. Experience with quarantine during the 2003 SARS outbreak suggests that local officials will face enormous logistic, economic, ethical, and psychological challenges in implementing community-level containment measures (Hawryluck, Gold, Robinson et. al., 2004). For example, closure of schools may have to be considered, along with restrictions on

public gatherings, revisions to policies on mass transit systems, etc. As individuals congregate or travel, influenza transmission will be difficult to avoid. In the initial phases of the pandemic (i.e., 6-9 months), vaccines are not likely to be available, and antiviral medications, if effective, will be in limited supply. Containment measures may prevent transmission, or at least suppress or slow the spread of a pandemic, allowing time for targeted use of medical interventions.

Applying knowledge of human behavior to pandemic influenza preparedness

History has demonstrated that exposure to psychologically traumatic events, like disasters, debilitating or deadly epidemics, criminal assault, or warfare, has been associated with increased utilization of healthcare services among a significant number of people for multiple physical complaints and poor functioning (Engel, 2004). During previous incidents, behavioral and psychological issues have played a critical role (see Table 1). For example, during the 2001 anthrax attacks, there were only 22 cases of anthrax yet 35,000 people were instructed to use antibiotic medication to protect themselves against infection, and an estimated hundred thousand plus perceived themselves to be at high risk (Gerberding, Hughes, & Koplan, 2002; Stein, Tanielian, Ryan et. al., 2004). In addition, there may also be maladaptive behavioral reactions involving groups of people in response to concerns about emerging disease states, beliefs about disease transmission, efforts to control the spread of disease, or beliefs about the ability of the government to effectively respond and provide protection or relief (Sandman & Lanard, 2003). Failure to manage a surge in demands on the healthcare system could have a cascading impact on health care infrastructure, including shortages for critical care or specialized infection control strategies; which, in turn, may create unnecessary exposure amongst those waiting for services or exacerbate secondary mass psychosocial reactions, including violence (Engel, 2004; Locke, McDonald, & Reissman, 2004). Furthermore, significant numbers of first responders, public health workers, healthcare workers, school teachers, utility workers, and other important community service providers may not be working, thus undermining critical infrastructure and community viability (Reissman, Spencer, Tanileian, & Stein, 2005). Therefore, interventions intended to shape how people behave to protect themselves and preserve their assets will play an important role in any coordinated response to this major public health threat.

Given these behavioral health challenges, two expert panels were jointly convened by the Centers for Disease Control and Prevention (CDC, part of the U.S. Department of Health and Human Services) and the National Center for Post-Traumatic Stress Disorder (NCPTSD, part of the U.S. Department of Veterans Affairs in partnership with Dartmouth University Medical School) to address the behavioral issues relevant to mass prophylaxis and community

containment measures in such a crisis. This is the official report reflecting all of the input from both of these panels, and facilitated by all of the authors. Based on existing research and prior experience, panel members provided subject matter expertise in the identification of key issues and development of recommended actions and processes that might address these issues during pandemic influenza preparedness and response planning efforts. In all cases, additional research will contribute to the continued clarification and implementation of these recommendations. These panels identified several potential *tipping points* and strategies to promote healthy adaptive behavior in compliance with recommended health directives.

Table 1: Psychological and behavioral responses are critical.

Massive Surge on the Medical System Is Likely	
Sarin attack, Tokyo 1995	More than 1,000 individuals experienced some form of acute or chronic gas exposure, yet more than 4,500 individuals sought medical attention (Okumura, Suzuki, Fukuda et. al., 1998).
Radiological incident, Goiania, Brazil	When 250 people were exposed to radioactive substance, 125,000 people requested medical screening (Collins & Banderia de Carvalho, 1993).
Adherence to Public Health Recommendations Will Be Low	
Anthrax, 2001	Despite extensive public health outreach, only 44% of individuals at high risk of anthrax exposure completed the recommended course of antibiotics (Shepard, Soriano-Gabarro, Zell et. al., 2002).
Plague, Surat India 1994	There were 53 deaths and 167 cases, yet a reported 600,000 individuals fled the area (Ramalignaswami, 2001).
Individual Decisions Can Have Grave Consequences	
Hurricane Katrina, 2005	Among those who did not evacuate before the Hurricane hit, many died in the following days as a result of the flood—some died while trapped in their attics, others drowned in the flood waters waiting for help to arrive (Dewan & Roberts, 2005).
Fear of their Own Risk Can Cause Providers to Avoid Caring for Patients	
SARS, 2003	16% of physician surveyed during the SARS outbreak in Hong Kong reported spending less time with patients and 7% avoided physical examinations (Wong, Lee, Tsang, & Wong, 2004).

Adherence to public health interventions and outcome at the population level.

The term *tipping point* was borrowed from Gladwell (2000) as he described social marketing trends, and was selected to represent the potential to either increase or decrease the likelihood of adverse health outcomes. More specifically, use of the label *tipping point* is meant to identify events, actions, or perceptions that strongly influence psychological reactions or social behaviors at the group or population level. The use of this term allows us to look at factors improving or decreasing the likelihood that sufficient numbers of people adhere to appropriate public health intervention measures, such that disease containment is achieved and health is protected at the population level. Several individual and community level factors impact these tipping points and will influence the psychological or behavioral responses to pandemic influenza.

Whether the tipping points lead to the success or demise of a public health response will depend upon the capacity and ability of any response system to understand and manipulate the factors. The remainder of this article provides recommendations that should be implemented by public health and emergency management officials, healthcare and business leaders, and other responsible parties *now* to minimize preventable losses and preserve our way of life.

Expert Recommendations: Behavioral and Emotional Countermeasures

The World Health Organization characterizes phases of pandemic influenza according to key evolving epidemiological features (e.g., viral pathogenicity, human infectivity, and magnitude of disease impact) so interested nations could compare and coordinate their preparedness and response actions (World Health Organization, 2005). The guidance and recommendations contained in this report will vary by phase and severity of each pandemic wave. As such, we categorized the findings of the expert panels according to three strategic approaches and provide guidance for implementation, as follows:

1. Measures to shape the public's behaviors so they are as adaptive and risk-reducing as possible.
2. Measures to reduce social and emotional deterioration and improve functioning.
3. Measures to support key personnel in critical infrastructure functions (e.g., healthcare, emergency responders, child-serving education or care, utilities, food, transportation).

Table 2: Individual or community level factors that will influence psychological and behavioral responses to pandemic influenza.

Pre-existing knowledge	<p>Knowledge about:</p> <ul style="list-style-type: none"> • What differentiates seasonal and pandemic strains, • What constitutes an effective public health response and what each person can do to prepare (physically and emotionally) and protect loved ones, and • Where to receive accurate health information and guidance as the pandemic evolves.
Information availability and accessibility	<p>Existence of appropriate public information exchange about the emerging situation and:</p> <ul style="list-style-type: none"> • Whether outside help is needed (e.g., likelihood of becoming seriously ill), • How to access appropriate assistance, • What personal protective actions to take, • What is being done to stop the spread of the disease, and • Measures that will ensure adequate and equitable resource distribution.
Perceptions of equity	<p>Whether individuals anticipate and assess the impact of public health measures may have a differential impact on individuals or groups (e.g., restricted movement is a shift in civil liberties and may exacerbate underlying socioeconomic or cultural conflict).</p>
Perceived trust and faith in institutions	<p>Establishing a track record with one's constituency that builds trust and faith in their social institutions and reinforces beliefs about leaders being appropriately prepared and willing to help.</p>
Perceived and/or actual economic impact	<p>Providing avenues for assistance as the pandemic is likely to have an uneven economic impact, as may the associated public health response measures (e.g., the extent to which disease containment measures call for the closing of schools or businesses, thus depriving individuals of income).</p>

Measures to shape adaptive behaviors

1. Maximizing public trust and communicating effectively.

The Institute of Medicine advises that “(t)he most effective way that public officials can avoid a damaging credibility problem in a pandemic is by sharing the dilemmas of pandemic control with the public in a productive and effective way, that is, by doing more than simply furnishing facts and figures” (Webby & Webster, 2004).

In a situation where high risk and fear of infection are likely, effective public risk communication will enhance “people’s willingness and ability to cope with risk, to bear anxiety, to follow instructions, to help their neighbors, and to recover when the crisis is over” (Sandman & Lanard, 2003b). Risk and health communication expert recommendations emphasize the need to align public perception with realistic assessments of threat and risk-reducing and adaptive behavior (Reynolds, Galdo, & Sokler, 2002). Achieving this requires concerted effort. In the United States, attention is being paid to creating just-in-time messaging products that define the technical terms, risks, health effects, and protective actions associated with pandemics (U.S. Government pandemic influenza website; CDC, 2002). Researchers continue to identify the individual and social factors required for appropriate message reception, including the impact of mass media (Wray, Rivers, & Jupka, 2004; Vanderford, 2002). How a message is packaged and delivered, as well as how trustworthy and knowledgeable the messenger is also impact communications effectiveness in terms of behavioral response (Stein, Tanielian, Ryan, 2004; Stein, Tanielian, Eisenman et. al., 2004; Blanchard, Haywood, Stein et. al., 2005; Vanderford, 2002). However, less attention has been paid to getting the public ready to receive the right information at the right time so it shapes their behavior in a crisis.

Table 3 outlines several factors that will contribute to the public’s trust and impact the effectiveness of risk and health communication, along with the expert panels’ recommendations for how to influence these factors. The effectiveness of risk and health communication messages will depend upon the communicator’s ability to: convince the audience that s/he has the requisite expertise, set appropriate expectations about scientific uncertainties, addresses deficits in resources and knowledge, and provide hope, empathy, and support (Reynolds, Galdo, & Sokler, 2002; CDC, 2002; Sandman & Lanard, 2003; Hobfoll, Watson, Bell et. al., in review).

Table 3: Experts recommend four tasks to promote positive public health outcomes.

<p>Task 1: To maximize public trust and effectively communicate risk and health information</p> <ul style="list-style-type: none"> • Have a resident expert clarify messages. • Use a flexible style of communication. • Be attentive and responsive to diversity in the community. • Ensure 2-way dialogue with real-time monitoring of feedback. • Create and leverage communication channels by building relationships with those in the field and within the community. • Address deficits in knowledge, trust, materials, and resources as they emerge. <p>Factors Influencing Tipping Points</p> <ul style="list-style-type: none"> • Knowledge about the nature of pandemic as separate from regular influenza. • Equity of messages: in every stage of the pandemic and for every population. • Message delivery: developing, marketing, and monitoring of messages appropriate to targeted groups.
<p>Task 2: To maximize adaptive behavior change</p> <ul style="list-style-type: none"> • Create a website to serve as authoritative, central source of information for multiple audiences (see for example: www.pandemicflu.gov). • Designate a multidisciplinary, multi-agency task force of experts to create educational material for website. • Gather knowledge about pre-existing community beliefs and needs. • Create feedback mechanisms within communities (for example set up active listening opportunities for members to voice concerns, consider involving community and business leaders as moderators). • Gather information about pre-existing community resources and plans for detecting and responding to a pandemic. • Assess existing social networks and identify potential opinion leaders from among natural leaders in the community. • Utilize multiple communication channels (TV, radio, web, billboards). • Seek to use existing systems for disseminating information such as through the workplace or schools (e.g., use existing newsletters or community bulletin boards). • Create media programming (positive role modeling, self-care facts). • Develop fact sheets, distribute flu-kits that include coping tips. • Minimize potential for discrimination and stigmatization by developing appropriate interventions (public education) that describe the rationale about movement restriction policies.

- Examine potential financial policies to counter any negative economic consequences associated with compliance (e.g., prevent loss of wages).
- Facilitate family and community interaction through available technologies and creative networking (virtual neighborhoods using internet blogs, or websites).
- Create or identify existing information sharing networks within communities to address the needs of special populations (e.g., tap into neighborhood listservs or newsletters).
- Conduct ethno-cultural assessments and incorporate local customs into messages and interventions where appropriate.

Factors Influencing Tipping Points

- Knowledge about: a) when to seek treatment b) what protective actions will be effective, etc. [knowledge may vary by cultural context]
- Allocation of resources: perceptions about adequacy and equity in the distribution of resources.
- Community readiness: existing infrastructure's capacity to facilitate response and coping among its members.
- Potential impact of movement restrictions: the extent to which these policies will impact civil liberties, economic survival, etc.
- Availability of ongoing support: resources to facilitate communication, social interaction, etc.
- Attention to needs of vulnerable populations (e.g., children, elderly, disabled).

Task 3: To reduce social and emotional deterioration and improve functioning

- Include information to facilitate emotional and social recovery on website; the information should seek to promote self-efficacy, social connectedness, calming (rather than fear), feelings of safety, and hope.
- Provide guidance about building resilience—include tips for increasing social support, maintaining optimism, setting manageable goals, achieving emotional and social balance, and employing problem-focused and emotion-focused coping (i.e., taking steps to ensure safety; receiving and giving emotional support).
- Create and fund front-line community crisis counseling teams (use telemedicine outreach for outreach about evidence-based interventions).
- Incorporate hospice and faith communities in community response plans.
- Identify individuals at risk and facilitate access to appropriate mental health and social services.
- Identify and task local leaders within special/vulnerable population groups to facilitate access to information and resources.

Factors Influencing Tipping Points

- Pre-existing social and emotional health.
- Coping strategies employed.
- Availability and accessibility of information and resources.

Task 4: To support key personnel in critical infrastructure functions

- Convene national, multi-disciplinary stakeholder group of trusted advisors for delivering consultation to leaders through pandemic phases and waves.
- Create state and local advisory councils to provide regular input to the national panel; and include infectious disease experts on the panel.
- Establish a joint information center to provide credible and accurate information on a continuous basis.
- Ensure appropriate evidence informs guidance about protective actions, for example: what is a safe distance between people to prevent disease transmission (depends on mode of spread); what, when and how long masks should be worn, when to invoke quarantine and isolation, what to do after plane travel, etc.
- Shape federal policy in a manner that requires local policies regarding triage and resource management be equitable in order to receive federal assistance.
- Create policies for protecting lower-income individuals, families, and businesses (e.g., consider models for ensuring financial relief, similar to the SARS Canada experience).
- Ensure that appropriate actions are taken to provide shelters for displaced persons, financial/economic relief, childcare, delivery of food, supplies, medication, compensation for lost wages, etc.
- Define ethical actions for physicians regarding triage and surge capacity issues (e.g., particularly with respect to prioritizing limited resources—including ventilators, vaccines, and anti-virals; as well as procedures for maintaining patient confidentiality, etc).
- Provide guidance for state and local leaders on safety of small businesses and policies for economic/income compensation.
- Provide training to local leaders on how to deliver risk and health communication, how to consult technical and subject matter experts, and their role during a pandemic.
- Conduct exercises (e.g., practice response roles, implementation of all levels of quarantine, enforcing movement restrictions, managing limited resources, handling mass fatalities) include the full array of issues relevant to a pandemic (religious, cultural/ethnic, mental health).
- Create just-in-time training opportunities for specific skills required as a pandemic influenza evolves and key personnel shortages emerge.
- Include information and guidance about resilience and coping activities for health care providers and first responders on website.
- Provide educational materials for providers, including information on the evolving clinical information, medical care and triage decision trees, mental health screening, coping with high stress demands, etc.
- Train leaders within the response community on the importance of stress management and psychosocial support for their workforce.
- Create and deploy mobile frontline stress control teams.

- Establish appropriate work-rest schedules for personnel in critical infrastructure position, including responders and health care providers.
- Facilitate support for and address needs of the responders' family members.

Factors Influencing Tipping Points

- Access to emerging information to facilitate response role.
- Appropriate policy guidance on response role, triage procedures and resource management.
- Prior training and planning.
- Availability and accessibility of information and resources.
- Leadership and team cohesion.

Use public education campaigns now.

Public education campaigns should be developed now to begin to influence the public's understanding of pandemic flu and build a trusted relationship with the response community (Lasker, 2004; O'Toole & The Working Group on Governance Dilemmas, 2004). Residents may be more reassured if it were obvious that states with international points of entry or crowds associated with tourist attractions anticipated their vulnerabilities and informed the public about anticipated procedures and changes during periods when the pandemic is spreading. Part of this process ought to involve a dialogue with community leaders and interested parties. To this end, the expert panels further recommended that the media be involved now in designing informational programs and that multiple dissemination opportunities be employed (messages, commercials and special programming on TV, radio, news). Message content, format, and dissemination pathways need to be tailored to meet the needs of different cultural communities and social networks (e.g., pictograms may transcend language barriers; Mobley, 2005). This may be the time to initiate a dialogue with the public, reminiscent of fireside chats with President Roosevelt during the Great Depression.

Dispel rumors and myths.

During a crisis, the tendency to misconstrue new information to conform to established beliefs, uncertainties, and conflicting or inaccurate information often lead to rumors and media miscues during a crisis. This may increase feelings of vulnerability, psychological distress, and increased non-specific physical complaints leading to a surge in demand for medical attention. Prevention messages should be simple and tailored to context, environment, and community history. The information should inform and provide a basis for action on the part

of the public, with stories highlighting successful adaptive behaviors and role models. The population needs time to absorb all the information. This is more likely to happen if information is integrated into pre-existing public dissemination and educational programming channels currently in use. Since multiple and conflicting sources of information are relatively easy to access, public leaders should periodically work to dispel myths, and prepare the public for contradictory information.

2. Maximizing adaptive behavior change.

Behavior modification will be necessary to prevent the spread of influenza and subsequent loss of life during a pandemic. It is important to encourage individuals to take actions to protect themselves and to change their environment to reduce the risk of infection. The actions selected can be evaluated dichotomously as those serving to protect health (e.g., washing one's hands properly), or as actions that endanger health (e.g., not washing one's hands). During a period of pandemic influenza universal hygiene and wellness behaviors should be strongly recommended. This includes respiratory and cough etiquette, hand hygiene, adequate sleep, exercise, and nutrition, creative means to maintain social support while adhering to health directives to limit disease transmission. However, without prior planning, prompting individuals to implement these behaviors is likely to be a challenge.

Facilitate self-care and appropriate care-seeking.

Throughout each phase of a pandemic, it is important to ensure that those with influenza symptoms and other acute medical problems seek proper care at the appropriate time. It is also worth efforts to instruct and support people with non-urgent health complaints to safely continue with their daily routine and seek alternative care or support for self-care. It is of prime importance that specialized health care resources retain safe environments--accessible to those needing acute care during an influenza pandemic. As such, it will be crucial to ensure that adequate information about when and how to seek treatment is provided to enhance the capacity of individuals and communities to react appropriately. Because pandemic influenza hasn't been experienced recently, expert panelists recommend that knowledge about successful behavioral adaptation be extrapolated from other infectious disease events. For example, in 2003, the Canadian government recommended cancelling certain public gatherings like funerals and nonessential meetings and invoking a voluntary quarantine for potentially-exposed persons to help contain the SARS outbreak. Civic and faith-based leaders may use this preparedness effort to initiate innovative methods for

conducting funerals, other rituals involving groups of people, and social support networks (using a variety of communication venues). A major contributor to the successful voluntary quarantine in Canada was a reimbursement strategy for absenteeism from work. Table 3 outlines several factors that will influence the public's willingness and ability to modify their health behaviors during a pandemic. It also outlines the workgroups recommendations for how to mitigate these factors.

Provide accurate, credible information now.

Multiple information needs will arise before, during and after an influenza pandemic. A government-sponsored website (www.pandemicflu.gov) has been created to serve as a central source of updated, authoritative information for multiple audiences (i.e., general public, physicians, state planners, news reporters, etc.) in the United States. A multidisciplinary, multi-agency task force of experts (i.e., medical, social science, clergy, policy, legal, emergency service, ethical, etc.), should help create the material for this source based on peer-reviewed, agreed-upon facts. Behavioral information on all aspects of the pandemic should be included, such as information on recommended coping strategies, dealing with stigma, educational materials for families, links to current statistics, changes in government operations, and protocols for how the public and businesses can help. Information should be conveyed in a manner that will counter the potential denial of early clinical symptoms because of fear of being socially marginalized and stigmatized. Official guidance should be provided about over-the-counter medicines for pain and symptom relief, alternative remedies, antibiotics, and antiviral medications. Attention should be given to the psychological and social factors that influence the ways in which people respond to such information (Reynolds, Galdo, & Sokler, 2002; CDC b, 2003; Engel, 2004; Naturale, 2006; Watson, Gibson, & Ruzek, 2006; Wray, Rivers, & Jupka, 2006).

Because a community's cohesion, values and resources will influence its members' ability and proclivity to receive such information, knowledge should be gathered about the pre-existing community context (Pfefferbaum, Reissman, Pfefferbaum, Klomp, & Gurwitch, in press; Mobley, 2005; Reissman, Spencer, Tanielian, & Stein, 2005). Natural leaders in the community who could disseminate and gather information, and educational systems that are already in place should be identified and tasked with a response role during a pandemic. Rapid ethnographic methods could be applied to better inform local leadership about their constituencies and how to leverage information exchange more effectively. A partnership with the public requires active listening; mechanisms need to be created to garner feedback and engage the public to understand how people are trying to appraise their own risk and choices.

In order to reduce public risk, efforts to enhance adaptive functioning and increase compliance with recommendations and restrictions will also be needed. To facilitate these reactions, the public should be informed by multiple channels prior to any widespread transmission that an influenza pandemic is likely to happen and they need to be emotionally prepared. Such preparation includes teaching about expected reactions and improving coping skills to better manage the emotional fall-out from pandemic influenza, such as grief, anxiety, apathy, dysfunction, and volatility. Information should also be provided now to increase awareness about disease transmission, health impact, available treatment, and how individuals can mitigate their own risk level. Instructions about what to do under different circumstances should be distributed to each household. Children's media programming can be created and disseminated on hand-washing, self-care, and family care. In addition, "flu kits" (i.e., tissues, games, alcohol-based hand disinfectants, fact sheets, and key information sources) could be made available to promote awareness and compliance.

Public education about limiting disease transmission.

In the event of an influenza pandemic, public health officials will recommend actions to decrease the likelihood of virus exposure and consequent disease transmission. Although these are effective policies for preventing and controlling the spread of disease, psychological and social consequences may be disruptive. During SARS in Toronto Canada, symptoms of post-traumatic stress disorder (PTSD) and depression were observed in 28.9% and 31.2% of quarantined persons, respectively, and the duration of quarantine was significantly related to increased PTSD symptoms (Hawryluck, Gold, Robinson et. al., 2004). Adverse psychological reactions were not limited to those infected or potentially infected as "many [hospital staff] expressed conflict between their roles as health care provider and parent, feeling on one hand altruism and professional responsibility and, on the other hand, fear and guilt about potentially exposing their families to infection."

Furthermore, for many individuals, the process of quarantine or community containment is synonymous with historical abuses of power, and thus the term evokes negative associations. In light of these emotionally-charged memories, containment measures may incite stigmatization and discrimination against affected persons or groups, with punitive and devastating economic consequences. These harmful behaviors have led to job loss and increased unemployment during previous disease outbreaks. Beyond the economic ramifications, these consequences may also lead to higher rates of substance abuse, domestic violence, major depression, suicide, and measurable declines in physical and occupational functioning.

Minimizing the negative reactions to containment measures is achievable if the public is informed why certain infectious diseases require quarantine and isolation and what happens if disease control is not achieved. Credible and clear justification for quarantines must be provided when an outbreak is in progress, including the anticipated duration and endpoint (CDC, 2003 a). If movement restrictions will be implemented and mandated, people should know why and how they will be enforced and how to comply. Communities should have proper plans, resources and power to implement the restrictions to avoid losing credibility. If there will be any financial reimbursement for those who must stay home, information should be clearly disseminated about how to access compensation. Additionally, communities should have clear information about how to get in touch with family and others.

Facilitate coping and recovery.

General support of adaptive behavior in multiple domains is recommended under situations of ongoing stress and threat. Past experience has shown that affiliation needs and community self-reliance are critical components of disaster recovery and resilience (Hobfoll, Watson, Bell et. al., in review). Work group members recommended that in communities with moderate to severe impact from pandemic influenza, virtual neighborhoods be created with communication support (e.g., walkie-talkies, local TV, conference call capabilities, use of faith/community group telephone call-trees or Internet chat rooms or “blogs”, etc.). Depending on how widespread the threat is, information-gathering and dissemination for special populations should also be included in planning and response efforts. For instance, information should be sent home with children when schools are closing about what to do with the children while they are home and interim plans for continuity of education and suggestions about ways to remain connected to the school or community-at-large. Faith-based groups or local cultural organizations should be recruited before hand to disseminate information and to organize visitation, social support and care for their members. Community information sharing networks (such as neighborhood listservs, newsletters, or bulletin boards) should be facilitated, given that people will feel much more comfortable going to sources of information that cater to their particular background. A community-wide ethno-cultural assessment should focus on the best methods to communicate with residents (Wray, Rivers, & Jupka, 2005). Whenever possible, local customs should be honored and reinforced. Information materials should be developed in foreign languages, and disseminated through multiple and culturally-appropriate channels (Mobley, 2005).

In previous infectious disease outbreaks, it was found that the community generally wants information from people they recognize as authoritative until

their family is more highly threatened. Then they may be more likely to turn to leadership they are familiar with (religious, union leaders, mayor). Therefore, State and local advisory councils should be formed, with regular input to and from the national advisory panel mentioned above. The groups should include local cultural leaders and first responders in communities, who can cull information about how people coped, survived, and sustained themselves in times of depopulating disease or severe economic depression. Local leaders should be informed about how to deliver messages to communities, and how to consult with subject matter experts regarding conveying details.

Measures to reduce social and emotional deterioration and improve functioning

Address key psychological domains to promote resilience and healthy recovery.

Because pandemic influenza will most likely have wide-reaching impact on physical health, economic status, and individual, social, and family functioning, plans are needed for social and emotional recovery. To facilitate such recovery, the panels recommended that guidance be available detailing how to move from the lower to higher (from the left to the right) end of the following five domains:

- Helplessness – Efficacy (self and collective)
- Loss – Connectedness
- Fear – Calming
- Risk – Safety
- Despair – Hope

These domains are instrumental in recovery from traumatic events, particularly those that are characterized by an ongoing threat (Hobfoll, Watson, Bell et. al., in review; Watson, Gibson, & Ruzek, 2006). Guidance is also needed for other issues including coping with stigmatization and grief, managing stress when familial roles change, and managing feelings of frustration, anger, and helplessness. Empirical evidence suggests that social support and reduction of ongoing stress are crucial to prevent long-term psychopathology following traumatic stress (Brewin, 2001). Therefore, efforts should be made by responding agencies (e.g., Red Cross, sheltering organizations, local emergency management) to enhance people's ability to reconnect with their natural support systems to enable communication (e.g., family, faith institutions, neighbors, co-workers, and civic groups).

Guidance about building resilience should also be made available to the public (Reissman, Klomp, Kent, & Pfefferbaum, 2004; Watson, Gibson, &

Ruzek, 2006). The American Psychological Association has created a self-help website on resilience (APA) that provides basic steps for improving resilience, based on empirical and consensus information. In addition, the need to actively do something to cope can be harnessed, such as through public awareness and action campaigns like “victims to heroes,” wherein positive role models who have complied with prescribed protective actions are highlighted.

Deploy appropriate programs and policies.

Those who have been most affected and/or stigmatized will need emotional support, protective social policies, and possibly treatment for adverse mental health. If federal policies allow, a federal crisis counseling mechanism should facilitate front-line community teams. For grief issues, hospice and faith communities are well-equipped to advise individual and group strategies and should be incorporated into community responses. Procedures for identifying those at risk for severe social, psychological, or functional impairment should be implemented, and formal mental health treatment provided for those most impacted, with provisions made for online or telemedicine where appropriate; relying on evidence-informed or approved treatments (National Center for Child Traumatic Stress & National Center for PTSD, 2005). If movement restrictions are in place, the major mode of communication exchange will be through the use of telephone lines (phone and Internet) or 2-way radios. Screening or triage may require self-assessment based on outreach and education. Live call-back arrangements should be incorporated on any automated screening or educational process. Alternative technologies can be used for more remote areas or to help bolster health care if personnel shortages or facility closures ensue. Municipal Planning Organizations (MPO) and Councils of Government (COG) can be instrumental with integrating efforts from different sectors (e.g., training and protective equipment for private business and public assets to facilitate food/medicine delivery during crises) to improve community relations, and possibly community cohesiveness before the pandemic strikes (Pfefferbaum, Reissman, Pfefferbaum et. al., 2006). Prior crisis counseling programs for federally-declared disasters can provide lessons learned on how to disseminate cultural messaging (Project Liberty; Norris, Hamblen, Watson et. al., 2006; Naturale, 2006).

Measures to support key personnel in critical infrastructure functions

It will be essential to maximize performance and resilience among leaders and personnel providing critical infrastructure capacity. This task will be particularly challenging in light of the grief, exhaustion, anger, fear, family and self-care

issues, and ethical dilemmas (e.g., duty to work, prioritizing resources, etc.) likely facing this critical group. Moreover, these responders and providers and their families may be targets of irrational stigmatization and discrimination (Maunder, Hunter, Vincent et. al., 2003; Nickell, Crighton, Tracy et. al., 2004). With pandemic influenza, there may be considerable loss of personnel to illness and possibly death. Finally, leaders and personnel may also be subject to social and economic factors that may adversely affect their ability to perform crucial tasks and functions. Therefore, programs and strategies designed to account for a reduced or insufficient (e.g., mortuary workers) workforce or loss of key personnel are an important consideration. Such uncertainties and the potentially adverse impact of shortages highlight the need to create leadership reserves and rapid training ('just in case' and 'just in time') packages now.

A national, multidisciplinary stakeholder group of trusted advisors should be formed now and able to consult with leaders across all phases of the pandemic; for consistency. This advisory body could then provide input for key preparedness and response decisions involving social policy, mass messaging (through a joint information center or JIC), and social programs. Information feeds from special committees should be prepared now to anticipate the emergence of critical issues requiring thoughtful guidance. Included on this panel should be infectious disease experts who can reach consensus on key issues (e.g., infection control practice for community and home settings; use and priority recipients for antiviral medication). The website mentioned above can provide efficient training mechanisms for responders, with downloadable information for both affected individuals and responders (i.e., patient fact sheets, practice guidelines for PDA, etc.). Also important is guidance about how to explain information to people who may not understand all the facts/implications, guidance for administrators on caring for staff (e.g., enforced breaks, crisis management interventions, family support), and concrete information on how to manage stress during a pandemic.

For healthcare responders, information regarding the emerging facts about the pandemic should be made readily accessible and downloadable. This includes guidance to help maximize responder performance and resilience: such as managing triage and ethical dilemmas (these may include: duty to work during a pandemic, how to prioritize limited supplies of anti-virals, vaccines, ventilators; how to maintain patient confidentiality), dealing with grief, exhaustion, anger, and fear in patients, peers, and self; and caring for self, peers, and family. This guidance ought to be created in consultation with the aforementioned national group of advisors, but tailored to address issues within their local context.

Maximize performance and resilience.

Team cohesion and morale are also essential to combat fear, helplessness, dysfunction, and burnout in healthcare workers. Prior research has demonstrated that some of the most important barriers to workforce participation among nurses are concerns about family; that is primarily the need for communication with family. Basic stress control begins with reasonable work/rest cycles along with the addition of mobile stress management teams. Frontline stress control teams can be formed to help alleviate provider stress, and rest and recuperation sites set up with food resources, music / relaxation tapes and movies, and circulating mental health workers. Specific family support is advised so that healthcare workers' families can exchange information regularly. Responders may also need assistance in changing their expectations about their capabilities. Maintaining a critical workforce for health care is a professional guild and facility management issue that needs to be addressed through a comprehensive worker protection program – including appropriate infection control practices that encompass engineering design, administrative rotation and patient cohorting, and proper use of personal protective gear.

Other responder populations will need special guidance and inclusion in response plans, including law enforcement, drug and alcohol rehabilitation facilities, faith-based organizations, nursing homes and prisons, visiting nurses, hospice agencies, managed health companies, social service providers (psychologists, social workers, psychiatric nurses, school counselors, employee assistance programs). Information should be disseminated through multiple mechanisms/channels: including professional organizations and multidisciplinary tabletop workshops. CEOs of large businesses ought to be recruited to create resources for preparedness funding, distribution, and service delivery for basic needs.

At the federal level, policy recommendations need to be shaped regarding equitable acceptance of patients in hospitals during a pandemic influenza. Policy should be backed by specific guidance for the local resources available. Federal, state, and local plans need to be formulated on how to protect lower-income individuals and families, and small businesses. State and local authorities in the medical, public and mental health, social service, urban planners, and emergency management sectors should collaborate to put plans in place for community preparedness. A template for stress control and emotional support during pandemic influenza should be created, as well as federal assistance with accessing compensation or insurance (e.g., federal guidelines may be needed to ensure that individuals can maintain insurance coverage for health care services delivered during a pandemic; federal guidelines may also be needed to ensure employers

can continue to receive salary or wages while complying with voluntary quarantine).

As part of the planning for an influenza pandemic, cross-cutting databases and coordinated analysis should be set up within communities to determine resource availability, community impact and needs, and to monitor compliance (adherence) with health directives and effectiveness of disease control measures. Pandemic influenza exercises need to address the behavioral issues likely to challenge the scenario, with guidance provided in the lessons phase to give leaders and responders a sense of control and provide policy parameters to address potential chaos. National oversight should be given to states and communities engaging in different scenarios, and answering key resource and logistics questions. Appropriate anticipation of the behavioral dimensions requires exercising all aspects of quarantine and isolation from voluntary and home-based, to the workplace, health care setting, and mass transit.

Develop policies for handling non-compliance.

In advance of the pandemic, procedures for handling people who are oppositional to movement restrictions need to be agreed upon and enforceable. Issues involving civil liberties, resource allocation, and economics need to be addressed in the planning stages. The World Health Organization recommends that governments determine who will get anti-influenza drugs and vaccines; whether hospitals will be open only to influenza victims, and whether international borders should be closed to travelers from influenza-infected countries. States should be mandated to perform exercises to test their plans, including anticipated behavioral challenges, and report results about corrective actions needed.

Conclusions

This document has been prepared to raise awareness and stimulate guidance regarding behavioral countermeasures which will be a critical component of public health preparation for pandemic influenza. Because of the complexity of issues likely to arise given this international threat, we need to strengthen our public health approach by incorporating psychological and behavioral countermeasures. It is hoped that these countermeasures will help shape the public's adaptive and risk-reducing behaviors and reduce social and emotional deterioration in the advent of pandemic influenza. Measures to support key personnel demonstrate an organizational commitment to the well-being of its workforce and may help counter a sense of helplessness and chaos that often accompanies disaster settings. This will only be possible with proper planning,

coordination, collaboration, policy commitment and economic support at federal, state, and local levels now, before a pandemic is declared.

References

APA. American Psychological Association's Help Center. The road to resilience. <http://www.apahelpcenter.org/featuredtopics/feature.php?id=6> last accessed 01/26/06.

Blanchard, J.C., Haywood, Y., Stein, B.D., Tanielian, T.L., Stoto, M., Lurie, N. 2005. In their own words: Lessons from those exposed to anthrax. *American Journal of Public Health*, 2005, 95(3): 489-495.

Brewin, C.R. 2001. Cognitive and emotional reactions to traumatic events: implications for short-term intervention. *Advances in Mind-Body Medicine* 17(3): 163-168.

Butler, D. 2006. Alarms ring over bird flu mutations. *Nature* 439: 248-9.

CDC (a). Centers for Disease Control and Prevention. 2003. Role of containment measures in the response to SARS available at <http://www.metrokc.gov/health/isoquarantine/cdc/>.

CDC (b). Centers for Disease Control and Prevention. 2003. Crisis and emergency risk communication course. <http://www.cdc.gov/communication/emergency/cerc.htm> last accessed on 1/23/06.

Collins, D., & Banderia de Carvalho, A. 1993. Chronic stress from the Goiania Cs-137 radiation accident. *Behavioral Medicine* 18:149-57.

Dewan, S. & Roberts, J. December 18, 2005. Louisiana's deadly storm took strong as well as the helpless. *The New York Times*.

Engel, C.C., Jr. 2004. Somatization and multiple idiopathic physical symptoms: relationship to traumatic events and posttraumatic stress disorder. In P.P. Schnurr & B.L. Green (eds.) *Trauma and health: Physical health consequences of exposure to extreme stress*. Washington, D.C. American Psychological Association: pp 191-215.

Gerberding, J.L., Hughes, J.M., & Koplan, J.P. 2002. Bioterrorism preparedness and response: Clinicians and public health agencies as essential partners. *Journal of the American Medical Association* 287:898-900.

Gladwell, M. 2000. *The tipping point: How little things make a big difference*. Little, Brown and Company: New York, NY.

Hawryluck, L., Gold, W.L., Robinson, S., Pogorski, S., Galea, S., & Styra, R. Jul 2004. SARS control and psychological effects of quarantine, Toronto, Canada. *Emerging Infectious Diseases* [serial on the Internet]. <http://www.cdc.gov/ncidod/EID/vol10no7/03-0703.htm> last accessed 01/26/06.

Hobfoll, S.E., Watson, P.J., Bell, C.C., Breimer, M.J., Friedman, M.J., et. al. (In peer review). Five essential elements of immediate and mid-term mass trauma intervention: Empirical evidence. (Official summary of expert panel about interventions during situations of on-going threat, sponsored by the U.S. National Institutes of Mental Health and the Substance Abuse Mental Health Services Administration, 2004).

Lasker, R.D. 2004. *Redefining readiness: Terrorism planning through the eyes of the public*. New York, NY: The New York Academy of Medicine.

Leavitt, M. May 16, 2005. Remarks by the U.S. Secretary of Health and Human Services to the 58th World Health Assembly Plenary Session, Geneva.

Locke, S.E., McDonald, M.D., & Reissman, D.B. Mar 2004. Psychosomatic medicine and biodefense preparedness (Presidential Address). American Psychosomatic Society's Annual Meeting, Orlando, FL.

Maunder, R., Hunter, J., Vincent, L., Bennett, J., & Peladeau, N. 2003. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *Canadian Medical Association Journal* 168(10): 1245-1251.

Mobley, J. Dec 2005. It takes a village: Identifying and reaching special populations in preparation for a health emergency. Presented at the American Public Health Association Annual Meeting in Philadelphia PA. Abstract available at http://apha.confex.com/apha/133am/techprogram/paper_112426.htm.

Naturale, A.P. 2006. Outreach strategies: An experiential description of the outreach methodologies used in the September 11th disaster response in New York. In E.C. Ritchie, P.J. Watson, & M.J. Friedman (eds.) *Interventions following mass violence and disasters: Strategies for mental health practice*. New York: Guilford Publications.

Nickell, L., Crighton, E.J., Tracy, C.S., Al-Enazy, H., Bolaji, Y., et. al. 2004. Psychosocial effects of SARS on hospital staff: survey of a large tertiary care institution. *Canadian Medical Association Journal* 170(5): 793-798.

Norris, F.H., Hamblen, J.L., Watson, P.J., Ruzek, J.I., Gibson, L.E., Price, J.L., Stevens, S.P., Young, B.H., & Friedman, M.F. 2006. Toward understanding and creating systems of post-disaster care: A case study of New York's response to the World Trade Center disaster. In E.C. Ritchie, P.J. Watson, & M.J. Friedman (eds.) *Interventions following mass violence and disasters: Strategies for mental health practice*. New York: Guilford Publications.

Okumura, T., Suzuki, K., Fukuda, A., Kohoma, A., & Takasu, N. 1998. The Tokyo subway Sarin attack: Disaster management, part 3, national and international response," *Academic Emergency Medicine* 5:625-8.

O'Toole, T. & The Working Group on "Governance Dilemmas" in Bioterrorism Response. 2004. Leading during bioterrorism and epidemics with the public's trust and help. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice and Science* 2(1): 25-40.

Pfefferbaum B., Reissman D.B., Pfefferbaum R.L., Klomp R.W., & Gurwitsch R.H. (In press). Chapter 19: Building resilience to mass trauma events. In Doll L., Bonzo S., Mercy J., Sleet D. (eds.): *Handbook on Injury and Violence Prevention Interventions Cross-Cutting Intervention Issues*. New York: Kluwer Academic/Plenum Publishers. Pp. 349-360.

Project Liberty, <http://www.projectliberty.state.ny.us/educational.htm>, last accessed on 01/26/06.

Ramalignaswami, V. 2001. Psychosocial effects of the 1994 plague outbreak in Surat, India. *Military Medicine* 166:29-30.

Reissman, D.B., Spencer, S., Tanielian T.L., & Stein, B.D. 2005. Integrating behavioral aspects into community preparedness and response. In Y. Danieli, D. Brom, & J. Sills (eds.) *The trauma of terrorism: Sharing knowledge and shared care, an international handbook*. New York: Haworth Press. Co-published in the *Journal of Aggression, Maltreatment, & Trauma* 10(3/4): 707-720.

Reissman D.B., Klomp R.K., Kent A.T., & Pfefferbaum B. Exploring psychological resilience in the face of terrorism. *Psych Annals* 2004; 34(8): 626-632.

Reynolds B., Galdo, J., & Sokler, L. 2002. Crisis and emergency risk communication. Atlanta, GA: Centers for Disease Control and Prevention.

Sandman, P.M. & Lanard, J. Sep 2003. Fear of fear: The role of fear in preparedness ... and why it terrifies officials.

<http://www.psandman.com/col/fear.htm> last accessed 1/26/06.

Sandman, P.M. & Lanard, J. Oct 2003. Risk communication recommendations for infectious disease outbreaks. Prepared for the World Health Organization SARS Scientific Research Advisory Committee, Geneva, Switzerland. <http://www.psandman.com/articles/who-srac.htm> last accessed 01/26/06.

Shepard, C.W., Soriano-Gabarro, M., Zell, E.R., Hayslett, J., Lukacs, S. and the CDC Adverse Events Working Group. 2002. Antimicrobial post-exposure prophylaxis for anthrax: Adverse events and adherence. *Emerging Infectious Diseases* 8(10): 1124-32.

Stein, B.D., Tanielian, T.L., Eisenman, D., Keyser, D., Burnam, A., & Pincus, H.A. 2004. Emotional and behavioral effects of bioterrorism: Planning a public health response. *Milbank Quarterly* 82(3): 413-55.

Stein, B.D., Tanielian, T.L., Ryan, G.W., Rhodes, H.J., Young, S.D., & Blanchard, J.C. 2004. A bitter pill to swallow: Non-adherence with prophylactic antibiotics during the anthrax attacks and the role of private physicians. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 2(3): 175-185.

U.S. Department of Health and Human Services. Nov 2005. HHS Pandemic Flu Plan. <http://www.hhs.gov/pandemicflu/plan/> last accessed 01/26/06.

National Center for Child Traumatic Stress and National Center for PTSD (U.S. Department of Veterans Affairs). 2005. Psychological First Aid: Field Operations Guide. <http://www.ncptsd.va.gov/pfa/PFA.html> last accessed 06/26/06

U.S. Government website for pandemic flu www.pandemicflu.gov last accessed on 01/26/06.

Vanderford, M. 2003. Communication lessons learned in the Emergency Operations Center during CDC's anthrax response: A commentary. *Journal of Health Communication* 8(1): 11-12.

Watson, P.W., Gibson, L., & Ruzek, J. 2006. Public mental health interventions following disasters and mass violence. In M. J. Friedman, T. M. Kean, & P.A. Resick (eds.), *PTSD: Science & practice—A comprehensive handbook*. New York: Guilford Publications.

Webby, R.J. & Webster, R.G. 2003. Are we ready for pandemic influenza. *Science* 302(5650): 1519-1522.

WHO (a). World Health Organization. Jan 2005. Avian flu: Assessing the pandemic threat. <http://www.who.int/csr/disease/influenza/H5N1-9reduit.pdf> last accessed on 01/03/06.

WHO (b). World Health Organization. Epidemic and Pandemic Alert Response, <http://www.who.int/csr/disease/influenza/pandemic/en/index.html> last accessed on 01/26/06.

Wong, W.C., Lee, A., Tsang, K.K., & Wong, S.W. 2004. How did general practitioners protect themselves, their family, and staff during the SARS epidemic in Hong Kong? *Journal of Epidemiology and Community Health* 58: 180-185.

Wray, R., Rivers, J., & Jupka, K. 2006. Individual, community and social-structural factors affecting adherence to public health directives in the event of an emergency: A review of the literature. Submitted as an interim report to CDC.