Human health status is the result of the complex interaction of genetic, behavioral and environmental factors.

In the circumpolar north, as in all other regions, climate is a major, constantly changing component of the environment.

The last 50 years have seen a steadily increasing scientific capacity to determine past climate parameters, and to investigate previously unknown climate elements, utilizing new techniques in satellite technology, for example. At the same time, the development of powerful modern computer processing has made possible great improvements in mathematical climate models.

Scientific interest and rapid technologic developments culminated in the formation of the Intergovernmental Panel on Climate Change (IPCC), which published a global climate change impact assessment based on future climate change predicted by climate models (1). In this assessment, two key deficiencies were recognized. First, the Arctic data was sparse, and thus the climate models were felt to poorly represent this region. Second, the Arctic climate factors were recognized as inextricably linked to climate change in the rest of the world. For these reasons, the Arctic Climate Impact Assessment (ACIA) was undertaken. This effort lasted four years, 2000-2004, involved hundreds of scientists, and resulted in the publication of the ACIA document titled “Impacts of a Warming Arctic”.

The papers in this Special Issue utilize the projections developed in the ACIA as context for the topics, conclusions, and recommendations.

Broadly stated, these ACIA projections can be summarized as follows:

- The present warming trend will continue, with 3-5°C mean annual warming over the next 100 years.
- Winters will warm more than summers.
- Mean annual precipitation will increase.
- Continued melting of land and sea ice.
- Increased weather variability, with a possible increase in extreme weather events.
- Increasing river discharge and rising sea level.

The scope of this Special Issue does not include mechanisms of climate change, or details of the ACIA projections. Regional differences in climate model projections are large, and the reader is referred to the ACIA for further information.

It is important to understand that, while the ACIA climate modeling represents the very best effort current technology can produce, it does have major limitations, including the following:

- There are no climate data for large regions of the Arctic, and data is the key element in models.
- Key components of climate change, such as the interaction of the atmosphere and ocean currents, and atmospheric interaction with
the ocean itself, are incompletely under-
stood.

- Abrupt cooling, and warming, are a matter of record in Arctic ice core climate data, and the threshold phenomena for these abrupt changes are poorly understood, and not represented in current models.

The ACIA utilizes climate models to project conditions of temperature and precipitation in the Arctic (divided into four regions), with ecosystem impact projections at three future “time slices”, 2020, 2040, and 2080. While this approach is feasible for analyzing potential impact on elements of the ecosystem within the four Arctic regions, it is not as useful for assessing impact on human health.

Compared to the time scale of the ACIA, the emergence and spread of the Human Immunodeficiency Virus (HIV), for example, took place over a few years, with a devastating health impact world-wide. Conversely, the development of polio vaccine, and its widespread use, mitigated a major cause of illness and death in an equally short period.

Although uncertainties in climate models exist, it is important to use the best information available in Public Health planning. Consensus among the scientists involved in the four year effort to produce the ACIA is that significant warming will continue for at least the next 100 years. For this reason, the authors of the papers in this Special Issue utilize the Precautionary Principal and the conclusions and recommendations reflect the existing data and our projection of potential health impact, in the context of the Precautionary Principal.

Human technology makes the potential responses to climate change impossible to predict. Equally, the impact of technology has unintended climate consequences, such as the destruction of atmospheric ozone by chlorofluorocarbon aerosol propellants and refrigerant compounds. For these reasons, the discussion of health impact of climate change must deal with mechanisms, rather than attempting to predict health status in a given set of climate conditions, at some time in the future.

Historically, climate change in the circumpolar region has prompted migration, and change in subsistence diet as conditions changed. Modern communities, facing the same changes, are able to utilize modern technology to remain and adapt, but they face new threats in doing so.

This special issue will explore the major mechanisms involved with the impact of climate change in the circumpolar regions on the health of individuals and communities. The discussion will deal with the same topics as in the ACIA, Chapter 15, The Health Impact of Arctic Climate Change, albeit in somewhat greater depth.

The mechanisms of climate impact are divided into two broad categories: First, direct impacts, such as those directly caused by temperature, or ultraviolet light; secondly, indirect impact mechanisms, such as climate induced changes in wildlife and the diseases they share with humans (zoonotic disease). The selection of topics is not meant to be exhaustive, rather it is reflective of the authors’ opinion and work on the health impact chapter of the ACIA (2). These topics were felt to represent impact areas which currently are showing some degree of response to climate change, with a potential, or established, impact on human health. This impact is frequently, but not always, adverse.
The topics in this Special Issue include areas not often discussed when climate change and health are considered globally. These include contaminants and climate change, traditional food security, community adaptation to stress, and community-based monitoring.

The papers included do not represent an exhaustive list of possible climate-human health interactions and only touch the surface of the complex topic climate-ecosystem interactions with human health, primarily with wildlife species of importance to human residents of the circumpolar north. Two Special Editorials are included, to discuss issues where little climate related data is available. The first deals with Food Security, and the impact of climate change on wildlife species critical to the diet of indigenous residents of the circumpolar region. The second Special Editorial deals with community monitoring, the central component of any public health strategy to assure early detection of threats to community health and safety.

Community-based monitoring represents the critical integrating element in all considerations of climate impact on health in the circumpolar north.

Linked community and regional monitoring networks can serve to inform community, regional, national and international strategy to mitigate adverse impact, recognize opportunities, and detect trends in health threats. Each paper contains research and monitoring recommendations that should not be seen as comprehensive, but rather a set of possible considerations in the continuing response to the changing climate in the circumpolar north.

The reader is referred to the ACIA document for a discussion of the other aspects of climate change in the circumpolar north.

It is the hope of the authors that these papers will serve to raise awareness in the health science community of the need to thoughtfully consider the potentially major impact of climate-related mechanisms on the health of northern residents. The advent of the 4th International Polar Year should offer an opportunity to begin a coordinated approach to this unique environment and it’s health problems.

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