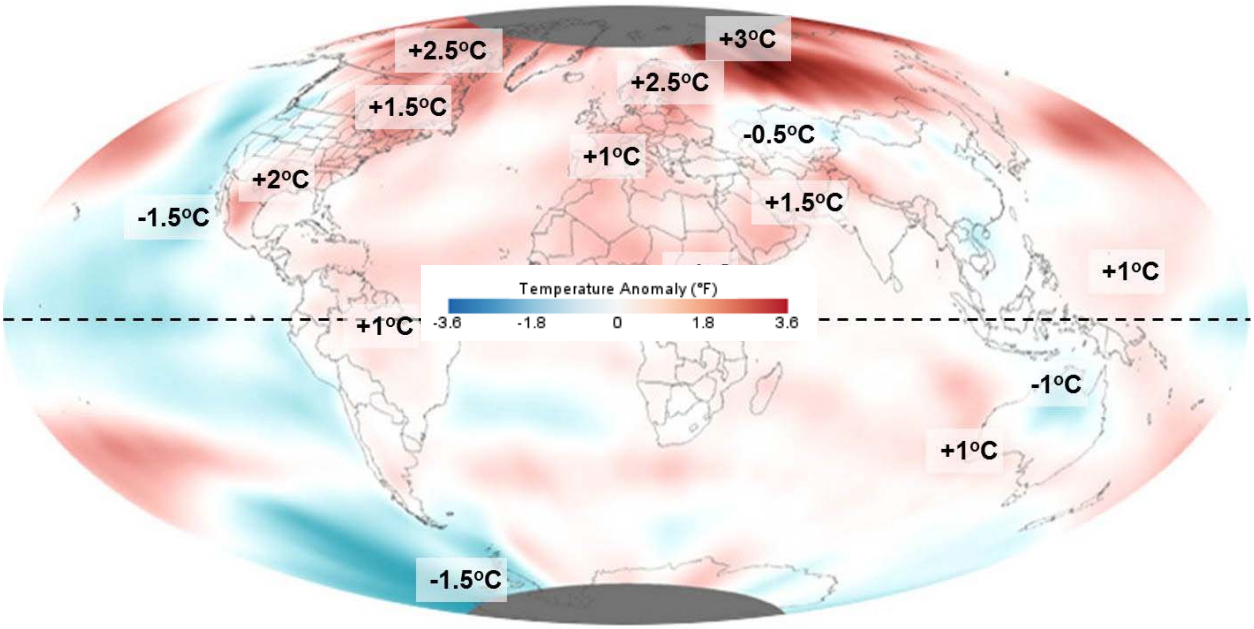
Implementation and Evaluation of Community-based Adaptation to Climate Change in Alaska: 2015 Highlights Report

Anchorage, AK – September 2, 2015. UAA's Institute for Circumpolar Health Studies (ICHS) today released the **Implementation and Evaluation of Community-based Adaptation to Climate Change in Alaska** assessing the health effects of unusual environmental conditions likely associated with climate change in Alaska.

This Highlights Report reveals the results of two rounds of community-based sentinel surveillance in Alaska, and describes the adverse health outcomes associated with those conditions in three ecologically-distinct regions of the state. It describes statistical associations between two exposures; *unusual environmental conditions* and *participant changes in travel as a result of those conditions*, with a variety of adverse health outcomes. A broader report with a detailed description of the methods and analytic approach employed in this study will be released in the scientific literature later this year.

Study Background

Residents of the circumpolar north, those regions within or bordering the Arctic Circle, are experiencing the environmental effects of climate change to a greater extent than those of other regions. Climate records in Alaska indicate that the average temperature in portions of the state have warmed nearly twice the global average since the 1950s.[1,2] These environmental effects are ubiquitous, and have been measured in changes to the circumpolar terrestrial, atmospheric, hydrologic and marine systems, including the degradation of permafrost, loss of sea ice, and warming and acidification of seawater.[1-3]



Adapted from: US NOAA, *State of Climate*, 2011

"Prospects for a Warming Planet: A Tripolar View" Tony McMichael Australian National University World Congress of Epidemiology Anchorage August, 2014.

The environmental effects of climate change are likely having negative impacts on the health of the 13.1 million residents of the circumpolar north.[4,5] Health vulnerability to the effects of climate change likely include increased incidence of injury, disease, and death due to heat waves, fires, under-nutrition, as well as food and water-borne disease.[4,6] Residents of rural and remote communities across the region have provided anecdotal reports of unusual shifts in the behavior and health of fish and game, subsidence of ground and surface water levels, and increasingly extreme local weather patterns. These alterations in the structure and functioning of the ecosystem, or phenomenological disconnections, are likely to have negative ramifications for the health of human and non-human residents of the region.[6]

Studies to assess the health effects of climate change in the circumpolar north are challenged by complicated pathways by which adverse health outcomes are manifested in the resident populations. Direct effects of climate change may result in health outcomes such as hyperthermia, injuries, deaths and illnesses resulting from storms and floods, and increases in subsistence practice-related injuries and deaths. Indirect effects of climate change may result from changes in availability of subsistence foods, damage to water sources and infrastructure due to erosion & subsidence, sanitary sewage disposal and usable landfills, mental health concerns & loss of community identity.[7,8] Changes in availability of subsistence foods may result in an increased reliance on expensive, non-traditional & potentially less healthy food options, and an attendant increase in obesity, diabetes, hunger & heart disease, along with cultural loss and mental health repercussions. Respiratory ailments may result from changes in allergens and in response to air pollution from increased wildfire activity.[1] Damage to water sources and infrastructure may amplify the encroachment of wildlife-borne, waterborne and vector-borne diseases.[9] Inuit residents of the Rigolet, Nunatsiavut, Canada, for example, perceive associations between a

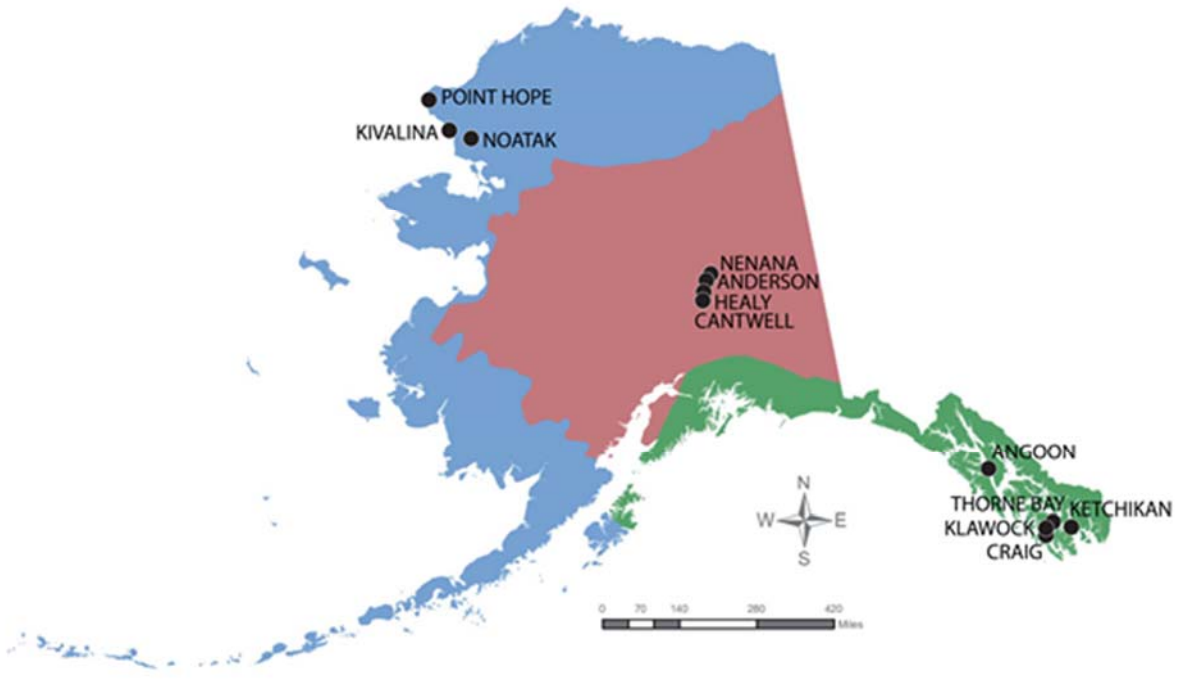
changing climate and many physical and mental health outcomes in their community.[8] Additionally, Inuit communities in northern Quebec reported a number of adverse health outcomes from unpredictable weather in a three year study by Inuit Tapirit Kanatami.[10]

This study focused on three ecologically-distinct regions of the state; *Southeast, Interior, and Northwest Alaska*.[11] The Southeast region of Alaska has a cool, moist climate. The average annual rainfall in the region exceeds 150 inches, and the annual average snowfall exceeds 36 inches. The average high temperature in July is 65 °F, and the average high temperature in January is 39 °F. The Alaskan Interior experiences seasonal temperature extremes. Temperatures can be as low as -60°F in mid-winter, and as high as +85°F in the summer. The average annual precipitation is generally low, just exceeding 12 inches, but flooding can be associated with rapid snowmelt. The Northwest Arctic Borough has a cool to cold climate. Average annual rainfall is 9 inches; average annual snowfall is 47 inches. The average high temperature in July is 58 °F, and the average high temperature in January is 5 °F.

Summary Results

Surveillance data were collected by residents of the city and villages of Ketchikan, Klawock, Craig, Thorne Bay, and Angoon in the southeast region of the state, Nenana, Anderson, Healy, and Cantwell in the interior, and Point Hope, Kivalina and Noatak in northwestern Alaska. These population centers provide a representative cross-sample of the state's population across Alaska's three ecologically-distinct regions; the Southeast, Interior, and Northwest (Figure 1: Study sites):

Figure 1: Study Sites



Pollen allergy symptoms were the most frequently mentioned health outcome in all three regions, followed by outdoor allergic asthma symptoms and injury as a result of unusual environmental conditions. The frequency ranking for health outcomes was similar across the two rounds with pollen allergy and then allergic asthma symptoms being reported most often in both rounds, and weather-related mortality and paralytic shellfish poisoning being reported least often.

Survey respondents were 1.5 times as likely to report that community members experienced allergic symptoms outdoors during months when the community experienced unusual environmental conditions although there was no difference in the likelihood of allergic symptoms outdoors during months when community members changed travel plans as a result of such conditions compared to other months.

Survey respondents were 4.5 times as likely to report that community members experienced any injury as a result of unusual environmental conditions in months when community members changed travel plans as a result of unusual weather and close to four times as likely to report that there was at least one death in the community as a result of usual environmental conditions in those months. Furthermore, survey respondents reported that community members were 3.5 times as likely to experience hypothermia or frostbite in months when community members changed travel plans as a result of unusual environmental conditions.

Reductions in water use were more likely in months when the community experienced unusual environmental conditions (OR = 1.6, $p = 0.007$) and in months when community members changed travel plans due to such conditions (OR = 1.7, $p = 0.010$). This change in water security was mirrored in community-based interviews and discussions with residents. Community wells or water points are a common source of water in rural Alaska, and when travel to these locations is impacted, respondents had to decrease the amount of water they normally use. Similar changes in food security were not reported.

Study Conclusions:

These results revealed the first statistical associations between unusual weather events and health outcomes and health outcome mediators in Alaska. Specifically, this study revealed significant associations between unusual weather conditions and cold-related morbidity and mortality in two rounds of surveillance data collection across the state.

These findings include observations from residents of communities separated by more than twenty degrees of latitude, or 1,000 miles, yet the concerns which emerged in our interviews were similar. It is clear that increasingly intense precipitation events, unseasonably warm winter temperatures, and fluctuations in daily weather are of great concern to participants across the entire state. We look forward to continuing to work with these communities and describing our efforts developing and implementing these measures to mitigate the environmental challenges described herein.

Study Citations:

1. Huntington H, Weller G, et al. Chapter 1: An Introduction to the Arctic Climate Impact Assessment. In: *Arctic Climate Impact Assessment. New York*, NY: Cambridge University Press; 2005: 1-20.
2. Hinzman LD, Bettes ND, et al. Evidence and Implications of Recent Climate Change in Northern Alaska and Other Arctic Regions. *Climatic Change*. 2005; 72: 251-298. doi: 10.1007/s10584-005-5352-2
3. Blunden, J., and D. S. Arndt, Eds. State of the Climate in 2011. *Bull. Am. Meteor. Soc*., 2012; 93 (7), S1–S264.
4. McMichael AJ, Campbell-Lendrum DH, et al. World Health Organization. Climate Change and Human Health: Risks and responses. Published 2003; http://www.who.int/globalchange/publications/climchange.pdf Accessed August 24, 2014.
5. University of the Arctic. Population distribution. http://www.uarctic.org/AtlasMapLayer.aspx?m=648&amid=7251 Accessed August 26, 2014.
6. Larson JN, Anisimov OA, et al. Intergovernmental Panel on Climate Change. 5th ed. https://ipcc-wg2.gov/AR5/images/uploads/IPCC_WG2AR5_SPM_Approved.pdf Published March 2014. Accessed August 26, 2014.
7. Cochran P, Huntington O, et al. Indigenous frameworks for observing and responding to climate change in Alaska. *Climatic Change*. 2013; 120(3), 557-567. doi:10.1007/s10584-013-0735-2
8. Willox AC, Harper SL, et al.. From this place and of this place: climate change, sense of place, and health in Nunatsiavut, Canada. *Social Science & Medicine*. 2012 August. DOI: 10.1016/j.socscimed.2012.03.043
9. Parkinson AJ, Butler JC. Potential impacts of climate change on infectious diseases in the Arctic. *Int J Circumpolar Health*. 2005; 64(5):478-486.
10. The Effects of Unpredictable Weather on the Inuit Nunangut Communities. http://www.ehatlas.ca/sites/default/files/inuit-adaptation-chart.jpg Accessed August 26, 2014.
11. Alaska Climate Science Center. About. https://csc.alaska.edu/about Accessed September 8, 2014.

For media inquiries, please contact:

David L. Driscoll
Associate Professor and Director, Institute for Circumpolar Health Studies
University of Alaska at Anchorage
DDriscoll@uaa.alaska.edu
907-786-6581