By Paul J. Schramm, Angelica L. Al Janabi, Larry W. Campbell, Jamie L. Donatuto, and Shasta C. Gaughen

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ANALYSIS

How Indigenous Communities Are Adapting To Climate Change: Insights From The Climate-Ready Tribes Initiative

ABSTRACT Climate change directly threatens human health, with substantial impacts on Indigenous peoples, who are uniquely vulnerable as climate-related events affect their practices, lifeways, self-determination, and physical and cultural health. At the same time, Indigenous communities are leading the way in innovative health-related climate change adaptation work, using traditional knowledges and novel approaches. In 2016 the Centers for Disease Control and Prevention and the National Indian Health Board created the Climate-Ready Tribes Initiative to support these efforts. The initiative has funded tribes, shared information nationally, and supported a learning cohort, resulting in pioneering work to protect health from climate hazards. We describe how two tribes—the Pala Band of Mission Indians and the Swinomish Indian Tribal Community—implemented their Climate-Ready Tribes Initiative projects, and we provide recommendations for making climate and health policy more effective for tribes. Lessons learned from the Climate-Ready Tribes Initiative can inform climate and health policy and practice nationwide.

Paul J. Schramm (imw3@cdc.gov) is the climate science team lead in the Climate and Health Program at the Centers for Disease Control and Prevention, in Atlanta, Georgia.

Angelica L. Al Janabi is a public health project coordinator in the Climate Ready Tribes Initiative at the National Indian Health Board, in Washington, D.C.

Larry W. Campbell is a tribal elder and the community health specialist in the Swinomish Community Health Program in the Swinomish Indian Tribal Community, in Fidalgo Island, Washington.

Jamie L. Donatuto is an environmental community health analyst in the Swinomish Community Health Program in the Swinomish Indian Tribal Community.

Shasta C. Gaughen is the director of the Pala Environmental Department for the Pala Band of Mission Indians, in Pala, California.

Climate change has significant impacts on human health. Increases in heat waves, shifts in wildland fire seasons, more extreme precipitation events, ecosystem changes leading to vectorborne diseases, and changes in aeroallergens (such as pollen) can all exacerbate underlying health conditions and lead to morbidity and mortality.[1] As people face these health challenges, worry about the future, and experience other impacts (such as damage to their homes), mental health can also suffer. As global temperatures continue to rise and climate change continues, health impacts are expected to worsen.

Although climate change has an impact on all communities, Indigenous peoples are among the first and most severely affected.[2] In this article the term "Indigenous," used interchangeably with "tribes," includes all of the unique and individual cultures whose stories and histories situate them on lands throughout what we now call the United States before European contact and colonialism, from time immemorial. Indigenous peoples often live in close connection with the land; many communities participate in subsistence activities (such as hunting and fishing) and spend time outdoors for cultural or spiritual purposes. Traditional food is often important not only as a source of nutrition, especially in the remote areas where many tribes are located, but also for its cultural and spiritual significance. Traditionally, Indigenous peoples recognize deep connections between their people, their

waters and lands, and animal and plant life.[3,43,4] Climate change–related damage to land, water, and life can negatively affect traditional practices and ways of life, causing deep distress.[2,5,6] Also, relocation necessitated by climate change could force people to leave the lands where their ancestors have lived for thousands of years, with direct impacts on mental health, social capital, food security, water supply, sanitation, infectious diseases, injury, and health care access.[7] Moreover, Indigenous peoples face existing health and socioeconomic disparities. American Indians and Alaska Natives have the lowest life expectancy of any US ethnic group, and in some communities health disparities are growing.[8] This can increase vulnerability to impacts from climate change resulting from the exacerbation of existing health issues, challenges accessing care, systemic health care system inequity, and stresses from high rates of poverty and geographic isolation. In addition, impacts and needs due to climate change vary drastically from tribe to tribe on the basis of geographic, demographic, and cultural factors; a vulnerability assessment can help to identify specific impacts.[9]

Challenges In Tribal Climate Change Adaptation Efforts

Many Indigenous communities foster and maintain multifaceted and nuanced relationships between humans and the natural world. Because of their connection to the land and the heightened impacts that they experience from climate change, in many cases, Indigenous communities are leading the way in innovative climate and health adaptation work, using traditional knowledges and novel approaches. *Climate and health adaptation* is the implementation of specific strategies to protect health from climate-related hazards and is distinct from climate change mitigation (reduction of greenhouse gas emissions). Many tribes are addressing climate-related health threats through activities such as climate change adaptation planning or education and outreach. Some tribes collect and use "values-driven" community data to inform their climate change adaptation plans. This provides information that is important for defining what health means, establishing health priorities, and specifying preferred actions to maintain or improve health.[10]

However, there are limited resources and technical assistance available to implement climate change adaptation plans, and tribes can face structural barriers.[11] Capacity building, including training and funding, is critical to ensure that tribes can implement programs tailored to their specific needs—but tribes consistently face capacity challenges. Many tribes, especially smaller ones, have few staff members, who may work in several different roles. Despite public perceptions to the contrary, the majority of tribes do not participate in the gaming economy, and many of those who operate small facilities bring in limited revenues. Thus, self-generated funding for tribal climate change adaptation work is very limited. When external funding is available, tribes might not have the capacity to contend for larger-scale, competitive grants, for which they are often in competition with large cities or entire states for funding. Smaller tribes may need additional training and support to implement their projects or could benefit from collaboration with outside partners. Tribes also face challenges in working with nontribal partners such as state and local agencies.[12] Although intertribal collaboration has proved extremely valuable, partner tribes often face limited funding and support. Moreover, tribes receiving information and short-term training may need sustained support and funding for meaningful projects that truly build institutional capacity and implement long-term adaptive management strategies to protect health in a changing climate. Although short-term activities can still be fruitful, long-term activities help ensure continuity of capacity and the prolonged ability to prepare for climate change by implementing interventions.

The Climate-Ready Tribes Initiative

To address adaptation capacity building and technical needs in tribes, the Centers for Disease Control and Prevention (CDC) and the National Indian Health Board (NIHB) launched the Climate-Ready Tribes Initiative (CRTI) in 2016.[13] The initiative has provided competitive funding and direct technical assistance to ten tribes. Funding has been provided for multiyear projects, ranging from $45,000 to $85,000 per year, as well as for one-year, communication-focused mini-grants of approximately $5,000 each.

A yearly site visit or in-person training is held for staff from funded tribes. Through hosting webinars, national conferences, and group calls; publishing articles; and sharing other sources of information as part of a broad communication effort, the CRTI supports a cohort of approximately 1,000 tribal professionals and partners who discuss best practices on climate and health adaptation. The initiative is a starting point—it expands capacity and supports a network of information sharing and collection of best practices so that communities have access to resources and technical support. The best practices and lessons learned from the funded tribes are

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shared widely, as are any relevant outputs such as communication products.[13]

Here we provide brief project descriptions for the ten funded tribes. Under the CRTI, Blackfeet Nation produced a Climate Health Guide that describes specific local health effects of climate change and potential activities for engaging community members and leaders in best practices to address these effects. The Swinomish Indian Tribal Community completed a climate change health impact assessment and action plan by tailoring an existing framework to Swinomish-specific health values, definitions, and priorities. The Village of Wainwright addressed thinning ice due to warmer temperatures by augmenting existing accident prevention and rescue programs through the use of location technology. They also developed new community-based programs that increased knowledge of climate and health risks. Kaw Nation completed local community education and outreach related to climate and health. Lummi Nation is developing plans to protect their community from harmful algal blooms and toxins in shellfish that are influenced by warming waters. The Pala Band of Mission Indians is developing climate and health communication and outreach materials tailored to community needs, including culture-based psychosocial resilience strategies. The Sitka Tribe of Alaska is coordinating a regional project to monitor shellfish contamination related to warming temperatures and shifting climate. Greenville Rancheria is building community health department capacity to communicate and respond to power outages during wildland fires and other disasters. Seneca Nation of Indians is working to address impacts from flooding and stormwater, including prevention of vectorborne disease, by incorporating health into existing collaborative work. Finally, the Winnebago Tribe of Nebraska is implementing a climate and health communication strategy to inform community members of climate-related hazards, including specific outreach to farmers.

Of the ten tribes that have participated in the Climate-Ready Tribes Initiative, six have implemented multiyear projects: three in the 2017–18 cohort and three in the current cohort. We discuss how two funded tribes—one from each cohort—have implemented climate and health activities that have integrated the needs of tribal members, directly engaged stakeholders, and leveraged collaborations and additional resources.

THE PALA BAND OF MISSION INDIANS The Pala Band of Mission Indians is located in north central San Diego County, California. It comprises primarily Cupeño and Luiseño people. In 1903 the Cupeño were displaced by the federal government from their ancestral homeland of Cupa and were forced to join the Luiseño people, who had already been confined to the reservation formed around the village of Pala. Pala's traditional lands extend from the Pacific Ocean to the Mojave and Sonoran Deserts, encompassing a wide range of habitats, species, microclimates, and resources. The Pala reservation, which is bisected by the San Luis Rey River, contains approximately 13,000 acres of land that range from river habitats to the mountainous foothills of the Palomar Range.

Pala's ability to build capacity to address climate change impacts is complicated by a variety of cultural, political, social, economic, and environmental conditions. Pala's standing as a sovereign nation is not always acknowledged or understood by its nontribal neighbors, and state and local government agencies do not always view Pala as an equal partner in discussions about and potential strategies for adapting to climate change. For example, San Diego County does not include tribal lands in its climate data, and existing climate planning by surrounding nontribal governments on the local, state, and federal levels has not been inclusive of tribal needs or voices.

Under the Climate-Ready Tribes Initiative, the Pala Environmental Department first conducted a vulnerability assessment, focused on identifying tribal-specific concerns about climate change impacts. High temperatures, wildfire, storms and flooding, and drought were identified by tribal members as major concerns, yet discussions revealed that few participants were aware of most of the potential consequences of these concerns to individual and community health and wellness. Based on community discussions, Pala Environmental Department staff developed a variety of community education and outreach materials that were tailored to the spe-

cific needs of the Pala community, such as using language that was sensitive to Pala's traditional cultural values related to health and well-being. These materials were provided at community meetings, cultural gatherings, and tribal events and are on the Environmental Department's climate change web page.[14]

Pala's vulnerability assessment also revealed a need to inform the community about how climate change affects cultural, physical, and environmental health and wellness and how to support community members in managing these impacts. Tribal members recognized that climate change affected culturally significant species and landscapes but had not considered how to enhance psychosocial resilience in the face of those effects. The Pala Environmental Department worked with consultants to develop "Chemşhúun Pe'ícháachuqeli (When Our Hearts Are Happy): A Tribal Psychosocial Climate Resilience Framework" to help Pala and other tribal communities safeguard cultural and emotional well-being when preparing for the impacts of climate change.[14] The framework proposes an approach for promoting connectedness, calming, hope, safety, and self-efficacy in the service of strengthening psychosocial resilience. The framework can be adapted to individual tribal communities based on their values, traditions, and cultural practices. For instance, in their outreach materials, the tribe showed how existing practices, such as sage burning and traditional blessings, can be used to ease climate-related stress and anxiety. The framework is a work in progress, and the coronavirus disease 2019 (COVID-19) pandemic, although not a directly climate-related event, is providing the first urgent opportunity to put the framework into practice. During the pandemic, the tribe is providing community resources for physical and emotional support—such as food distribution, wellness checks on elders, and socially distanced performances of traditional bird songs—that highlight Pala's connectedness and resilience.

SWINOMISH INDIAN TRIBAL COMMUNITY Under the Climate-Ready Tribes Initiative, the Swinomish Indian Tribal Community, located in present-day Washington State, has "Indigenized" the CDC's Building Resilience Against Climate Effects (BRACE) framework. Normally, BRACE is a five-step process that helps health officials develop strategies to prepare for the health effects of climate change.[15] BRACE involves incorporating complex atmospheric data and short- and long-range climate projections into public health planning and response activities. The Swinomish tailored the BRACE framework to create I-BRACE, incorporating Indigenous concepts of health and enhancing the framework's applicability and attention to equity by incorporating a model of Indigenous values–based data collection, analysis, and decision making.

Enhanced coordination and collaborative efforts would help improve tribal climate change adaptation work.

The Swinomish are fishing, hunting, and gathering people, and harvesting, preparing, and using Swinomish foods and medicines are integral to the sociocultural community fabric. Akin to many other Indigenous communities, the Swinomish characterize a healthy community by referencing countless generations of knowledge and practices developed via connections to the lands and waters. "Health" is shaped by the many interrelated relationships among humans, non–human beings, and nature. Moreover, health is thought of on familial and community scales, rather than an individual scale. Biophysical health plays a role, but it is not the sole factor in determining health. In Swinomish beliefs, physical health status is often the outcome of social, cultural, mental, environmental, and intellectual health.[10,16,17]

I-BRACE shifts the foundation for decision making from assessed vulnerabilities based on modeled climate projections to health values chosen by the community. To make decisions that reflect community priorities, communities require information about the consequences of climate change on things that they care about and the opportunity to deliberate and provide input on the importance of the identified impacts.[18–20] For the Swinomish, health values are embodied in the Indigenous Health Indicators, which are not represented in conventional public health assessments. These indicators are community connection, natural resources security, cultural use and practices, education (the Swinomish teachings), self-determination, and resilience.[10,1710,17] Each Indigenous community's values may be different; I-BRACE ensures that a community's unique values set the stage for the rest of the process.

For the next step of I-BRACE, Swinomish

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staff worked with modelers to forecast how climate change would impact the habitats of key Swinomish foods. Next, Swinomish staff facilitated a series of community discussions about the modeling projections with a wide demographic of tribal community participants. Participants ranked the importance of protecting the Indigenous health indicators and priority habitat locations from climate change impacts. They ranked the Swinomish teachings (education) as the most important health aspect to protect, followed by natural resources security and cultural use and practices.[10]

Based on these rankings, Swinomish staff identified climate change adaptation strategies related to the three most important health indicators. For one of the strategies, Swinomish staff created an informal educational curriculum about Swinomish foods and medicine to increase intergenerational knowledge sharing between elders and youth. For another, the Swinomish are building the first modern-day clam garden in the US. Clam gardens are an ancient Indigenous technology that increases bivalve biodiversity and populations and may attenuate climate impacts such as storm surge and ocean acidification.[21] In addition, the existing Swinomish Climate Action Plan was updated to include health-specific considerations. For the final step, evaluation, the Swinomish obtained funding from the Robert Wood Johnson Foundation (Grant No. 76577) to evaluate the effectiveness of the I-BRACE approach, the influence of the project on addressing climate health impacts and advancing health equity locally and regionally, and how other communities may learn from this values-based approach to tackle similar issues.

Discussion

The Climate-Ready Tribes Initiative has provided funding and technical assistance to ten tribes to implement strategies to protect health from climate impacts. The two projects described here demonstrate that direct climate and health funding to tribes can result in products that can bolster knowledge and capacity in other tribes. Although every tribe will have specific climate hazards and sensitivities, Pala's Tribal Psychosocial Climate Resilience Framework and the Swinomish's modified I-BRACE framework are designed to help tribal communities incorporate their own data and traditional knowledges into climate change adaptation work. Both projects have been shared widely through webinars, conference presentations, and online learning modules.[22] These are new frameworks, and planned evaluations will demonstrate how effective they are for protecting tribal communities from the health impacts of climate change.

The CRTI has resulted in increased collaboration, novel and innovative climate change adaptation strategies, and incorporation of health into existing tribal climate policies. The initiative is relatively new and much smaller than the existing CDC Climate-Ready States and Cities Initiative,[23] with room for expansion and engagement with additional collaborators. There are currently no other dedicated funding sources from the federal government specifically for tribal climate and health initiatives; however, the Environmental Protection Agency's Indian Environmental General Assistance Program and the Bureau of Indian Affairs' Tribal Resilience Program have been leveraged to support some tribal climate and health activities.

It can be challenging for tribes to successfully compete for funding from the federal government as a result of oversight or lack of capacity, and funding given to states cannot be guaranteed to include tribal projects or pass-through funding to tribal nations. The NIHB and the CDC have simplified and shortened the application process for the CRTI, compared with a standard CDC Notice of Funding Opportunity, to reduce the burden of applying and have ensured that only tribes are eligible to alleviate competition for funding with states and cities.

The CRTI's direct funding has enabled tribes to implement interventions specific to their needs, but the initiative's direct funding impact is small: Only ten tribes have been funded of the 574 federally recognized American Indian and Alaska Native nations in the US.

Recommendations

Based on lessons learned from the Climate-Ready Tribes Initiative, we provide recommendations for making climate and health policy more effective for tribes. Policies may be more effective when driven by tribal experts instead of

being directed by states or the federal government. State, federal, and other funding opportunities can include funding sources set aside specifically for the unique needs of tribal nations (for example, the CDC's Tribal Public Health Capacity Building and Quality Improvement Umbrella Cooperative Agreement). This ensures that funding is available to tribes without significant competition from nontribal applicants (for example, state health departments with advanced grant-writing capacity). When they are practical, simplified application processes and requirements and potential training and technical assistance during the application period would further benefit tribes of smaller size or with less capacity. This approach has been successful for the CRTI, which uses a relatively short funding application form and informative webinars during the application window to assist potential applicants. State and federal governments can also foster collaboration and provide technical assistance to support tribal projects. However, collaboration must always be done with respect to tribal sovereignty and data ownership.[12]

Tribal involvement in federal- and state-level climate policy decisions may improve climate change adaptation effectiveness, although some tribes may be hesitant to work directly with state governments, as their legal government-to-government relationship is with the federal government. Tribes' needs should be carefully considered in consultation with tribal leadership, including formal government-to-government consultation. This not only supports tribal self-determination and sovereignty but also allows tribes to identify impacts on their communities during the development process.

Evidence shows that climate change will continue to affect tribal health, and thus health should be considered in tribal climate policies.[2] Many tribes are currently conducting innovative climate change work without directly considering health impacts.[24] Some other tribes incorporate health in their planning, although perhaps not in the way that nontribal experts might imagine—as with the Swinomish Indigenous Health Indicators. Alternative or tribal definitions of *health* can also be included, with tribal organizations and the CDC helping incorporate health concerns into existing climate plans.

Enhanced coordination and collaborative efforts would help improve tribal climate change adaptation work and facilitate the sharing of best practices. Tribes, tribal organizations, and the CDC could benefit from continued and expanded collaboration with additional partners. This could include the Bureau of Indian Affairs' Tribal Resilience Program, the Environmental Protection Agency, regional Climate Adaptation Science Centers, and the Tribes and Climate Change Program of the Institute for Tribal Environmental Professionals. Providing additional and diverse frameworks for tribes to share information may increase collaboration and partnership while reducing duplication of efforts.

As sovereign nations, tribes may benefit from determining their own health priorities and climate change responses, as evidenced by the examples presented here. Because of the vast diversity of tribes (by location, size, expected climate change impacts, health status, and other factors), solutions often vary between communities. However, the Swinomish framework, beginning with identifying health values, could be widely implemented to help tribes determine their own priorities and conceptions of health. Pala's psychosocial resilience framework could be similarly tailored to the specific values and needs of individual tribes. The NIHB and the CDC can continue to collect and evaluate the outputs from the CRTI to aid tribal preparedness for the health impacts of climate change. ■

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