Health is the integrative function of biologic/ecologic systems, civil structures, economic forces, and health care capacity.
While interactions are complex, there is a simple (if poorly recognized in policy) biological reality: health is an ecological phenomenon. Health depends on a functioning biosphere. As the biosphere is altered by anthropogenic climate change, the fundamental sources of human health are at risk. Climate change is a healthcare emergency.

While this is true globally, the Arctic is warming four times faster than the global average which puts Arctic populations who are already at special risk, at further risk. Climate-related changes are impacting Arctic citizens’ health now.

Arctic populations’ health is already negatively impacted by several pre-existing features:

- Existence of multiple adverse determinants of health (social, economic, educational, infrastructural factors that directly impact individual and population health).
- Distance from definitive medical care. Provision of care in rural environments faces inherent barriers (roadless areas, wide variations in EMS capacity, distance from urban tertiary care medical and trauma centers) that impact populations.
- Medical staffing considerations and demands. In communities already medically underserved, the burdens of high expense, frequent staff turnover, extraordinary demands on local providers, lack of training opportunities, and insufficient pipeline-building educational experiences impact health systems and their patients.
- Imposed economic forces which have had direct impact on subsistence cultures, increasing stressors on already underserved communities causing cultural disruption and increasing risk of negative social determinants of health (including substance use and suicidality).

Alaska Native populations have responded to climate-related changes with leadership. Driven by the intimate knowledge of the environment that subsistence living requires, Alaska state and local tribal organizations detected, studied, and documented the impacts of climate change more than 10 years ago -- and yet few policy-based solutions have been enacted.¹,²

This insufficient policy action to date may be attributed to several causes including:

- **distance from** where the impacts are happening to major population centers where decision-makers tend to reside,
- a failure to appreciate the **linkage** between climate change and health impacts,
- a **lack of priority** of health impacts because populations in this region are already underserved and at risk with below average health metrics,
- a fundamental **lack of available health metric data** to adequately identify and qualify the correlation between climate change, changing local environmental conditions, and acute health impacts (including presentations to the emergency department), and
- the **failure to establish context-specific health evidence** to guide investments in health and civic infrastructure built on permafrost that limits adaptation and mitigation strategies.

Together these features have kept local, state, and national leadership from fully recognizing the economic, health, and social imperatives that demand urgent action to mitigate and adapt to climate change.

In addition, **Arctic populations face additional unique risks posed by climate change:**

- Permafrost thaw impacts local housing stock, local governmental buildings, energy infrastructure, and healthcare facilities. Permafrost thaw impacts access to clean water and impairs safe disposal of sewage. It threatens runways required for health care access and evacuations.
- Permafrost thaw accelerates coastal erosion and threatens the viability of coastal communities leading to increased stressors, impacting domestic and health infrastructure.\(^3\)
- Permafrost thaw releases long-dormant viruses, bacteria, and toxic substances (heavy metals) previously safely stored in frozen ground, directly threatening human health in the region.\(^4\)
- The traditional diet of Indigenous peoples relies heavily on the complex web of animal and plants that are being changed by climate and pollution. This leads to food insecurity, cultural, and social threats. Climate-related food insecurity and failure of traditional storage methods

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creates significant physical, psychological, and social disruption. Changes in the land and sea ice directly impact subsistence patterns and ability to travel safely and lead to increased hazards (e.g., falls through ice).

Emergency departments and emergency medical systems (EMS) are uniquely positioned in healthcare. Given their universal distribution and expertise in the intersection of environmental, social, and individual determinants of health, emergency systems have a unique capacity to sense and respond to new diseases and trends of the intersection of environment and individual/population health to provide lessons for key policymakers.

Our Massachusetts General Hospital, Arctic Initiative, Maniilaq, and Woodwell Climate Research Center teams have proposed to address these deficits by implementing a pilot program in the Kotzebue, AK regions (Maniilaq) with four key outcomes:

- The creation of a system designed to monitor emergency department visits in the Maniilaq service area for climate change related morbidity and mortality.
- Dissemination of knowledge gained regarding emergent climate threats to health which will inform adaptive and mitigative planning in the local area.
- National and international dissemination of data gained from the monitoring system which can inform scientific and policy priorities for protecting the health of Arctic populations in the era of rapid climate change.
- A scalable model for assessing the health impacts of climate change that could be deployed to emergency departments and other health care settings nationally and internationally.

To meet these goals, we anticipate continuing our local meetings with relevant stakeholders in the Alaska’s Northwest Arctic region, with further engagement through established channels, leveraging longstanding relationships with the Maniilaq Social Medicine Program, and local healthcare, tribal, and governmental leadership.

Data gathered on the direct impact of climate change on health will provide a fulcrum to encourage adoption of thoughtful mitigation and adaptation strategies. While these data are profoundly local, these are lessons for a wider audience.

It is critical for federal agencies to recognize that threats to human health in Arctic populations are a leading indicator of threats to come in populations in more temperate latitudes. They are a warning. Arctic health is the canary in the coal mine for global citizens.
This brief was originally prepared for and presented at the Harvard/DHS Workshop on Impacts and Policy Challenges from Rapid Climate Change in Alaska, co-hosted by Harvard Kennedy School’s Arctic Initiative and the Science and Technology Directorate of the U.S. Department of Homeland Security on May 8, 2023, in Cambridge, MA. It has been edited from its original form.