Pandemic Influenza Preparedness and Vulnerable Populations in Tribal Communities

American Indian and Alaska Native (AIAN) governments are sovereign entities with inherent authority to establish and administer public health programs within their communities and will be critical partners in national efforts to prepare for pandemic influenza. Within AIAN communities, some subpopulations will be particularly vulnerable during an influenza pandemic because of their underlying health conditions, whereas others will be at increased risk because of limited access to prevention or treatment interventions.

We outline potential issues to consider in identifying and providing appropriate services for selected vulnerable populations within tribal communities. We also highlight pandemic influenza preparedness resources available to tribal leaders and their partners in state and local health departments, academia, community-based organizations, and the private sector. (Am J Public Health. 2009; 99:S271–S278. doi:10.2105/AJPH.2008.157453)

IN THE UNITED STATES, FEDERALLY RECOGNIZED AMERICAN INDIAN AND ALASKA NATIVE (AIAN) GOVERNMENTS ARE SOVEREIGN ENTITIES WITH INHERENT AUTHORITY TO ESTABLISH AND ADMINISTER PUBLIC HEALTH PROGRAMS WITHIN THEIR RESPECTIVE COMMUNITIES.

Comprising approximately 1.5% of the total US population, the AIAN population exceeds 4 million people and includes more than 560 federally recognized Indian tribes and Alaska Native villages. Although many AIAN persons live in rural locations such as reservations, more than 60% now reside in urban settings. Criteria for tribal membership vary from tribe to tribe, with tribal enrollment ranging from under 200 to over 300,000 members. The size of a given tribal community (or a tribal government’s jurisdictional area) can vary from a few to tens of thousands of acres. Tribes with the largest populations and land bases are primarily located in the western United States, but tribal communities are located in 34 states across the nation. Tribal lands exist both within and across state borders, and many rest on or near international boundaries with Canada and Mexico. Tribal lands, reservations, Alaska Native lands, and urban Indian communities are often referred to collectively as ‘Indian country’ and we use the term herein in that sense, in contrast to its more restricted use in federal law.

Many AIAN people receive health care from the Indian Health Service (IHS), tribal or Alaska Native health programs, and Urban Indian health centers, but an increasing number also have access to health services through private health insurance plans. Delivery of public health services to AIAN communities and the ability to adequately prepare for and respond to public health events is affected by a number of factors that include the uncertain availability of federal funding, variability in tribal public health infrastructure (e.g., workforce, information systems, public health laws), and a mix of legal and jurisdictional factors that blur the lines of responsibility around public health actions.

AIAN governments and communities will be important partners in national preparedness and response efforts to address pandemic influenza. Although prevailing socioeconomic conditions may place entire AIAN communities at increased risk during an influenza pandemic, our focus is on the need to identify specific vulnerable populations within tribal communities and to provide appropriate services for them.

Vulnerable populations in tribal communities may include, but are not limited to, persons with chronic diseases or disabilities, elderly community members, urban AIAN people, and residents of remote and isolated areas. The information and resources contained in this paper will be useful for tribal leaders and their partners in state and local health departments, academia, community-based organizations, and the private sector.

We produced this paper as a working group that represents a spectrum of backgrounds and expertise from AIAN tribes and tribal organizations, state health departments, and federal agencies. We received valuable input from tribal leaders across the country during a meeting with the Centers for Disease Control and Prevention’s (CDC) Tribal Consultation Advisory Committee in July 2008. The information we present was gathered from peer-reviewed and non-peer-reviewed literature on both seasonal and pandemic influenza, web sites, and conference abstracts and proceedings.

TRENDS OF INFLUENZA IN INDIAN COUNTRY

Although data on the effects of the 1918 pandemic on AIAN populations are limited, government reports from 1919 and 1920 found that the epidemic among American Indians was “extremely severe,” with mortality rates 4 times higher than that reported for larger cities in the United States during the epidemic. Numerous reports, both anecdotal and scientific, have noted the high attack rates and high burden of morbidity and mortality associated with influenza outbreaks in AIAN and other indigenous communities. The frequent and intense exposure to a novel viral pathogen in isolated communities, often with crowded housing conditions and limited access to medical care, likely contributed to high attack
Even today, AIAN people experience a greater burden of pneumonia and influenza mortality compared with the US population (Table 1). Hospitalization rates for pneumonia and for lower respiratory infections also are higher for the AIAN population compared with the general US population.24–26 Secondary bacterial infections resulting in pneumonia are a common cause of death in persons with influenza infection.27 This cause of death may be of particular concern for some AIAN communities that experience increased rates of invasive pneumococcal disease.28–30 or high rates of infection with methicillin-resistant Staphylococcus aureus (MRSA).31,32 In the event of an influenza pandemic, the presence of these pathogens may further contribute to influenza-associated morbidity and mortality.

**Vulnerable Populations**

Within AIAN communities, certain subpopulations will be particularly vulnerable to the effects of pandemic influenza. Some may be physically more vulnerable because of underlying health conditions, whereas others may be vulnerable because access issues prevent them from receiving information and prevention and treatment interventions. Given the heterogeneity of the AIAN population and tribal communities, an exhaustive account of all potentially vulnerable populations is beyond the scope of this review. In the sections that follow, we discuss previously defined vulnerable populations and highlight some of the unique characteristics of these populations in AIAN communities that tribal, county, state and federal public health officials, as well as other stakeholders, should consider when planning and preparing for pandemic influenza.

**Chronic Disease**

There has been a dramatic increase in the prevalence of chronic diseases such as diabetes and cardiovascular disease among AIAN people over the past 2 decades.29 AIAN people are more likely to have risk factors associated with chronic diseases and to live with chronic disability compared with other racial/ethnic groups (Table 1). This high prevalence of chronic medical conditions and disabilities presents challenges related to the potential impact of pandemic influenza in AIAN communities. These challenges include: (1) the need to maintain adequate medical services to provide appropriate management of complex chronic conditions, (2) maintenance of pharmaceutical supply lines for medications to treat these conditions, and (3) the chronically low level of funding received by IHS.33

Diabetes mellitus is a pervasive problem among AIAN communities everywhere and is the primary cause for the significant increase in end-stage renal disease (ESRD) observed in AIAN populations.34–35 ESRD is an issue of particular concern for many tribal leaders. Patients with ESRD, especially those with diabetes mellitus, face higher mortality, higher hospitalization rates, and an array of substantially disabling comorbidities such as vision loss, paralysis, amputation, and dementia.34 Disruption of regularly scheduled dialysis during emergency situations has a significant impact on mortality, causing persistently increased rates for months after regular service is returned.36

Meeting the needs of people with ESRD during an influenza pandemic will require continuity of operations of dialysis centers, access to specialty nephrologist care, an adequate supply of multiple medications, and access to specialized diets. The National Forum on ESRD provides disaster-planning resources, including education and training for providers and resources for patients. Some of the 18 ESRD networks37 across the nation have specific plans in place to maintain services during an influenza pandemic; however, most of these plans rely on state plans that do not specifically address the many challenges that dialysis centers will face to maintain staffing and medical supplies and to address the urgent needs for hospitalization that patients with ESRD often require.

More than 36 dialysis centers are now located on reservations or tribally owned lands, yet some patients must travel more than 1 hour each way to receive treatment.38 Reductions in staffing, the possibility of isolation or quarantine procedures, and disruption of supplies all could have a significant impact on whether these vital services will remain available in AIAN communities. Short-term interim steps, such as the emergency 3-day diet, could serve as a bridge between treatments but are not a substitute for hemodialysis on an ongoing or prolonged basis.39 Shifting more patients from hemodialysis to home-based peritoneal dialysis has been

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**TABLE 1—Examples of Mortality, Disability, and Risk Factors Among AIAN Versus Other Racial/Ethnic Groups**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Year</th>
<th>Ratioa</th>
<th>Companion Group</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia and influenza mortality (all ages)</td>
<td>2002-2004</td>
<td>1.5</td>
<td>All US races</td>
<td>IHS38</td>
</tr>
<tr>
<td>Pneumonia and influenza mortality (infants)</td>
<td>2000-2001</td>
<td>4.0</td>
<td>US Whites</td>
<td>US DHHS and IHS39</td>
</tr>
<tr>
<td>Diabetes mortality (all ages)</td>
<td>2002-2004</td>
<td>2.9</td>
<td>All US races</td>
<td>IHS38</td>
</tr>
<tr>
<td>Prevalence of ≥3 chronic disease risk factors (adults)</td>
<td>2001-2002</td>
<td>1.2-6.9</td>
<td>US Blacks, Hispanics, and Asians</td>
<td>CDC39</td>
</tr>
<tr>
<td>Prevalence of disability in older adults</td>
<td>2000</td>
<td>1.3-1.6</td>
<td>US Whites</td>
<td>Goins et al.32</td>
</tr>
<tr>
<td>Prevalence of end-stage renal disease (all ages)</td>
<td>2006</td>
<td>1.7</td>
<td>US Whites</td>
<td>US Renal Data System33</td>
</tr>
</tbody>
</table>

Note. AIAN = American Indians and Alaska Natives; IHS = Indian Health Service; DHHS = Department of Health and Human Services; CDC = Centers for Disease Control and Prevention. aAIAN versus Comparison Group
The elderly population (aged 65 years and older) comprises 5.6% of the overall AIAN population, compared with 12.4% of the general US population. Whereas older people in all racial/ethnic groups may be at increased risk during an influenza pandemic, many older AIAN people face additional challenges that make them particularly vulnerable. In addition to an increased burden of disease and disability, older AIAN adults are less likely to have health insurance or access to public assistance compared with other racial and age groups, and may face additional pressures related to caregiving responsibilities.

The AIAN population also experiences increased disability at an earlier age compared with other racial/ethnic groups. Despite increased chronic disease and disability, access to health care and public assistance remains a challenge for some elderly AIAN adults. Although Medicare is an important source of health care for many elderly AIAN people, the requirement for at least 40 quarters of social-security covered employment means some AIAN elders may not qualify. In addition, transportation to obtain health care services is often a problem, especially in rural areas where distances may be great, road conditions poor, and public transportation limited. These and other access issues, including language barriers, may explain why some elderly American Indians and Alaska Natives do not use public assistance and services that are available to them. These complex problems will intensify the challenge of protecting this population during an influenza pandemic.

Some American Indians and Alaska Natives are grandparents who act as primary caregivers for their grandchildren, which presents another challenge for the elderly AIAN population. According to the US Census Bureau’s Census 2000 Report, American and AIAN populations have the highest prevalence of grandparent caregivers (6.0% and 5.8%, respectively) when compared with non-Hispanic White respondents (1.3%). In AIAN communities, this subset of the elderly population may be particularly vulnerable in a pandemic situation. AIAN grandparent caregivers are more likely than their noncaregiving AIAN peers to be disabled, be unemployed, live in poverty, reside in overcrowded quarters, and be unable to communicate well in English. They are also less likely to receive public assistance services for which they are eligible. A pandemic influenza situation may place increased pressure on AIAN grandparents already struggling to provide for their grandchildren.

The combination of increased vulnerability from underlying health issues, barriers to accessing health care, and infrequent use of public assistance and other services suggests that typical methods of outreach and distribution of services may not be effective for reaching the elderly in AIAN communities. Alternative strategies may be needed to ensure that this population benefits from pandemic influenza interventions.

**Urban American Indian/Alaska Native Populations**

Since the federal relocation programs of the 1950s, AIAN people have continued to move to urban areas seeking economic and educational opportunities and better access to health and social services. Data from the US Census Bureau’s Census 2000 Report indicate that urban American Indian and Alaska Natives represent 61% of the total US American Indian population. Despite the promise of prosperity in metropolitan areas, many urban AIAN persons face health and socioeconomic challenges. Only limited services are available through the 34 designated urban Indian health organizations, and most urban AIAN people lack access to adequate health care services. The urban AIAN population has poorer health compared with the US general population. For instance, rates of infant mortality and mortality from unintentional injuries, chronic liver disease, diabetes, and alcohol are higher among urban American Indians and Alaska Natives compared with the urban US general population. In addition to these health challenges, urban American Indians and Alaska Natives are twice as likely as the urban US population to be poor or unemployed and to lack a college degree.

Some urban AIAN persons travel back and forth between urban areas and rural tribal lands to visit or care for family, maintain cultural practices, access IHS or tribal health services, or receive care from traditional healers. In the event of an influenza pandemic, many urban AIAN persons may return to tribal lands to be close to family and have better access to tribal or IHS health care services, potentially overwhelming existing service capacities. This possibility should be considered in preparedness planning. In addition, the urban AIAN population’s tendency to migrate, along with their intermittent access to care, may be a barrier to carrying out pandemic influenza community mitigation strategies.

**Remote and Isolated Areas**

Although the majority of the AIAN population resides in urban areas, 39% reside in rural areas. Of these, 40% reside in particularly remote and isolated areas referred to as Rural Minority Counties (RMCs). RMCs are extremely rural, with only 1.4 persons per square mile compared with the national average of 79.6 persons per square mile. The poverty rate among AIAN people residing in RMCs is 38.5% compared with 14.3% for other rural residents. American Indian and Alaska Native RMCs are found in primarily 3 regions of the United States: the northern plains (Montana, North and South Dakota), the southwest (Arizona, New Mexico, and Utah), and throughout much of Alaska. Household crowding rates for AIAN people residing in RMCs are 5 times higher than national crowding rates (28.9% vs 6%). Because 20.7% of AIAN homes in RMCs lack household plumbing, limited access to potable water and safe wastewater disposal is a particular problem that places community members at increased risk for infectious diseases. Although rural
isolation may act as a buffer to the spread of influenza in some locations, the introduction of a novel viral pathogen into isolated communities, often with crowded housing conditions and limited access to medical care, could be devastating. In addition to housing issues, language barriers may be more common for AIAN people living in rural areas. On the rural Navajo reservation, for example, 24.5% of the population reported speaking English “less than well.”41

In Alaska, geographic isolation is particularly pronounced, with approximately 42% of Alaska Natives living in areas that are not accessible via road or the Alaska Marine Highway.52 Although many communities maintain at least a partial subsistence lifestyle, items such as fuel and medical supplies are primarily delivered by aircraft or by barges through water routes. In the event of a pandemic, maintaining these delivery systems will be particularly important. During the 1918 influenza pandemic, some residents of remote communities died of starvation or exposure to cold because of an inability to maintain a subsistence lifestyle during this time of extensive illness and death.17,53 While conditions today may be somewhat different, it is important for emergency preparedness planners to address issues related to maintaining subsistence lifestyles.

The socioeconomic factors, housing conditions, lifestyle, and access issues faced by AIAN people living in remote rural areas will likely present special challenges in the event of an influenza pandemic. During preparedness planning, public health officials should carefully consider that even tribal communities that are not particularly remote could have tribal members that live in isolated settings.

**Tribal Strategies and Models**

In preparing for an influenza pandemic, tribal leaders face unique challenges around jurisdictional issues, tribal sovereignty, and tribal self-determination. All entities engaged in pandemic influenza preparedness planning for tribal communities are currently operating in the context of a federal funding stream that does not allow for direct funding to tribal governments. Therefore, tribes must depend on close cooperation with state and county health departments to receive resources to support pandemic influenza preparedness planning. Effective cooperation across all jurisdictions—tribal, county, state, and federal—will help to ensure that tribal communities and their vulnerable populations fully benefit from available federal resources. Such resources include access to the Strategic National Stockpile, assistance with purchasing antiviral medications, and support in administering pandemic influenza vaccine. In addition, improving tribal public health legal infrastructure and using legal tools such as mutual aid agreements will help address jurisdictional issues and carry out community mitigation strategies within tribal communities.1

There is a well-documented history of AIAN people confronting and responding to infectious disease outbreaks and other hazards,54,55 and although this history need not frame all discussion of pandemic response in tribal communities, these experiences can help inform the planning and implementation of national emergency response activities in tribal communities.56 Compelling stories of courage, loss, and survival from descendants of victims of the 1918 influenza pandemic continue to emerge, and many of these stories are being compiled in CDC’s online Pandemic Influenza Storybook. In one of these stories, an American Indian family demonstrated how traditional native knowledge exemplified “modern” principles of disease containment that led to their survival (Figure 1).57

![Pandemic Influenza Storybook](source.png)

**Figure 1—Pandemic Influenza Storybook.**
complete the same tasks [L. Harvey, Chairperson, Northwest Tribal Emergency Management Council, oral communication, September 2008].

Tribes’ participation in state emergency preparedness exercises has occurred in several states. The Navajo Nation, for example, developed and successfully tested a mass prophylaxis distribution plan for their communities using community gathering sites known as chapter houses.58

The community-based participatory research model emphasizes the importance of involving tribal communities in researching, developing, and implementing strategies to address a variety of health issues.59–62 A range of tribally specific health interventions have been developed based on this model63–70 which could be useful for emergency preparedness planning and response activities.

Models for community-based health care delivery, such as the Community Health Representative program71 and the Alaska Community Health Aide Program,72 exist in many AIAN communities. These programs train community members to help deliver health care and public health services to their own communities and are an important resource for emergency preparedness and response activities.

The IHS Portland Area office worked with IHS, tribal, and urban Indian health facilities to implement a short-term initiative that successfully increased influenza vaccination coverage among AIAN adults older than age 65 years. The initiative engaged nontraditional partners in promoting vaccinations and used innovative techniques to increase the use of electronic health data systems.73

In addition to these examples, Table 2 includes a list of resources for emergency preparedness planning in tribal communities.

CONCLUSIONS AND ADVICE

Most tribal communities have particular population groups with unique characteristics that place them at increased risk for adverse health outcomes if an influenza pandemic occurs. Tribal leaders and public health officials will need to take the lead in identifying vulnerable population groups within their communities and in developing pandemic influenza response plans that address the needs of these groups. Developing sound public health legal preparedness and formal partnerships with local, state, and federal public health agencies will also help address these needs. Public health officials should engage tribes in pandemic influenza planning efforts to ensure that pandemic influenza response activities are effective and that the needs of all communities are met.

To effectively address the needs of vulnerable populations in tribal communities, tribal leaders and health officials should identify the

TABLE 2—Resources for Emergency Preparedness Planning in Tribal Communities

<table>
<thead>
<tr>
<th>Source</th>
<th>Resource Type</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centers for Public Health Preparedness</td>
<td>Web site</td>
<td>Links to tribal-specific resources (eg, training modules for tribal planners)</td>
<td>Centers for Public Health Preparedness75–78</td>
</tr>
<tr>
<td>Northwest Center for Public Health Practice and Northwest Portland Area Indian Health Board</td>
<td>Conference</td>
<td>Emergency preparedness conference bringing together tribal, local, state, and federal emergency preparedness planners</td>
<td>Northwest Portland Area Indian Health Board79</td>
</tr>
<tr>
<td>Northwest Tribal Emergency Management Council</td>
<td>Web site</td>
<td>Links to tribal resources such as tribal pandemic influenza plans, grant opportunities, Community Emergency Response Team (CERT) training, Tribal Medical Reserve Corps, and legislative updates</td>
<td>Northwest Tribal Emergency Management Council80</td>
</tr>
<tr>
<td>CDC, Public Health Law Program</td>
<td>Guidance Documents</td>
<td>Guidelines for developing mutual aid agreements and similar legal tools to aid preparedness activities across all jurisdictions; inventory of tribal-specific mutual aid agreements</td>
<td>CDC81</td>
</tr>
<tr>
<td>CDC, Office of Enterprise Communication</td>
<td>Training</td>
<td>Crisis and Emergency Risk Communication (CERC) training opportunities for tribal audiences; course materials available</td>
<td>CDC 82</td>
</tr>
<tr>
<td>Association of State and Territorial Health Officials (ASTHO)</td>
<td>Guidance Document</td>
<td>Guidance for public health agencies to plan for identifying and engaging at-risk populations and testing, exercising, and improving preparedness plans for these groups</td>
<td>ASTHO83</td>
</tr>
<tr>
<td>CDC, Emergency Preparedness and Response Web site</td>
<td>Workbook</td>
<td>Workbook for defining, locating and reaching special, vulnerable, and at-risk populations in an emergency.</td>
<td>CDC84</td>
</tr>
</tbody>
</table>

Note. CDC = Centers for Disease Control and Prevention.
specific vulnerable populations in their communities and determine the pandemic influenza preparedness needs of those populations; state health officials should engage tribal health officials and community leaders in preparing to assist vulnerable populations in tribal communities; and tribal leaders and their federal, state, and county partners should refer to existing, tribally focused models and proven approaches from other public health interventions to inform pandemic influenza preparedness planning for vulnerable populations. Tribal and state leadership should also cooperate closely to clarify responsibilities that may cross jurisdictional lines, legal authorities should be defined for specific public health activities needed to assist vulnerable populations in tribal communities, and legal tools, such as mutual aid agreements, should be used to help accomplish these tasks. Finally, federal and state officials should clarify mechanisms for distributing pandemic influenza resources, such as Strategic National Stockpile supplies, that may be needed for vulnerable populations in tribal communities, and federal and state officials should ensure that tribal communities have adequate resources and training to support pandemic influenza planning and response efforts that are designed to meet the needs of vulnerable populations.

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Contributions
A. V. Groom led the authors in writing and editing, compiled contributions from all authors, and conducted key components of the literature review. C. jim contributed to the literature review and writing of the sections on chronic disease and the elderly. M. LaRoque led the literature review and the writing and editing of the section on rural isolation. J. McLaughlin contributed crucial information for the section on rural isolation and reviewed and helped edit the essay. L. Neel conducted the literature review and led the writing and editing of the tribal strategies and model section and participated in the literature review and drafting of the section on the urban population and the influenza in Indian country background. C. Mason conducted the primary literature review for and led the writing of the urban section and provided input and helped write the background about influenza in Indian country. T. Powell contributed to the section on rural isolation and served as a primary resource for Alaska Native health issues. T. Weiser conducted the literature review and led the writing of the chronic disease section, provided critical review of the entire essay and helped develop and review the tables. R. T. Bryan originated the project and led all components of it. All authors helped conceptualize ideas, conduct literature reviews, interpret findings, and review and re-write drafts of the essay.

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