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**CONNECTING SCIENCE WITH SOCIETY**

Deliverable 1.8

Minutes of a workshop with international partners and stakeholders at ASSW

## Submission of Deliverable

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# **Minutes of AMAP/EU-PolarNet Stakeholder Workshop on Arctic Health and Wellness**

**Date and Venue:** 12 March 2016

**Rapporteur(s):** Janet Pawlak, AMAP Secretariat

**Participants:** See Annex

## MEETING AGENDA

<b>Conference Date(s)</b>	<b>12 March 2016</b>
<b>Conference Location</b>	<b>Fairbanks, Alaska, University of Alaska Fairbanks</b>
<b>MEETING TITLE: AMAP/EU-PolarNet Stakeholder Workshop on Arctic Health and Wellness</b> Chair: Lars-Otto Reiersen, AMAP Secretariat	
<b>Time</b>	
9:00-10:15	<p><b>Opening and welcome</b> Lars-Otto Reiersen, AMAP Executive Secretary</p> <p><b>Context of the workshop: Research needs defined for EU-PolarNet work</b> Nicole Biebow, AWI, Project Manager EU-PolarNet</p> <p><b>Aims and outcome of the workshop</b> Janet Pawlak, AMAP Secretariat – Rapporteur</p> <p><b>Structure and schedule of the workshop</b> Rhonda Johnson, University of Alaska Anchorage – Facilitator</p> <p><b>Overall perspectives: Climate change and health in the Circumpolar North</b> Ashlee Cunsolo-Willox, Cape Breton University</p> <p><b>Local perspectives: Fish and wildlife co-management in relation to health and wellness in the Labrador Inuit Settlement Area</b> Jamie Snook, Torngat Wildlife, Plants and Fisheries Secretariat</p> <p><b>Contaminants in Arctic food species: health effects issues</b> Pál Weihe, The Faroese Hospital System</p>
	<b>Coffee Break</b>
10:45-12:00	<p><b>Combined effects of climate change, contaminants, and zoonotic diseases</b> Birgitta Evengård, University Hospital, Umeå University, Sweden</p> <p><b>Initiative to build on: One Health: animal, environment, and human health</b> Jim Berner, Alaska Native Tribal Health Consortium</p> <p><b>Discussion</b></p>
	<b>Lunch</b>
13:15-14:30	<p><b>Promoting resilience and well-being</b> Stacy Rasmus, University of Alaska Fairbanks</p> <p><b>Moving beyond preventing suicide individual by individual: Making a case for more collective and community systems interventions</b> Diane McEachern, University of Alaska Fairbanks, Bethel</p> <p><b>Initiative to build on: Rising Sun: suicide prevention</b> Pamela Collins, U.S. National Institute of Mental Health</p> <p><b>Discussion</b></p>
	<b>Coffee Break</b>
15:00-17:00	<p><b>Community health perspectives</b> Gert Mulvad, University of Greenland</p> <p><b>Public health infrastructure</b> Ali K. Hamade, Alaska Dept. of Health and Social Services</p> <p><b>Technological aids: E-health and E-welfare</b> Garret Spargo, Alaska Native Tribal Health Consortium</p> <p><b>Discussion</b></p> <p><b>Panel discussion – Research needs for Arctic Health and Wellness</b></p> <p><b>Final remarks and closing of meeting</b></p>

## 1) Session name: AMAP/EU-PolarNet Stakeholder Workshop on Arctic Health and Wellness

Chair: Lars-Otto Reiersen, AMAP Secretariat

Time: 9:00-17:00

Rapporteur: Janet Pawlak, AMAP Secretariat

Attendees: See annex

### Executive Summary: Compiled research needs for Arctic health and wellness

A new reality under climate change requires a new community health research agenda that will respond in a much more integrated way to the needs and priorities of the Circumpolar North, led by Indigenous peoples and working in strong partnership with local, regional, national, and international stakeholders. Health sovereignty—or the ways in which communities are able to achieve optimal health and wellness, through culturally, environmentally, politically, and historically relevant pathways—will be an essential framework for assessing and evaluating both climate-change-sensitive health impacts and health mitigation and adaptation responses, and for formulating interdisciplinary and multi-sectoral circumpolar research priorities.

Cooperation among Arctic countries should be strengthened and international networks should be further developed on health issues. Priority issues include mental health; vectorborne infections; modeling ecological changes such as range shifts of plant and animal species, temperature changes, and changes in precipitation; increased and better national monitoring; and communication of the findings to national and local health authorities.

To evaluate whether general public health status is threatened by societal and climate change, more general data on individuals need to be collected over a period of time in a way similar to the contaminant cohort studies conducted in the AMAP human health work. This similarity gives the possibility for conducting joint projects with prospective studies in the future, with information collected to analyze associations between contaminants and health effects as well as for analyses of associations between lifestyle factors and health status. Investigations of the relationship between contaminant exposure and health effects can best be achieved by well-designed and implemented cohort studies, representative for the population and large enough to be able to draw conclusions. Representative tissue samples should be also collected for contemporary and future analysis. Mother-child cohort studies with long-term follow-up are needed to elucidate the impact of contaminant exposure during fetal life and the risk of disease later in life. The establishment of joint cohorts in the various regions of the Arctic will provide a number of advantages.

Proposals include development of a circumpolar biomonitoring strategy that covers both humans and key wildlife species to provide data on exposure to contaminants, zoonotic pathogens, and harmful algal bloom toxins. This should include standardizing zoonotic antibody testing for a range of infections found with a circumpolar distribution and the possibility of establishing a network of rural hunters willing to use filter papers to take blood samples from harvested animals for analysis of contaminants and pathogens. This would enable the tracking of trends in zoonotic

infection and contaminant exposure and the movement of pathogen species among regions. Research on the most effective method of establishing local capacity for hunters to use filter paper blood sampling of subsistence species should be considered by all circumpolar countries.

Research should be considered on the impact of climate change on the mental health of people in the North and the Arctic as they are most affected by the environmental changes that impact culturally critical and nutritionally important traditional subsistence activities. In identifying research needs for Arctic health and wellness, questions should be considered concerning the definition of resilience in a culturally and ecologically specific context, and ways to conduct interventions that promote and support resilience and wellbeing, as defined by the coping, adaptive and transformative capacities of social-ecological systems and communities, at the local level.

There is a need for an interdisciplinary, holistic approach to research and program development on mental health and wellness that is community-driven and in line with community-level factors shown to be protective and culturally important. There is also a need to determine important steps for knowledge generation and dissemination to improve the health of Arctic people. This new approach should be community-driven and evaluated. Community members are best able to prevent suicide and promote wellness. However, scientific research is useful to strengthen and guide local efforts. Arctic health research efforts should partner with tribes, organizations and other community structures (including sharing funding with them) and build onto local systems. Research outcomes should provide resources, insights or tools to communities and organizations so that they can most effectively work toward health equity.

Studies should be solution-focused instead of problem-focused and there should be rigorous evaluation of the results. This involves reframing health research from a problems and deficits model to one seeking to understand what protects community health. This approach necessarily draws upon traditional knowledge, culture, spirituality, language and local resources to define community-based solutions to health challenges. Health care solutions to problems in the North will require practices and solutions designed by people of the North in collaboration with external expertise.

Research partnerships in the North should include local and Indigenous people. PhD opportunities should be made more accessible in the North as communities can do much more regarding research in partnership with universities and other research organizations. Such research should also include the impact of government policies that may have more impact on an Indigenous community than climate change.

Building local capacity and strengths is important and consideration should be given to how to support more capacity building for researchers and health professionals as well as to connect research with education in the North.

## 1 Background

Rapidly occurring changes in the Arctic, including economic development, resource exploitation, socio-cultural alterations, and the various impacts of climate and environmental changes, are having an influence on the physical and mental health and wellness of Arctic residents, particularly Indigenous peoples around the Circumpolar North. Research is needed to be able to understand these impacts on health and to assist in the development of means to ameliorate such impacts. Arctic residents, especially Indigenous people, and other relevant stakeholders in the Arctic need to be involved in the identification of the types and topics of research that are needed, the methods used, and the conduct and approaches of the work, to ensure that the results will be usable, locally and culturally appropriate, and capable of being implemented.

The Arctic Monitoring and Assessment Programme (AMAP), as a partner in the Horizon 2020 coordination and support action EU-PolarNet, is responsible for promoting trans-Atlantic research activities between EU countries and the USA and Canada and, as one aspect of this, to hold stakeholder workshops to determine common research needs that can be provided as input to the central EU-PolarNet requirement, namely, to develop an Integrated European Polar Research Programme together with an implementation plan. An important aspect of EU-PolarNet is 'connecting science with society', under which dialogue and cooperation with relevant Arctic stakeholders will ensure their input to the formulation of this research programme. AMAP organized this first of four annual stakeholder workshops to identify and formulate key Arctic research needs over the next five years. The central theme of this workshop is research needs associated with the health and wellness of Arctic residents.

The format of the workshop, after the introductory presentations setting the background and aims of the workshop, comprised presentations by several experts from around the Circumpolar North on a theme followed by discussion by the participants of the ideas presented and identification of research needs requiring further work. The workshop, as a group, then worked to prioritize key themes and approaches.

For a quarter of a century, AMAP has coordinated contaminant-related studies of health in the Arctic; this work has recently expanded to include the combined effects of other stressors, particularly climate change, on health. The AMAP Human Health Assessment Group also cooperates with the Human Health Expert Group under the Arctic Council Sustainable Development Working Group, which has a particular focus on the mental health of Arctic residents. Experts from these groups have assisted in the preparations for this workshop. Representatives of Arctic Council Permanent Participants, which are organizations that represent a large percent of the Indigenous peoples in the Arctic, are also important to this process. A map of the share of Indigenous populations in the Circumpolar North is shown in Figure 1.

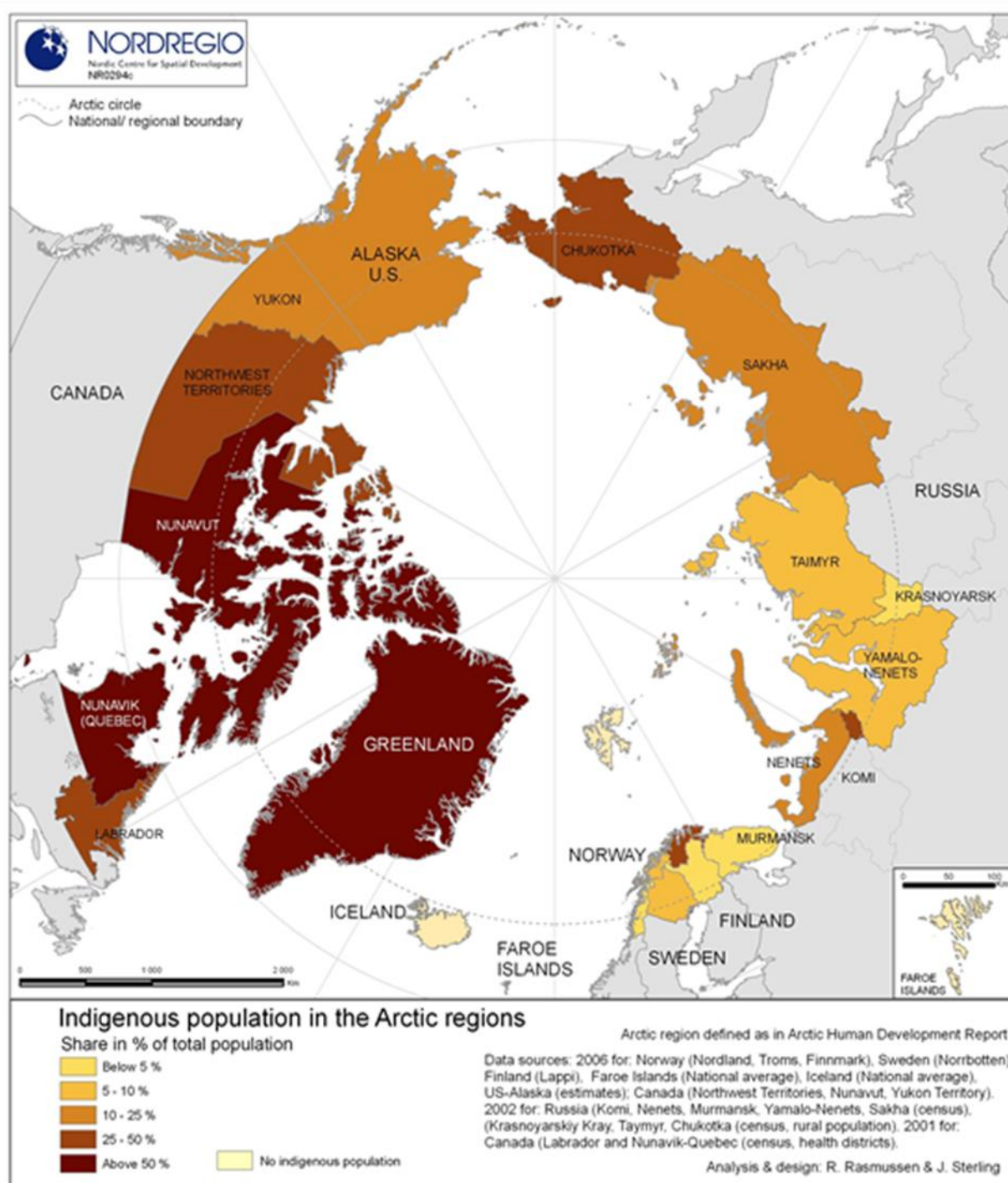


Figure 1. Indigenous population in the Arctic regions as a % of the total population. Source: NORDREGIO.



## 2 Introduction

Representatives of the two co-sponsors of the workshop, the AMAP Secretariat and EU-PolarNet, provided the overall background for the workshop.

Lars-Otto Reiersen, AMAP Executive Secretary, briefly described the origins of AMAP 25 years ago and the structure of the Arctic Council, established five years later, which provides for the active involvement of and engagement with indigenous communities in the Arctic. Six international Indigenous peoples' organizations are designated as Permanent Participants to the Arctic Council and its working groups. They provide for contributions to the work of the Arctic Council relevant to most of the roughly one million Indigenous people in the Arctic (out of a total population of about 4 million).

As one of the six working groups under the Arctic Council, AMAP has coordinated monitoring programs for contaminants and their effects among the eight Arctic countries since its inception, with monitoring data compiled at thematic data centers. AMAP has also conducted numerous assessments on persistent organic pollutants, mercury and radionuclides in the Arctic environment and, more recently, on climate change and the cryosphere. Human health has been an important topic, particularly the exposure of Arctic residents, and especially Indigenous people, to environmental contaminants and concentrations of contaminants in wildlife species consumed. This includes coordination of a biomonitoring program on contaminants in the blood of Arctic residents to follow temporal trends in exposure levels (see Figure 2 for a map showing the communities monitored). For a broader understanding of contaminant trends and effects, most Arctic countries have established cohort studies of specific segments of the population, particularly mothers and their children. Results of these studies are reported in AMAP human health assessments, of which the fourth report has just been published (AMAP, 2015). Each major assessment report is accompanied by a summary report for policymakers containing policy-relevant science-based key findings. Results are also contributed to relevant UN agencies, including UNEP and IPCC, for their use.

Dr Nicole Biebow, Project Manager of the EU coordination and support action EU-PolarNet, the other co-sponsor of the workshop, presented a brief overview of this activity. She noted that polar issues have been rising up in the political agenda across Europe over the past decade owing to the rapid changes occurring in the polar regions, which are significantly influencing global climate with consequences for global society. As a result, the European Union and its executive body, the European Commission (EC), attribute an increasing importance to science and innovation in the high latitudes for a variety of reasons. As part of this, the EC launched a five-year coordination and support action 'EU-PolarNet – Connecting Science with Society', which is the largest consortium of expertise and infrastructure for polar research, comprising 17 countries represented by 22 of Europe's internationally respected multidisciplinary research institutes. EU-PolarNet will work in close cooperation with the EC in the next five years in shaping Europe's polar research and policy agenda.

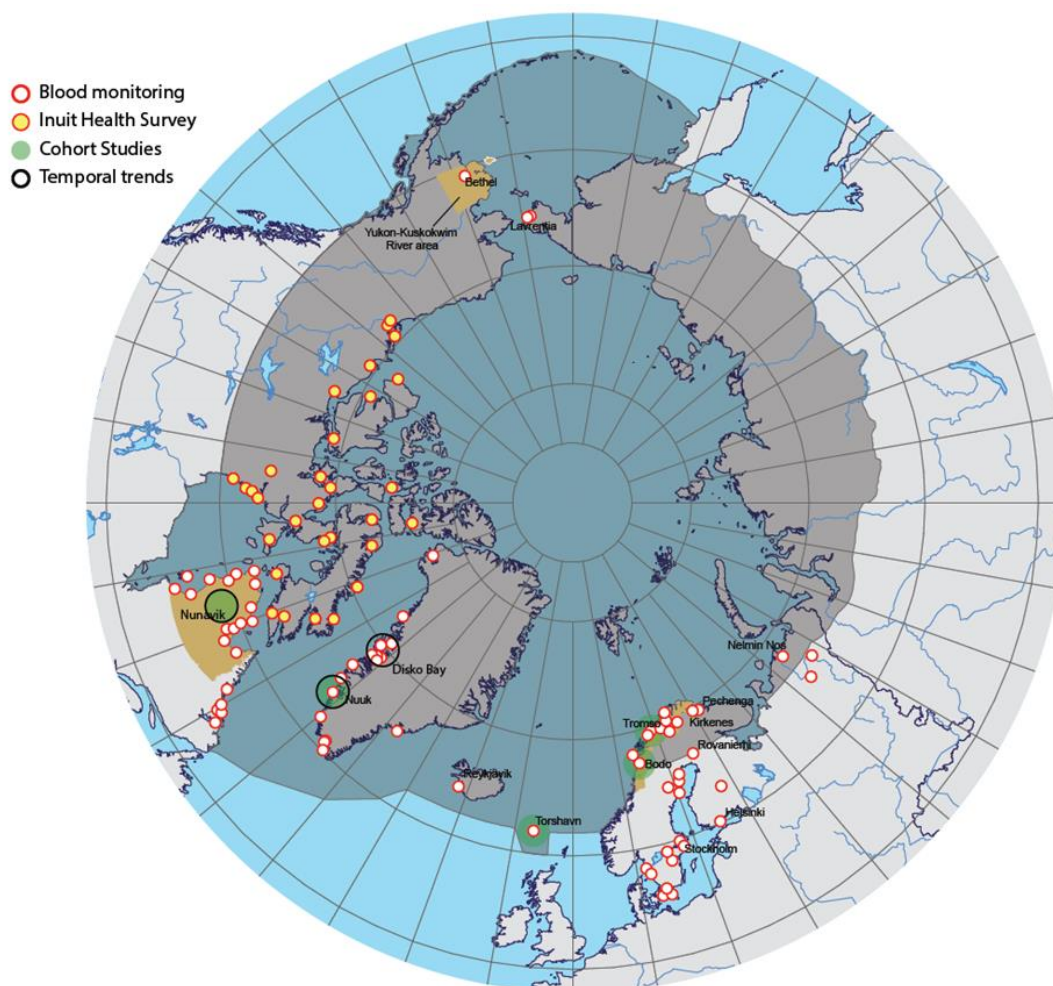


Figure 2. Communities for which biomonitoring data on contaminants are available, some of which cover many years of trend monitoring. Source: AMAP.

EU-PolarNet is establishing an ongoing dialogue between policymakers, business and industry leaders, local communities and scientists to increase mutual understanding and identify new ways of working that will deliver economic and societal benefits. The results of this dialogue will be brought together in a plan for an Integrated European Research Programme for the Arctic and the Antarctic. This will be co-designed with all relevant stakeholders and coordinated with the activities of many other polar research nations beyond Europe, with which consortium partners already have productive links. This especially includes cooperation with Canada and the United States, particularly under the Trans-Atlantic Research Alliance. As part of this activity, EU-PolarNet is preparing a report on prioritized objectives for polar research. It is also designing a resource-oriented European infrastructure access and usage plan to support the integrated research program. Additionally, EU-PolarNet is cooperating closely with the European Commission by providing support and advice on all issues related to the polar regions. An affiliated partner, the European Polar Board, is supporting the work and will ensure that the legacy of EU-PolarNet will be sustained.

The workshop organizer and meeting rapporteur, Janet Pawlak, AMAP Deputy Executive Secretary, emphasized the importance of this workshop as one of the stakeholder contributions to the further development of prioritized objectives for Arctic research and ultimately the

Integrated European Research Programme for the Arctic. As health is only one of many research topics for the Arctic, it is vital that this workshop identify the most important research needs to support health and wellness in Arctic communities and people. These research needs will be included in the report she will prepare based on the presentations and discussions at the workshop for submission to EU-PolarNet as a stakeholder contribution on health issues in the Arctic.

The workshop facilitator, Dr. Rhonda Johnson, Professor of Public Health at the University of Alaska Anchorage, welcomed the participants and noted that all are stakeholders in relation to the health and wellness of residents of the Arctic and northern communities. She encouraged participants to make comments and raise issues to provide diverse stakeholder perspectives on this very broad topic.

### **3 Climate Change and Health in the Circumpolar North**

#### **3.1 Overall perspectives on Climate change and health in the circumpolar North**

Dr. Ashlee Cunsolo, Canada Research Chair in Determinants of Healthy Communities and Associate Professor at Cape Breton University, stated that climate change and health should be the main priority for research in the Arctic. A 2009 Lancet commission identified climate change as the ‘biggest public health threat of the 21st century’. Climate change will affect physical and mental health and the consequences will be wide-ranging and far-reaching.

The circumpolar North is experiencing some of the most rapid changes in climate and environment in the world, with disruptions to sea-ice regimes, including later formation and earlier break-up and decline in sea-ice extent; increased surface air temperature; thawing permafrost; changes in weather and snow patterns; and disruptions to wildlife and vegetation. These changes are currently disrupting the livelihoods and cultural practices of many Northern peoples, particularly Indigenous populations, leading to a range of climate-change-related health impacts: increased death and injury from unstable ice conditions and unpredictable weather; increased risk, frequency, and distribution of foodborne, waterborne, and vectorborne disease; increased heat stress and sunburns; increased respiratory challenges from new allergens, dust, and forest fires; magnification of health impacts from anthropogenic environmental contaminants; displacement and forced relocation from sea-level rise and coastal erosion; and widespread mental health impacts from both direct and indirect impacts.

These climate-change impacts affect the land on which Indigenous people live. An overview of determinants of wellbeing in Inuit communities in Canada showed that land is the basic need for wellness; land underpins all understanding of health and wellness in these communities, serving as the platform on which are built friendships, community activities, cultural skills, traditional knowledge and many other aspects that contribute to wellbeing. The entire system of wellbeing of these communities is premised on the ability to travel safely, reliably, and regularly on the land to hunt, trap, fish, pick berries, travel and a multitude of other activities that have been part of their culture and livelihood for centuries— aspects that are now being threatened or destroyed by changes in the land, weather patterns, and the ice regime. This affects food security owing to changes in the wildlife, berries and other traditional food sources and has a large impact on mental health, manifested by strong emotional responses, loss of land-based activities, changing

cultural identities, potential increases in addictions, interpersonal violence and suicide rates, and the amplification of other physical and mental health stressors.

Climate-change-sensitive health impacts are a pressing priority across the circumpolar North, and how communities, governments, researchers, and policymakers act and respond will be defining moments moving forward. The prospect of a way of life being taken away owing to major changes in the environment arising from circumstances beyond the control of a community contributes direct and indirect stressors on the people. Community health needs to be supported by enhancing preparedness for a new reality under climate change. This requires a new research agenda that will respond in a much more integrated way to the needs and priorities of the Circumpolar North, led by Indigenous peoples and working in strong partnership with local, regional, national, and international stakeholders. In particular, health sovereignty—or the ways in which communities are able to achieve optimal health and wellness, through culturally, environmentally, politically, and historically relevant pathways—will be an essential framework for assessing and evaluating both climate-change-sensitive health impacts and health mitigation and adaptation responses, and for formulating interdisciplinary and multi-sectoral circumpolar research priorities.

### **3.2 Local perspective: Labrador case studies and research opportunities to understand the compounding impact, of Climate Change and Government Policy on Arctic Health and Wellness**

Jamie Snook, the Executive Director for the Torngat Wildlife, Plants and Fisheries Secretariat and the Mayor of Happy Valley-Goose Bay, stated that the health impacts of climate change are a priority across the circumpolar North and recently featured in documentary films such as *Lament for the Land* directed and produced by Dr. Cunsolo and the five communities of Nunatsiavut ([www.lamentfortheland.ca/film](http://www.lamentfortheland.ca/film)). Many of the mental health impacts are amplified by government policies that make traditional Inuit ways of life an increasing challenge. The Labrador Inuit Land Claim Agreement recently celebrated its tenth anniversary. After ten years of fisheries and wildlife co-management, there are case studies that represent opportunities to research and explore how changes to policy could perhaps positively impact the health and wellness of Labrador Inuit, and help to counteract climate change impacts.

Land, plants, fish and wildlife are paramount to health and wellness. In Nunatsiavut there are five communities, ranging from 300 people to 1200 people per community and representing 4% of Inuit in Canada. Food security is very important to these communities. Arctic char is a main staple food; this fish species is being impacted by climate change, and a 40-year scientific program to study and maintain the stock is at risk of being closed. Atlantic salmon is another important staple; this species is managed by the North Atlantic Salmon Commission, which looks critically on maintaining a minimum quota for each Inuit household. The current quota is six fish per household. Lake Melville is an important source of ringed seal, salmon, char and smelts for these communities, as well as being considered an ecologically and biologically significant area by the Department of Fisheries and Oceans Canada. However, a hydroelectric dam is under construction that will increase the concentration of methylmercury, the most toxic form of mercury, by up to 200%. Other important food resources affected by government policies include (a) northern shrimp, for which the Inuit quota has been seriously limited so small communities cannot benefit from these fisheries; (b) halibut, for which Inuit receive 3.3% of the total quota; (c) caribou, which is subject to a government ban on hunting resulting in large emotional and mental health effects

on people in the region; and (d) polar bear, for which hunting is also limited. Climate change is an important factor in the limitation on hunting polar bears as it is a major stress on polar bears and is probably also affecting the caribou population.

Climate change is also affecting the types of species in the fishing areas of these communities, with dwindling numbers of cold-water shellfish, but increasing numbers of groundfish entering the warming ocean. Communities need to prepare for these changes.

Research is needed on the impact of government policies on the food security and health of Indigenous people in the Arctic.

### **3.3 Contaminants in Arctic food species: health effects issues**

Dr. Pál Weihe, Chief Physician, Department of Occupational Medicine and Public Health in the Faroese Hospital System, explained that prenatal exposure to methylmercury has been associated with effects on the developing brain of children. Effects associated with mercury exposure have been documented in humans at successively lower exposures and it is clear that the developing brain is the most vulnerable organ system. Even minor damage is permanent and, by lowering a child's IQ, affects educational ability and income later in life. Although generally the exposure to mercury is decreasing, in parts of the Arctic exposure levels of methylmercury are still at a level where effects can be expected (Figure 3) and monitoring the effects is needed.

Some studies have suggested potential effects of PCBs and perfluorinated compounds (PFCs) on the immune system of children in the Arctic; however, further studies are needed to improve understanding and quantify this relationship. Studies have also suggested that exposures to certain persistent organic pollutants (POPs) are associated with an increased risk of developing Type 2 diabetes in Arctic populations. Despite recent studies, current knowledge remains limited. Genetic predisposition to mercury neurotoxicity has also been suggested; however, studies in the Arctic are limited and are needed to explore this possibility.

Follow-up studies on mother-child cohorts are needed to elucidate the impact of contaminant exposure during fetal life and the risk of disease later in life.

Thus, as there will be a need in the coming several decades for monitoring of contaminant levels in Arctic populations as well as a need for investigating the relationship between contaminant exposure and health effects, this can best be achieved by well-designed and implemented cohort studies. Characteristics of such investigations are that they are representative for the population or populations under investigation and are large enough to be able to draw conclusions even for rare or unusual conditions. Furthermore, representative tissue samples should be collected in adequate quantities for contemporary analysis as well as when the participants in the cohort become older. However, such investigations are very expensive.

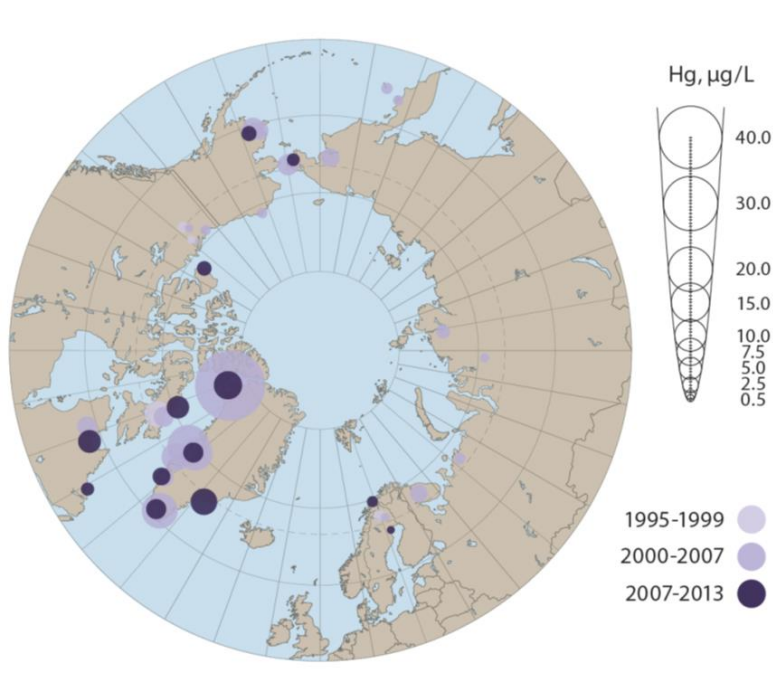


Figure 3. Circumpolar concentrations of mercury in blood of mothers, pregnant women and women of child-bearing age during different time periods ( $\mu\text{g/L}$  whole blood). Source: AMAP (2015).

In order to evaluate whether the general public health status is threatened by societal changes and climate change, there is also a need to collect more general data on individuals over a period of time, for example, 10 to 20 years. This type of study is similar to the contaminant cohort studies conducted in the AMAP human health work. This similarity gives the possibility for conducting joint projects with prospective studies in the future, such that information is collected in relation to the analysis of associations between contaminants and health effects as well as information of relevance for analyses of associations between lifestyle factors, among others, and health status.

The establishment of joint cohorts in the various regions of the Arctic will have a number of advantages, among them: they will be considerably cheaper to establish; they will relieve the local societies of repeat investigations and thus also increase the proportion of the population that participates in the investigation; they will establish a bridge between the various research initiatives arising from the problem of contaminants and from the problem of sustainable development.

### 3.4 Combined effects of climate change, contaminants and zoonotic diseases

Dr. Birgitta Evengård, Professor, Division of Infectious Diseases, Department of Clinical Microbiology, Umeå University in Sweden, noted that there are many challenges and opportunities in the Arctic. Arctic ecosystems have many things in common: they are vast and sparsely inhabited, they are facing rapid climate change and they are subjected to increased tourism and trade with the rest of the world. At the same time, they consist of cold-adapted species, making them particularly vulnerable to pressures like climate change and invasion by all types of organisms, including plants, animals and pathogens causing human diseases. Humans are part of ecosystems; ecosystems affect and are affected by societies and human health is related to both. With climate change, new species are moving north, bringing with them zoonotic

diseases; thus, the health of animals cannot be separated from the health of humans. One example is that willow trees are moving north, bringing beavers and some diseases. Indigenous people may be more vulnerable to such new diseases, possibly because of their genetics.

For the Saami in northern Norway, Sweden and Finland, reindeer herding is very important. With climate change, reindeer are affected by thin ice and a lack of food, and they are becoming more susceptible to disease. The more than 2 million semi-domesticated reindeer in the Arctic are at risk from the midge-borne virus blue tongue and the mosquito-borne West-Nile fever. Uncertainty caused by these changes in conditions is causing stress in Saami communities in these and other areas where the traditional foods, lifestyle and culture are being affected by climate-related changes.

Another example is that ticks are moving northwards with the warmer weather bringing with them a number of micro-organisms such as the virus causing tick-borne encephalitis and the spirochetes causing borreliosis in humans. There are a number of potentially climate-sensitive zoonotic diseases of concern in circumpolar regions (Figure 4 [slide 31]). This is not limited to the Arctic; mosquito species that carry viral pathogens such as for dengue fever and malaria are moving northward in southern Europe. About 70% of emerging infections are zoonoses associated with a change in the range zone of vectors, affecting the health of humans in areas where these diseases previously were not found.

Increases in other types of disease associated with climate change include increases in respiratory diseases caused by more molds in houses and other building resulting from more flooding from extreme rain events. The extension of the northern range of trees also creates more pollen and thus increased respiratory illness.

Water security is also becoming a real problem in many areas. In many places, the infrastructure for water provision is outdated. This resulted in outbreaks of cryptosporidium in northern Sweden in 2010 and 2011 during which over 100,000 people were affected and more than 20,000 became ill.

Spreading plants (both native and alien) and changes in species interactions are affecting biodiversity and ecosystem functioning. Plants, animals, humans and pathogens in the vulnerable cold ecosystems of mountains and the far north have thus far been neglected by scientists as well as policymakers. It is important to work across disciplines to address emerging biosecurity issues in cold environments.

Under the Millennium Development Goals, there is now less poverty in the world than there was twenty years ago, but the impacts of climate change are diminishing these advancements. These goals have now been replaced by the Sustainable Development Goals, and it is important to associate with these goals in the further development of health-related research in the Arctic.

To better understand these changes and combat their effects, cooperation among Arctic countries should be strengthened and international networks should be further developed on health issues. Priority issues include mental health; vectorborne infections; modeling ecological changes such as range shifts, temperature changes, and changes in precipitation; increased and better national monitoring; and communication of the findings to national and local health authorities.

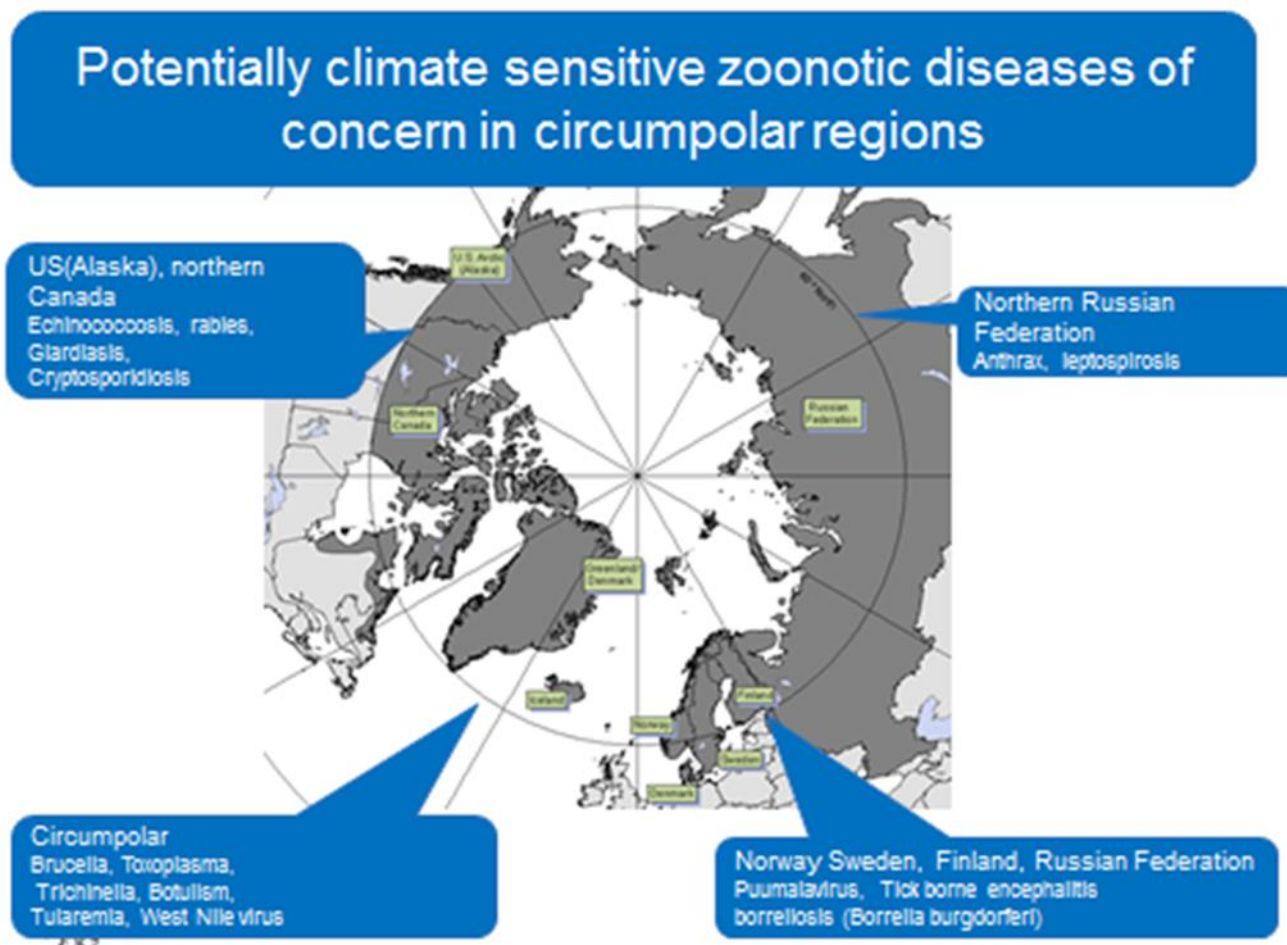


Figure 4. Examples of zoonotic diseases that are potentially climate sensitive in circumpolar areas. Source: Umeå University.

### 3.5 'One Health' as an organizing principle in detecting, assessing, monitoring, and adapting to emerging environmental, human and wildlife health threats

Dr. James E. Berner, Alaska Native Tribal Health Consortium (ANTHC) Anchorage presented information on the 'One Health' initiative. The term 'One Health' refers to a holistic view of all components of the ecosystem that regards all components, living and non-living, as an interconnected whole, with every change in any component (human, animal, environment) eventually having a potential effect on the health of the others.

In order to create a framework to approach the research needs of human residents in the Arctic, the ANTHC has elected to view the emerging environmental health threats in terms of food and water security, and threats to village infrastructure. These elements are among the most critical to community health and sustainability. The definition used for both food and water security is: adequate amounts, adequate access, and adequate information about safety of the resource.

Existing research has documented three basic environmental threat categories: anthropogenic contaminants, warming air and water temperatures, and zoonotic and other microbial threats. Others exist, such as resource extraction industries, and rapid socio-cultural change, but these will not be discussed here.



A critical requirement for identifying priority issues for human health research and evaluating interventions is an interested community, equipped to observe the local environment and to regularly monitor key elements, and willing to participate in creation of adaptation strategies based on the data gathered. Examples of these community-based monitoring efforts covering a spectrum of environmental threats identified in rural Alaska are presented here, together with potential possibilities for partnering with other circumpolar countries.

The Rural Alaska Monitoring Program (RAMP) has been designed by the ANTHC to monitor the Bering Strait region's climate-impacted threats to human and wildlife environmental health. RAMP uses a 'One Health' framework, which assumes that all parts of the environment and ecosystem are related and are affected by changes in any other part. The particular focus of monitoring is on food and water security in rural Alaska, where Arctic warming, anthropogenic contaminants, and disease-causing organisms interact to form threats to food and water security (Figure 5). The changes in the climate, landscape and wildlife species result in a sense of loss of control in the residents of small communities, so the RAMP monitoring components provide a means for residents to participate in tracking their environmental threats; they also decrease the sense of powerlessness in the face of the changing environment, reducing stress.

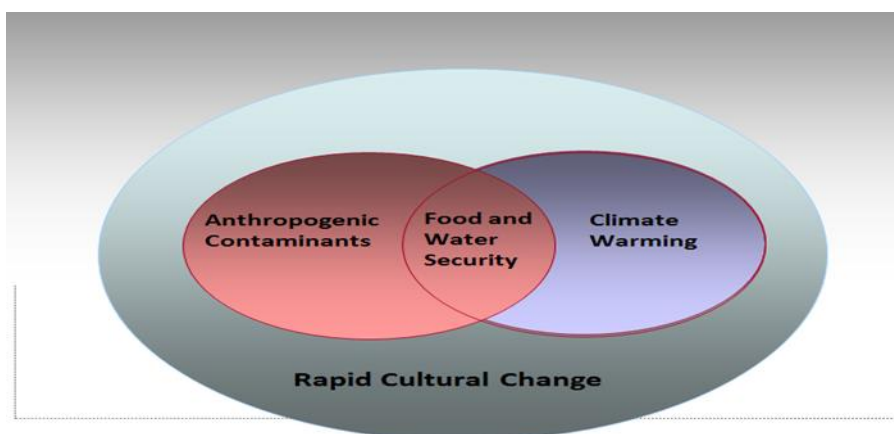


Figure 5. A confluence of changes affect rural Arctic communities.

The RAMP monitoring components include:

- Measurements of antibodies in the blood of terrestrial and marine mammals collected by soaking filter paper in hunter-killed animals to indicate exposure to diseases that can infect both animals and humans, i.e., zoonotic diseases. In the future, this blood will also be tested for the presence of environmental contaminants. Filter strips with animal blood are dried, put into an envelope, and sent for testing.
- Sampling the stomach and intestinal contents of marine mammals to test for the harmful algal bloom toxins saxitoxin (causing paralytic shellfish poisoning) and domoic acid (causing amnesic shellfish poisoning).
- Testing ticks and mosquitos for the bacteria that cause the tularemia infection, a zoonotic disease of beavers, muskrats and rabbits, which are species that have moved north with the northward movement of the tree line.
- Testing local freshwater sources for the presence of mercury, which is a mix of naturally occurring local mercury and mercury transported via air from Asian power plants. Mercury, as

deposited from air or released from thawing permafrost, can be methylated by resident species of bacteria, and the longer, warmer ice-free seasons may well have increased that process. In addition, testing occurs for the presence of harmful cyanobacterial blooms that may occur in freshwater when it warms and thaws permafrost, which can release nitrogen and phosphorus into the water providing optimal conditions for these blooms.

Among the zoonotic diseases, Q-fever, caused by the bacteria *Coxiella burnetii*, is having a major impact on northern fur seals in the southern Bering Sea. These seals, which are an endangered species, show a prevalence of antibodies against the bacteria of 75%. Stellar sea lions in adjacent rookeries on St. Paul Island have a similar prevalence of antibodies to this disease. About 50% of harbor seals have formed antibodies to the *Toxoplasma gondii* parasite and the trichinella parasite is very common in polar bears and walrus. Farther south, the West Nile Virus has moved north into the middle of the prairie provinces of Canada, and there is no reason to expect it will not progress further north.

Anthropogenic persistent organic contaminants, including polychlorinated biphenyls (PCBs), toxaphene, and the DDT group as well as perfluorinated compounds, are released from countries with rivers that empty into the Pacific basin, exposing marine mammals and fish species. Ribbon seals from the Russian side of the Bering Sea have been shown to contain very high levels of DDT in their fat compared to the other species of seals at the same latitude in the Bering and Chukchi Seas. Residents of communities on the Chukotka Peninsula are especially exposed to various contaminants in thousands of abandoned metal barrels, which have contained a variety of contaminants, and are buried in permafrost or stored on the surface in nearshore environments.

Health studies of pregnant women in the Yukon-Kuskokwim Delta in Alaska show that the exposure of young mothers to mercury and organic contaminants has not increased over the 13 years of monitoring, but many of these mothers, and especially their newborn infants, have low levels of vitamin D. Vitamin D deficiency, with visible bone deformities, has begun to be recognized increasingly frequently in Alaska Native children. Pregnant women in this region with deficient levels of Vitamin D are also more likely to have other clinical findings of insulin resistance, and thus are more likely to develop Type 2 diabetes mellitus. The gradual change in diet to a greater proportion of western foods, and away from the prior high-vitamin-D traditional diet, may contribute to this problem.

Research needs include the necessity of continuing to monitor maternal contaminant exposure and vitamin D intake, with long-term follow-up of mothers and their infants to detect health effects in the foreseeable future, as contaminants continue to be distributed by oceanic, riverine and atmospheric transport.

There is also a need to continue testing of appropriate marine mammal tissues for harmful algal bloom toxins. High-performance liquid chromatography (HPLC) investigation of the variant forms of saxitoxin in ice seal tissues should be conducted in different parts of the Arctic to determine whether the toxin is being formed by the same plankton species in all Arctic regions. Investigations should also begin on effects of harmful algal toxins on marine mammal genes.

Consideration should be given to widespread testing of circumpolar populations for vitamin D adequacy, with prioritization of maternal populations entering prenatal care and sampling of

newborn cord blood; inadequate levels should be handled with early aggressive replacement therapy.

Large-scale investigations could be conducted of vitamin D-associated genes in different Arctic human populations to determine whether different population groups have variations in what is an adequate measured level of vitamin D.

Consideration should be given to standardizing zoonotic antibody testing for a range of infections found with a circumpolar distribution. Consideration should also be given to establishing a network of rural hunters willing to use filter papers to take blood samples from harvested animals. This would enable the tracking of trends in zoonotic infection and contaminant exposure and the movement of pathogen species among regions; it would also assist the establishment of a circumpolar archive of specimens.

Consideration should be given to the development of a circumpolar biomonitoring strategy that includes both humans and key wildlife species, and would provide data on exposure to contaminants, zoonotic pathogens, and harmful algal bloom (HAB) toxins. The strategy should be specific for each region, with standardized laboratory techniques, and should utilize existing data to design and take advantage of pooled specimens, use of stable isotope techniques to replace standard dietary surveys (where feasible), sampling at two- to three-year intervals and, where possible, sample limited numbers of forage species at a lower trophic level (such as Arctic cod or representative runs of salmon).

The objective of such a strategy would be implementation of a biosampling plan that would provide statistically significant trend data for contaminant levels, zoonotic pathogen exposure, and HAB toxins, with less cost and labor than a more intensive program.

### **3.6 Discussion of research needs related to combined effects of climate change, contaminants, and zoonotic diseases in the Arctic**

In the discussion, a number of topics were identified for future research. Many of these topics are already being investigated in some regions.

#### *Monitoring of contaminants, zoonotic pathogens and harmful algal bloom toxins*

Monitoring programs for contaminants in animals are currently being conducted on a local and national basis and the data are usually published quickly and readily available in national and international literature. Contaminant data on humans in the Arctic are largely contained in the published AMAP Arctic Human Health Assessment Reports. It was suggested that AMAP might be an organizing entity to encourage the design of a long-term human and subsistence wildlife monitoring strategy utilizing existing programs, that would reduce costs without sacrificing trend data, as described above.

Research on the most effective method of establishing local capacity for hunters to use inexpensive filter paper blood sampling of subsistence species should be considered by all circumpolar countries. Ideally, synchronization of laboratory techniques would produce comparable data for human health and wildlife agencies on exposure to contaminants, zoonotic pathogens, and harmful algal bloom (HAB) toxins.

HAB toxins have been found in sea mammals and other species in the northern Bering and Chukchi Seas, and research is needed to better define the toxins and the organisms responsible.

There is a need for research on the northward movement into the Arctic of species of fish, marine mammals, and terrestrial wildlife, as well as zoonotic diseases.

#### *Monitoring of drinking water sources*

Monitoring of permafrost temperatures around surface water sources in permafrost-dependent regions should be seriously considered. Drinking water sources in the Arctic are at risk. Ponds on tundra are drying up owing to greater evaporation, while in other cases the thawing of permafrost containment has caused ponds to drain down through the soil.

Monitoring the presence and levels of total and methylated mercury in surface ponds as well as testing for cyanobacteria toxins, especially in prolonged periods of warm weather, should be considered.

#### *Human health*

Low vitamin D levels in many rural Alaska Native mothers and infants indicate the need for vitamin D assessment in pregnant women in other Arctic populations. These measurements are inexpensive and, if treated early, can prevent much morbidity in these populations.

Research on the impact of climate change on the mental health of people in the North and the Arctic should be considered. They are most affected by the environmental changes that impact culturally critical and nutritionally important traditional subsistence activities. These environmental changes result in a sense of loss and may include depression or other mental health problems.

#### *General issues*

There is a need for greater international cooperation on health research in the Arctic and this should also include the Russian Federation.

The Intergovernmental Panel on Climate Change (IPCC) Working Group 2 did not include much information on the effects of climate change on health, mainly because it was difficult to clearly attribute these impacts to climate change. A stronger attribution to climate change is needed for health to be included in IPCC reports. However, the World Health Organization has now labelled malaria and dengue fever as climate-related.

## **4 Mental Health and Wellbeing in Arctic Communities**

### **4.1 Promoting Resilience and Wellbeing**

Dr. Stacy Rasmus, Center for Alaska Native Health Research, University of Alaska Fairbanks, stated that from colonialism to climate, Indigenous people in the Arctic continue to experience threats to their overall survival and sustainability and must continually innovate and adopt new strategies for social persistence, adaptation and transformation in the face of global change. New threats arise from the new and changing conditions. Today, Indigenous people in the Arctic find their

greatest threats to survival coming not only from the environmental factors that predict conditions of the ice but from the social and relational processes that determine individual and collective community health and wellbeing. Throughout the generations, Alaska Native people have developed strategies and valuable expertise in mitigation of situations of risk and vulnerability.

Social or social-ecological resilience is a construct useful in understanding the ways that Alaska Native and other Indigenous peoples are coping, adapting and transforming in the face of rapid change. The concept of resilience, while gaining wider application in research related to drivers of change and impacts on culture, environment and health, is not often clearly defined and even less rarely understood from an Indigenous perspective. Resilience in an ecological perspective is the maintenance of structure and function under disturbance. In psychology, resilience implies the ability to cope with and overcome adversity and continue normal development, i.e., managing changes throughout life. It also covers the ability to learn from past experiences and adjust to future challenges. Linked to the notion of resilience is the concept of wellbeing as a more holistic health indicator.

In the Arctic, the weather is changing with the people. Human impacts on the environment are changing the climate. In Alaska, the Yup'ik have faced many changes throughout their lives, and continue to work to enhance wellbeing by promoting strength, health and coping. One example of an action to enhance wellbeing is the use of Indigenous constructs of resilience and wellbeing as they are applied in the context of a Yup'ik Alaska Native community to reduce youth suicide and alcohol risk as well as to increase strengths and reasons for life. This application is in the form of a Qungasvik or toolbox, which provides a model for promoting reasons for life and wellbeing in Yup'ik and Cup'ik communities, and thus is specifically developed for the cultures of these communities. The Qungasvik comprises the following terms: protective factors (teachings, words to live by, instructions); self-efficacy (I can); communal mastery (we are strong); wanting to be a role model (I want to lead); giving (compassionate, a caring, loving person); affection/recognize (to be thankful to); clear limits and expectations (instruction, rule); family models of sobriety and wellness (ones that are respected); safe places; opportunities (opening their future); role model (good provider); and village rules (village warnings). Six communities in southwest Alaska have taken a similar approach to protect their youth.

In identifying research needs for Arctic health and wellness, the following questions should be considered: How is resilience defined in a culturally and ecologically-specific context? How can we move beyond defining resilience and wellbeing to conduct interventions that promote and support it at the local level? What is an Indigenous 'life lived well' in the Arctic? What other examples exist in the Arctic that demonstrate Indigenous social resilience and wellbeing, as defined by the coping, adaptive and transformative capacities of social-ecological systems and communities? How can wellbeing, as embedded with Indigenous value systems, provide key access points to culture in interventions? How can research promote Indigenous resilience and wellbeing in the Arctic?

#### **4.2 Moving beyond preventing suicide individual by individual: Making a case for more collective and community systems interventions**

Dr. Diane McEachern, Assistant Professor, University of Alaska Fairbanks, Kuskokwim Campus, Bethel, Alaska, stated that youth suicide is a tragic and pressing problem that plagues Northwest

Alaska disproportionately when compared to other areas of the United States. These rural Indigenous communities suffer from one of the highest youth suicide rates in the world. Previous research has shown that Indigenous suicide is associated with cultural and community drivers, namely social disorganization, culture loss and a collective sense of disempowerment. Similarly, lower suicide rates, fewer incidences of alcohol abuse and increased wellbeing have been associated with community connectedness, spirituality, family involvement, intact community services and systems, and cultural affinity for Indigenous people. Despite the established connection between personal, family and community, spirituality, and Indigenous health, behavioral health services are often individually focused and clinically based. This approach ignores the spiritual, family and community-level factors shown to be protective and culturally important, and results in services that can be culturally incongruent and under-utilized in tribal communities.

There is a need for research and program development that is community-driven and thus more in line with community-level factors shown to be protective and culturally important. The typical 'gatekeeper approach' to suicide prevention is based on packaged training of individuals, teaching of risk factors and signs, and is standardized (one size fits all) and de-contextualized; there is mixed evidence of its efficacy although it improves the ability to speak about the problem.

An interdisciplinary alternative is needed to provide a holistic approach; this must be community-driven. It should take an epidemiological approach to the problem, determining who, where and what is associated with it and when the problem occurs (seasonally and historically). It should also determine how people make sense of the problem and respond to it (in narrative and ethnographically). It should consider what community and sociological conditions contribute to 'the problem' or are correlated with its reduction. There is also a need to determine the next important steps for knowledge generation and dissemination to improve the health of Arctic people.

This new approach should be community-driven and evaluated. It should acknowledge community members as a source of knowledge and build on the lived experience of participants in the program to inform action. It can draw from popular education models to develop critical consciousness and activism to empower and transform their societies. It takes a village, and all organizations within it, to prevent suicide. Community members are best able to prevent suicide and promote wellness. However, scientific research is useful to strengthen and guide village efforts. Arctic health research efforts should partner with tribes, organizations and other community structures (including sharing funding with them) and build onto local systems. Research outcomes should provide resources, insights or tools to communities and organizations so that they can most effectively work toward health equity.

One example of such an approach being implemented in an Alaskan community is the National Institute of Health-funded PC-CARES: Promoting Community Conversations about Research to End Suicide. Under this initiative, the community gathers together once a month for about two or three hours to consider the findings in a piece of research. After a brief summary of the paper, the community breaks into small groups and discusses the findings and whether and how they could be applied in their community. This is a slow process, running over about eight months so that the concepts have time to be understood and incorporated in community thinking.

#### **4.3 Reducing the Incidence of Suicide in Indigenous Groups – Strengths United through Networks (RISING SUN)**

Dr. Pamela Collins, Director of the Office for Research on Disparities and Global Mental Health, National Institute of Mental Health (NIMH), Bethesda, MD, stated that mental disorders are ubiquitous throughout the world. Disabling mental and behavioral disorders are unique among non-communicable disorders because of their high burden in youth through middle age. Suicide rates are very high internationally and are the leading cause of death among older teenage girls. Within the Arctic, the highest suicide rates are in Chukotka, followed by Greenland and Nunavut, and then the other areas in the Russian Arctic. The highest rates of suicide in Alaska are among Native men.

In 2014, the National Action Alliance for Suicide Prevention published 'A Prioritized Research Agenda for Suicide Prevention: An Action Plan to Save Lives'. In this report it is noted, however, that 'A research document alone cannot reduce suicide deaths or attempts; rather, its intent is to identify the research needed to guide practice and inform policy decisions across many areas...'

Under the Canadian Chairmanship of the Arctic Council, the Sustainable Development Working Group held a Mental Wellness Symposium in March 2015 to summarize the initiative on mental wellness under their chairmanship and to launch the initiative's final report. This symposium's participants presented findings from two projects that mapped interventions for mental wellness and suicide prevention in Arctic Indigenous communities. The authors of the report on the mental wellness initiative noted that solutions must be culturally grounded, community-based and community-driven, with intervention specificity for communities. It is also important to have culturally appropriate shared interventions across communities, including mental health services and intersectoral cooperation. Studies should be solution-focused instead of problem-focused and there should be rigorous evaluation of the results. Furthermore, while there is an elevated risk of suicide in remote, rural, Arctic communities, there is considerable variation in rates. However, standard research approaches to evaluating the effectiveness of interventions in these communities are challenging owing to geographical isolation and small populations.

Building on the Canadian activities, the RISING SUN initiative has been established under the 2015–2017 U.S. Chairmanship of the Arctic Council. RISING SUN is designed to create a common way to evaluate suicide prevention interventions across the Arctic. The use of outcomes and common assessment measures—developed in collaboration with Indigenous peoples' organizations (i.e., Arctic Council Permanent Participants), community leaders, and mental health experts—will facilitate data sharing, evaluation, and interpretation of interventions across service systems in the Arctic. The ultimate goal is to generate shared knowledge that will aid health workers in better serving their communities and help policymakers measure progress, evaluate interventions, and overcome regional and cultural challenges to implementation. Arriving at common outcomes, measures, and reporting systems is especially important in the Arctic, where the vast geography, high number of remote communities, and breadth of cultural diversity pose challenges for systematic approaches to suicide prevention.

The method for achieving the goals of RISING SUN is consensus building, through an adaptation of the Delphi method, as well as regional face-to-face meetings with local stakeholders. For the Delphi method, a panel of over 200 scientific, technical, and traditional knowledge experts was invited to establish a convergence of opinion over the period of the initiative. Panel members

have been selected to represent the diverse advocacy, clinical, policy, research, and survivor groups with interests in suicide prevention among Arctic Indigenous communities. To incorporate the viewpoints of additional key stakeholders, three regional face-to-face meetings will integrate local perspectives in consensus-building and priority-setting.

The first of three workshops was held in Anchorage, Alaska, in September 2015, with the purpose of understanding the current suicide prevention landscape across the Arctic and the accomplishments of partnering countries, reviewing the aims of the RISING SUN initiative, and eliciting feedback on efforts to develop an Arctic-specific suicide prevention toolkit. Presently, RISING SUN is conducting the consensus-building activity and planning for the second workshop, scheduled for May 2016 in Tromsø, Norway. This meeting will convene participants to review stakeholder feedback, come to consensus on the best outcomes and measures available, specify gaps in available measures that may require further development, and identify potential implementation challenges. At the end of the initiative, RISING SUN will result in a toolkit of common outcomes and their measures for suicide prevention efforts, applicable across the Arctic, which could expand Arctic states' capacity to evaluate the implementation of evidence-based interventions to combat suicide.

#### **4.4 Discussion on suicide prevention and mental wellness**

Regarding the very high rates of suicide in the Russian Arctic, especially in Chukotka, it was noted that there are many other health problems in Russia and longevity is low. Under a U.S.-Russian collaboration, data are being collected on suicide, infectious diseases and many other diseases in people in Chukotka and a course is being developed on health and safety for this region. Another project, financed by the U.S. National Science Foundation, is bringing together a large number of Russian Indigenous people and Yup'ik from Alaska to explore their views and experiences based on a common set of questions. Reports will be prepared on the outcome of both of these initiatives.

The development of toolkits, such as the one constructed for the Yup'ik in Alaska and those in development under RISING SUN, to prevent youth suicide and create healthy communities was considered very important. They are particularly needed when a small community suddenly experiences a rapid rise in the number of suicides among young people, leaving the community shocked, scarred and feeling helpless. There is a need to build up a healthy community premise, arising from strength-based foundational work.

Youth are at risk, often high risk, in their communities. Communities need to be taught that resilience is a strength-based process. Protective factors based on strength provide building blocks in their culture. Resilience should be considered beyond the individual level and more at a community level. However, some consideration may need to be given concerning the relation between communities and health professionals in terms of treatment. There is a need to balance how to help individuals and the community approach to wellbeing.

Furthermore, the community basis to determine what is protective against suicide should be more holistic, not just to stop suicide but to give youth reasons for living, as guided by elders. Protective factors need to be enhanced as young people go through the activities prescribed by the toolkit. To determine protective factors relevant to a specific community, the U.S. National Institute of Mental Health has published a research concept (and now a request for applications



as of 22 March 2016) focused on stimulating collaborative research with American Indian and Alaska Native communities regarding suicide prevention.

## **5 Public Health and Community Services**

### **5.1 Community health perspectives**

Dr. Gert Mulvad, physician, Greenland Center for Health Research, University of Greenland, Nuussuaq, described the approach to community health in Greenland. A community health perspective can be gained from a local exhibition of words: 'Assiliaq', meaning humor and childhood, as well as from four concepts from the report 'High level determinants of community wellness, Fulbright Arctic Initiative on Community Health and Wellness in The Arctic: Capacity Building, Training in Communities, Rapid Transitions, and Cultural Connection'. Despite serious challenges, Arctic communities have proved resilient in adapting to environmental and social change. However, large challenges remain and new partnerships between scientists, medical professionals, and communities are essential to increase local capacity, participation and control over health care and wellness programs. The view of community health issues in the Arctic region is shifting from one solely based on problems and deficits to one that builds on examples of community resilience, promotes capacity building, and disseminates successful outcomes. Furthermore, the focus on children, family values, family traditions and family responsibility is becoming increasingly important in rapid changing communities. This focus on family values and the health and wellness of children and youth as the key priorities is part of the Inuit Circumpolar Council (ICC) Strategy for Family Health and Wellbeing. This strategy emphasizes selflessness, sharing and respect for each other, as well as fostering traditional values with the help of elders in the community. It also emphasizes the need for individuals to take responsibility for their own health and families to take responsibility for the health and wellness of their children. Communities must also take ownership over responses to emerging crises and rely less on external support.

Capacity building is required to develop new graduate and medical training programs that instill a better understanding of research ethics and responsibilities when working with communities, and promote an appreciation of the values of traditional knowledge in forming research plans and relationships with communities. Researchers should be encouraged to form authentic partnerships with local communities based on questions developed in cooperation with the community and designed to produce tangible benefits to the community. Social-ecological restoration needs to be incorporated as a component and measure of community health. It is also necessary to increase the number and quality of professional health staff, particularly Indigenous people with native language skills. The local capacity of current health programs to meet the physical and mental health needs of individuals and the community is highly strained.

To meet these aims, the Greenland Center for Health Research is developing PhD courses in Greenland to develop knowledge to elevate the health status in Greenland to its optimum level. The University of the Arctic and Oulu University in Finland offer a Master of Science course specializing in health and the environment in Greenland and in the Arctic. The aim is to enhance capacity building to develop new graduate and medical training so that about 50% of the nurses and 15% of the doctors will be Inuit.

In communities, there is a need to place health education, programs and services in a holistic framework of personhood that links personal responsibilities for health with social obligations to family, neighbor, and community. Furthermore, it is not possible or desirable to separate the health of Arctic residents and communities from the health of their culture, language, and educational systems. Innovations in community health care delivery need to be based on the level of community involvement and local determination of health care benchmarks. This involves reframing health research from a problems and deficits model to one seeking to understand what protects community health. This approach necessarily draws upon traditional knowledge, culture, spirituality, language and local resources to define community-based solutions to health challenges. Health care solutions to problems in the North will require practices and solutions designed by people of the North in collaboration with 'outside' expertise.

Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO). Climate change is having an impact on fisheries, agriculture and wildlife harvesting, and globalization affects trade, with a focus on fisheries in the Arctic for local food and commercial interest.

As Arctic societies develop at record-breaking speed both economically and politically, the traditional family structure has been transformed. Norms and value systems, including gender and intergenerational relationships, have also changed dramatically. With these changes within society, many social and psychological problems have been brought to the surface. The family has always been the basis for childhood; it is necessary to maintain the family perspective in a community in transition. Priority needs to be given over the next decades to ensuring that children grow up in the family and that community services are available for childcare, development and training. Schools must have the necessary resources as well as appropriate educational and professional tools, with the family in focus, to create a much closer collaboration between health care, social services and the school system. The rapid development in Greenland, with changes in family structure, labor and economy, has created a need for a functioning social service to alleviate losses in the wake of these developments. A close collaboration between health, social and educational systems must lay the groundwork for better welfare for families in Greenland.

Welfare is about social and economic security for citizens. People in the North have a desire to be economically independent in the future. Innovative research in fisheries, mining and infrastructure can be the way to attain economic independence, but local capacity building is an essential issue for this development.

## **5.2 Public health infrastructure**

Dr. Ali Hamade, Environmental Public Health Program Manager, Division of Public Health, Alaska Department of Health and Social Services, described the challenges to public health services in Alaska. It is the largest state in the U.S., but has the lowest population density. Of the roughly 737,600 residents, about 150,000 live in rural communities spread over the immense state and its thousands of islands. Several entities contribute to Alaska's public health infrastructure. These include the Department of Health and Social Services, Department of Environmental Conservation, Municipality of Anchorage, the Alaska Native Tribal Health Consortium, Native Health Corporations, clinics, the Centers for Disease Control and Prevention, the healthcare

community, and others. These agencies collectively aim to protect and promote the health of Alaskans by independently and collaboratively fulfilling needs related to disease surveillance and tracking, health promotion and disease prevention, women and children's health, vital statistics, emergency preparedness, health planning and health systems development, chemical and infectious agent testing laboratories, epidemiology, toxicology, vaccinations, and nursing. Alaska constituents and stakeholders in public health are engaged directly and indirectly by providing services, sharing public health findings and recommendations, and addressing health questions and concerns. Independent efforts are augmented by strong partnerships and collaborations among state, tribal, local, federal, and private entities.

In the public sector, 20% of Alaskans are served by the Alaska Tribal Health System and 12% by military and Veterans Administration systems. The remainder is served by state and local clinics and hospitals and the private sector facilities. There is, however, a shortage of health professionals in many areas. The Alaska Native Tribal Health Consortium offers services in a broad range of health-related issues, from rural energy and clean water and sanitation to behavioral, environmental and community health. The Alaska Division of Public Health offers a wide range of health services and facilities, and develops health care policy and regulations. The broad reach of Division of Public Health Services is exemplified by the Section of Public Health Nursing, which operates 21 public health centers from which nurses travel mainly by air to remote interior or island communities to provide health care. Partners in public health include communities, the Department of Environmental Conservation (covering environmental health, sanitation and hygiene, and public drinking water systems, among other areas), tribal health systems (with 150 to 200 small clinics) and various federal agencies.

Three major challenges to public health in Alaska include adequate rural facilities, food safety and security, and wildfire preparedness

Adequate facilities in rural areas are not always available to support access to medical care. This includes the need for improved landing strips for aircraft carrying health care personnel and to facilitate medical evacuations in some remote rural areas. Moreover, road maintenance is needed for ease of transportation within communities. Unpaved roads with inadequate dust palliative application foster dust generation and air quality decline.

Food safety and food security represent another important challenge facing Alaskans. The subsistence food harvest is associated with many important nutritional, cultural and spiritual values. The changing climate is affecting the traditional harvest and impacting traditional methods of capture or hunting and food preservation methods. New insecurities arise from the occurrence of harmful algal blooms resulting in shellfish toxins as well as potentially changing levels of environmental contaminants in wildlife species. As a result, monitoring for contaminants and toxins in food samples and preparing guidelines for consumption of fish and marine mammals are increasingly important.

Wildfires have been intensifying over the past few decades and there is a need for broader coverage of contingency and preparedness plans for villages with regard to evacuation and restoration after the fire is over. Current air quality monitoring and modeling could be augmented, and there are deficiencies in clean and safe capacity for sheltering in place. A Local Environmental Observer program has been established throughout the state to share environmental observations and other information.

The 'Healthy Alaskans 2020' initiative, co-led by the Alaska Department of Health and Social Services and the Alaska Native Tribal Health Consortium, provides a framework to support the work of partners and stakeholders throughout the state. It prioritizes 25 health objectives for the decade that include cancer, suicide, interpersonal violence and sexual assault, alcohol, tobacco and drug use, and obesity.

### 5.3 Technological aids: Telehealth and Technology in Alaska

Garret Spargo, Director of Product Development, Telehealth Department, Alaska Native Tribal Health Consortium, stated that he has a program to help select appropriate telehealth systems. In this context, the term 'telemedicine' means the 'delivery of billable, interactive clinical services performed at a distance', while 'telehealth' is a broad category covering 'the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration'.

Telehealth technology is used by different facilities. In hospitals and specialty clinics, specialists see and manage patients remotely, making sure that patients follow up properly. In integrated care facilities, mental health and other specialists work in primary care settings to aid patients. For situations of transition and monitoring, patients access care (or care accesses patients) where and when needed to avoid complications and the need for higher levels of care. The technology requirements vary depending on the purpose.

The main types of technology are:

- Live videoconferencing (synchronous): This is a live, two-way interaction between a person and a provider using audiovisual telecommunications technology. This, however, requires internet connectivity to the site with the patient, which is not always possible in remote areas of Alaska.
- Store-and-forward (asynchronous): This provides for the transmission of recorded health history through an electronic communications system to a practitioner, usually a specialist, who uses the information to evaluate the case or render a service outside of a real-time or live interaction.
- Remote Patient Monitoring: This involves the collection of personal health and medical data from an individual in one location via electronic communication technologies, which is transmitted to a provider in a different location for use in care and related support.
- Mobile Health: Under this, health care and public health practice and education are supported by mobile communication devices such as cell phones, tablet computers, and personal digital assistants (PDAs). Applications can range from targeted text messages that promote healthy behavior to wide-scale alerts about disease outbreaks, as just a few examples.

The Alaska Tribal Health System, a voluntary affiliation of 30 Alaskan tribes and tribal organizations that serves approximately 140,000 Alaskan Natives across the state, 70% of whom live in rural communities, uses telemedicine carts as a primary care tool (Figure 6). Instruments on these carts can test for ear disease, heart disease, and respiratory illness, and have a digital camera to view wounds and skin diseases, as well as a dental camera. A scanner is also attached. Cases reviewed in a village are transmitted to a specialist in a relevant remote clinic who then makes treatment recommendations. A large number of specialty healthcare clinics are available by video-teleconference, including clinics in other states for certain specialties.



Figure 6. Telemedicine cart used by the Alaska Tribal Health System. Source: G. Spargo.

A review of the experience of healthcare providers on their use of telehealth over the past 15 years indicated that three quarters felt that telehealth improved the quality of care for the patient, while two thirds indicated that use of telehealth improved patient satisfaction. Waiting time for diagnosis has also decreased significantly, with 25% of cases turned around in one hour and 60% of the cases turned around on the same day. Another advantage of the increasing use of telehealth in Alaska has been a large savings in travel costs for patients and the health system.

In a supplementary presentation, Dr. Sven Ebbesson, a long-time physician-researcher retired from the University of Alaska Fairbanks, described his 20 years of work to determine the key risk factors for coronary disease and diabetes in Alaskan Natives. The study concentrated on 13 villages in the Norton Sound area, where the local communities are now experiencing high rates of coronary disease, diabetes and stroke. Whales, seals and fish, which have very low levels of saturated fats, had been the traditional diet of these communities for over 1,000 years, and until 1970 diabetes and coronary heart disease were very rare. However, since then convenience food stores arrived, bringing processed foods with high levels of saturated fats including products such as shortening, which contains 25% saturated fat. This dietary shift from highly unsaturated to more saturated fats currently experienced by Alaskan Natives presented an exceptional opportunity to study the effects of such changes on health. Based on the risk factors determined, a food guide was prepared to recommend which foods to avoid and which foods are healthy. As part of this NIH-funded work, over 8000 house visits were made to explain the study and its results and encourage good dietary habits and adequate exercise.

#### 5.4 Discussion on community health and telehealth examples

While telehealth is available for a large and growing range of physical health conditions and diseases, there have been difficulties in establishing behavioral health aids in telehealth. There has been a lack of professionals to assist in behavioral telehealth so far. Another issue regarding telehealth in the U.S. is that few insurers pay for telemedicine services and some physicians are wary of possible malpractice suits against them.

Regarding research partnerships in the North, Inuit consider themselves ‘the original Arctic scientist’. It would be advantageous to make PhD opportunities more accessible in the North as communities can do much more regarding research in partnership with universities and other research organizations. Furthermore, such research should also include the impact of government policies that may have more impact on an Indigenous community than climate change.

It would be useful to link case studies across borders. Building local capacity and strengths is also important and consideration should be given to how to support more capacity building for researchers and health professionals. It is very important to connect research with education. When doing research in the North it is not always easy to do education in the North, so the possibility of connecting research with education should be increased. Collaboration in the North is of great importance and is particularly needed for capacity building. Capacity building is important; Indigenous groups should not be seen as a charity case—they want to be part of the process.

Regarding research priorities, it is important to move away from geographical and disciplinary silos. Indigenous organizations conduct good research. There is a need to hear Indigenous voices and for Indigenous leadership to set priorities with and for the broader health research community. Climate change will impact everything. There is no health without mental health.

More intervention studies and research are needed, not only to examine an interesting idea but for the purpose of helping people. There is a need to educate people in the villages, to teach young people how to cook and choose a healthy diet. Diet is the most important factor in disease and also the most possible to change.

### 6 Panel Discussion—Research Needs for Arctic Health and Wellness

One proposal was to build on the work that the AMAP Human Health Assessment Group has coordinated for over 20 years. The core of this program has been to collect biomonitoring data on the exposure of Arctic and Northern residents to environmental contaminants arising primarily from dietary sources and, more recently, related studies on the health outcomes and effects that may be associated with these contaminant exposures. However, public health professionals ask questions regarding health on a much broader basis. Obtaining a good data set both on public health variables and on contaminants could provide a full picture of the exposure of children. This could be combined with a genome study. If this could be conducted on a broad basis in the Arctic and North, covering social and mental conditions and contaminant exposures and comparing with different genetic backgrounds on a circumpolar basis, a very powerful dataset would be established. The methodology could employ the use of blood samples on filter paper from humans and also from animals hunted for food. It takes a good amount of work to establish such cohorts, but data can be harvested for years to come. The breadth of this proposal includes the

suicide issues discussed earlier, and can explore why 15-year-old children have thoughts about death: is this new or did we just not see this before? Results will be useful from both the environmental health and public health perspectives.

This proposal was seconded by another panelist. There are already a number of cohort studies in the Arctic and it would be good to follow them prospectively on a broader public health basis.

This proposal also emphasizes the importance of public health professionals working with veterinarians; much better collaboration is needed between these groups to tackle the spread of zoonotic diseases. As climate change has, and will continue to have, a rapid and significant impact on the ecology in the North, vectors for infections will change their habitat and have an impact on the health of animals and humans. To monitor this change, longitudinal studies are of value and stress the need for not only regional and national surveillance but also international collaboration, which is very important and should become more pro-active, for example, with regard to sustainable development goals. As the Russian Federation constitutes a large part of the Arctic, it is particularly important to have Russia included in these collaborations.

The presentations showed a clear need for multilevel interventions regarding mental health and wellness. A program is needed to determine what works and how to bundle together and package interventions to mitigate social disruptions, as well as how to disseminate the ideas so that others can adapt and use them. Capacity building for research in these communities is very important. From a funding perspective, there is an issue of how to ensure that the research makes a public health intervention effective; for this there is a need for partnerships between governments and end users.

Northern populations are very resilient; they have a survival instinct that may have been lost by other populations, but now they feel that there are new threats that they cannot see. It is important to develop communication tools to help them learn about these threats and to monitor them. Furthermore, some Indigenous tribes no longer have a single village that is solely theirs. It would be useful to build a more centralized way to share with all communities; to build a tool for managers. As health issues are impacting Indigenous populations disproportionately, there is also a need to move from interventions to broader wellness measures.

A participant quoted from a Yukon First Nations report prepared 43 years ago: “We must decide what research needs to be done and who will do it and include our own people so we can learn to do it on our own, We need to own the results of the research so it can be used.” However, it was pointed out that some organizations that were not participating in this workshop represent large Indigenous groups who have their own research agendas. Work is needed regarding dissemination of scientific findings. Many communities are experiencing rapid change and are very interested in these types of research; although it may be difficult to include them, it is important to do so.

Accordingly, there is a need to have research generated from Indigenous communities, based on Indigenous leadership and priorities, as well as to have translational research to take research results to Indigenous communities in a way that they can most easily apply these results. Western researchers and social workers have been trained to view Indigenous people as clients, not as equals; there is a need for such workers to reflect and challenge themselves about their role and position and how to work cross-culturally and collaboratively on research. This is beginning to

change as more Indigenous people earn PhDs and other professional degrees and become colleagues and more integrated in the research process, and as more Indigenous leaders, organizations, and communities are taking greater control of the research agenda to steer research so that results are useable and meet needs and priorities. Classically trained researchers are now also being exposed to more participatory research designs and indigenous ways of creating and sharing knowledge, thus enhancing and enriching this collaboration.

## **7 Final remarks**

The facilitator Rhonda Johnson thanked the speakers and participants for their contributions to the workshop. On behalf of AMAP, Lars-Otto Reiersen expressed his appreciation, noting that much good information had been presented and discussed. From EU-PolarNet, Nicole Biebow stated that the workshop had been very informative, and now the most relevant issues need to be conveyed to the EU-PolarNet consortium.

## **Reference**

AMAP. 2015. AMAP Assessment 2015: Human Health in the Arctic. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. vii + 165 pp.



## Annex

**AMAP/EU-PolarNet Workshop on Research Needs for Arctic Health and Wellness, Fairbanks, Alaska, 12 March 2016**

### List of Participants

Country	First name	Last name	Institute name	Mailing address	e-mail
Canada	Bob	Van Dijken	Council of Yukon First Nations		Bob.VanDijken@cyfn.net
Canada	Heather	Mariash	National Wildlife Research Centre, EC	Carleton University Ottawa	Heather.Mariash@gmail.com
Canada	Jamie	Snook	Tornгат Wildlife Plants and Fisheries Secretariat	217 Hamilton River Road P.O. Box 2050, Station B Happy Valley - Goose Bay NL, A0P 1E0	jamie.snook@torngatsecretariat.ca
Canada	Ashlee	Cunsolo Willox	Community Health Department of Nursing, Cross-Appointed with Indigenous Studies Cape Breton University	Sydney, NS, B1P 6L2	ashlee_cunsolowilcox@cbu.ca
China	Gunagshei	Na	National Marine Environmental Monitoring	Lingje St. No. 42 Dalian	gsna@nmemc.org.cn
Denmark	Frank Marin	Sonne	Ministry of Environment and Food Danish Environmental Protection Agency	Strandgade 29 DK-1401 Copenhagen K	fms@mst.dk
Estonia	Rein	Vaikmäe	Department of Isotope-palaeoclimatology Institute of Geology at Tallinn University of Technology	Ehitajate tee 5 19086 Tallinn	rein.vaikmae@ttu.ee
Faroe Islands	Pál	Weihe	The Faroese Hospital System Department of Occupational and Public Health	Sigmundargata 5 FA-100 Torshavn	pal@health.fo
Finland	Kirsti	Latola	Thule Institute University of Oulu	P.O. Box 7300 FIN-90014 University of Oulu	Kirsi.Latola@oulu.fi
Finland	Arja	Rautio	Thule Institute University of Oulu	P.O. Box 7300 FIN-90014 University of Oulu	arja.rautio@oulu.fi
Finland	Hannele	Savela	Thule Institute University of Oulu	P.O. Box 7300 FIN-90014 University of Oulu	Hannele.Savela@oulu.fi
France	Yves	Frenot	French Polar Institute (IPEV)	Technopôle Brest-Iroise CS 60075 - 29280 Plouzané	Yves.Frenot@ipev.fr
France	Denis-Didier	Rousseau	CNRS - Institut National des Sciences de l'Univers	3, rue Michel-Ange 75794 PARIS Cedex 16	Denis-Didier.ROUSSEAU@cnsr-dir.fr
Germany	Kristina	Bär	Alfred Wegener Institute	Am Handelshafen 12 D-27570 Bremerhaven	kbaer@awi.de

Country	First name	Last name	Institute name	Mailing address	e-mail
Germany	Nicole	Biebow	Alfred Wegener Institute	Am Handelshafen 12 GE-27570 Bermerhaven	nicole.biebow@awi.de
Germany	Carolina Cavazos	Guerra	Institute for Advanced Sustainability Studies e.V. (IASS)	Berliner Strasse 130 14467 Potsdam	carolina.cavazosguerra@iass-potsdam.de
Germany	Karin	Lochte	Alfred Wegener Institute	Am Handelshafen 12 GE-27570 Bermerhaven	karin.lochte@awi.de
Greenland (via teleconf.)	Gert	Mulvad	University of Greenland Greenland	Manutooq 1 3905 Nuussuaq	gm@peqqik.gl
Portugal	Gonçalo	Vieira	University of Lisbon	Alameda da Universidade, 1649-004 Lisboa	vieira@campus.ul.pt
Spain	Juanjo	Danobeitia	CSIC - UTM	Pg Marítim de la Barceloneta 37-49 08003 Barcelona	jjdanobeitia@utm.csic.es
Spain	Antonio	Quesada	MINECO	Universidad Autónoma de Madrid C/Darwin, 2 28049 Madrid	antonio.quesada@uam.es
Sweden	Björn	Dahlbäck	Swedish Polar Research Secretariat	Box 50003 SE-104 05 Stockholm	Bjorn.Dahlback@polar.se
Sweden	Birgitta	Evengård	Department of Clinical Microbiology Head of Unit Infectious Diseases	Byggnad 24 (K), Köksvägen, Infektionskliniken, Universitetssjukhuset, 3187, Umeå universitet, 901 85, Umeå SE	birgitta.evengard@umu.se  birgitta.evengard@climi.umu.se
Sweden	Jan-Olov	Westerberg	Swedish Museum of Natural History	Box 540001 Stockholm	Jan-olov.westerberg@nrm.se
United Kingdom	Ruth	Driver-Breen	British Antarctic Survey	High Cross Madingley Road Cambridge CB3 0ET	rutver@bas.ac.uk
United Kingdom	Elaina	Ford	British Antarctic Survey	High Cross Madingley Road Cambridge CB3 0ET	elaina.ford@bas.ac.uk
United Kingdom	David G.	Vaughan	British Antarctic Survey	High Cross Madingley Road Cambridge CB3 0ET	dgv@bas.ac.uk
United Kingdom	Ruth	Vingerhagen	University of Cambridge	Downing Str. Cambridge	Ruth.hindshaw@gmail.com
USA	Thomas	Armstrong	University of Montana		tom@madisonrivergroup.com
USA	Julie	Benson	Alaska INBRE	205 Arctic Health Building PO Box 757040 Fairbanks, AK 99775-7040	jcbenson@alaska.edu

Country	First name	Last name	Institute name	Mailing address	e-mail
USA	Jim	Berner	Alaska Native Tribal Health Consortium Division of Community Health	4000 Ambassador Drive, Suite 442 Anchorage, Alaska 99508	jberner@anthc.org
USA	Sigrid	Brudie	University of Alaska Fairbanks	2835 E. 144 <sup>th</sup> Anchorage AK 99516	sbrudie@uaa.alaska.edu
USA	Pamela	Collins	Office for Research on Disparities & Global Mental Health Director, Office of Rural Mental Health Research National Institute of Mental Health/NIH	6001 Executive Blvd, Suite 7211 Bethesda, MD 20892	Pamela.Collins@nih.gov
USA	Robert A.	Delgado	Office for Research on Disparities & Global Mental Health National Institute of Mental Health	6001 Executive Blvd, Rm. 7211-D Bethesda MD 20892- 9659	roberto.delgado@nih.gov
USA	Irina	Dardynskaia	University of Illinois at Chicago	1200 West Harrison St. Chicago, Illinois 60607	dardynsk@uic.edu
USA	Oleg	Doubynsky	University of Illinois at Chicago	1200 West Harrison St. Chicago, Illinois 60607	doctor23@uic.edu
USA	Gunnar	Ebbesson	Turning Point Counseling Services	315 5th Ave Fairbanks, AK 99701	gunnarebbesson@mac.com
USA	Kelly	Falkner	Division of Polar Programs, NSF	Arlington, VA 22230	kfalkner@nsf.gov
USA	Ali	Hamade	Environmental Public Health Program Manager Alaska Department of Environmental Conservation	3601 C Street, Suite 540 Anchorage, AK 99503	ali.hamade@alaska.gov
USA	Rhonda M.	Johnson	University of Alaska Anchorage	Bragaw Building, Suite 220 Anchorage, AK 99508- 4614	Rhonda.Johnson@uaa.alaska.edu
USA	Diane	McEachern	UAF - Bethel	Box 2344 Bethel AK 99559	dmmceachern@alaska.edu
USA	Hild	Peters	Alaska Vision Arctic Wellness & Justice	Box 82067 Fairbanks, AK	hildpeters@gmail.com
USA	Guy	Peters	Alaska Vision Arctic Wellness & Justice	Box 82067 Fairbanks, AK	Gpeters03@gmail.com
USA	Peter L.	Pulsifer	ELOKA Project ( <a href="http://eloka-arctic.org">http://eloka-arctic.org</a> ) National Snow and Ice Data Center Cooperative Institute for Research in Environmental Science (CIRES) University of Colorado	449 UCB University of Colorado Boulder CO 80309	pulsifer@nsidc.org

Country	First name	Last name	Institute name	Mailing address	e-mail
USA	Stacy	Rasmus	Center for Alaska Native Health Research Institute of Arctic Biology University of Alaska Fairbanks	PO Box 757000 Fairbanks, AK 99775-7000	smrasmus@alaska.edu
USA	Lorrie	Rea	Institute of Northern Engineering Water and Environmental Research Center University of Alaska Fairbanks	PO Box 755910 Fairbanks, AK 99775-5910	LDREA@alaska.edu
USA	Inna	Rivkin	Department of Psychology and Center for Alaska Native Health Research University of Alaska Fairbanks	PO Box 756480 Fairbanks, AK 99775-6480	idrivkin@alaska.edu
USA	Patricia	Sekaquaptewa	UAF Fairbanks Campus	307 Brooks Building PO Box 756500 Fairbanks, AK 99775-6500	pssekaquaptewa@alaska.edu
USA	Garret	Spargo	Alaska Native Tribal Health Consortium	3900 Ambassador Dr. Anchorage, AK 99508	gspargo@anthc.org
USA	John	Stedfman R.N.	American Society of Circumpolar Health	Bethel, Alaska	stedman_alaska@hotmail.com
USA	Bryan	Thomas	Barrow, Alaska Observatory, NOAA	P.O. Box 888 Barrow, AK 99723	Bryan.Thomas@noaa.gov
European Polar Board Secretariat	Renuka	Badhe	European Polar Board Secretariat	PO Box 93138 NL-2509 AC The Hague	r.badhe@nwo.nl
AMAP	Lars-Otto	Reiersen	Arctic Monitoring and Assessment Programme Secretariat	Gaustadalléen 21 N-0349 Oslo Norway	Lars-otto.reiersen@amap.no
AMAP	Janet F.	Pawlak	Arctic Monitoring and Assessment Programme (AMAP) Secretariat	Gaustadalléen 21 N-0349 Oslo Norway	jpawlak@dahm.dk