Human Health and Well-being

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During the Twelfth International Congress on Circumpolar Health in 2003 in Nuuk, Greenland, a number of presenters called for a new approach in discussing the health and well-being of northern people. Rather than focusing on diseases and illnesses, there was a desire to look at positive aspects of life. When health is defined as the mental, physical and social well-being, and not merely the absence of disease and infirmity, cultural and social practices become critical contributing factors.

This chapter will look at three major trends in health and well-being in the Arctic. The first trend describes the increasing problems with mental health and violence, but also how new approaches that engage the local community can dramatically reduce suicide rates. The second trend is an increase in community-based participatory health research, especially regarding traditional foods. The third trend is the increased use of new technology in addressing health concerns and service delivery throughout the Arctic. This chapter provides a number of examples to support these key trends. Together they demonstrate how the Arctic could become a global leader in creating health care systems that integrate local control, new technologies, and many traditions in ways that become increasingly relevant in a rapidly changing world.

Reports about health in the Arctic

Several Arctic Council projects and reports deal with human health, and this chapter does not repeat the work that has been done by other teams of experts. Further information is available via the following reports and web sites:

- Arctic Pollution Issues: A State of the Arctic Environment Report. Chapters "Peoples" and "Human Health": www.amap.no
- Arctic Pollution 2002. Chapter "Human Health" and AMAP Assessment 2002: Human Health in the Arctic: www.amap.no
- The Future of Children and Youth Program Report: www.ookpik.org
- Arctic Climate Impact Assessment. Chapter "Human Health." Forthcoming via http://www.acia.uaf.edu
- Reports from the Sustainable Development Working Group including Telemedicine and International Circumpolar Surveillance of Emerging Infectious Diseases: www.sdwg.org
- Survey of Living Conditions of the Arctic: www.iser.uaa.alaska.edu/projects/Living_Conditions

Guarding health in the Arctic

Our point of departure in this chapter is that health in the Arctic has to be seen in the context of the special conditions in the region, and that guarding health is a key to improving well-being.

A special place

The Arctic has many factors that make it a special place in discussing health and well-being. These include rapid social changes, where local and global cultures as well as old traditions and new technologies are mixed in a myriad of ways. Some people move from one end of the spectrum to the other in a matter of minutes, such as children walking home from a 21st century school computer lab stopping by an "uncle's" yard to enjoy liver from a freshly killed seal. The blending of diverse values, skills, and resources makes up the environment in which children are raised and adults live their lives.

Other characteristics that make the Arctic special are the great distances and severe conditions for travel. The provision of health services in remote communities is a challenge. It always has

been and always will be. However, recent advances in technology are enabling those in communities who want to be engaged in research to be active members of teams, and those who provide clinical services to gain access to local insights or expert advice over a radio, telephone, computer camera, or video conference line.

Life in the Arctic also includes the survival skills of the indigenous populations and an attitude of "optimistic problem solving" that brings a sense of mastery, confidence, and self-esteem – prime ingredients for survival (*1*). Guarding health is closely connected to such attitudes.

Guarding Health

"Here as elsewhere, the parts of culture that guarded health, whether by design or inadvertence, were more valuable than those intended to restore health after accident or disease." *Margret Lantis*, 1959 (*2*)

The parts of today's multi-national world culture that guard well-being are quite varied and many are not considered primarily as health delivery programs. They can include practices of the past, modern technological advances, and local control of a broad range of community services. In order to assure the best combination of factors that contribute to healthy longevity, there must be a broad view that allows for a flexible combination as each community sees fit.

It is the parts of culture that promote health that have the most significant impact. In the Arctic, it is very well known that the prevention of frostbite and hypothermia are far more effective than trying to treat either after the fact. Likewise it is far more effective to keep young people active in their communities than it is to attempt to "straighten" out their anti-social behavior when they become adults.

Recent research has indicated that when a number of factors are considered for predicting an individual's true state of well-being, one will stand out. It is not percentage of body fat, grip strength, jogging endurance, or visual acuity. It is not the number of volunteer activities, number of drinks per week, or smoking habits. It is not the number of visits to the clinic for annual physicals or even access to regular health care. The best predictor of the individual's health is one's own perception of own health. If you feel healthy, then you are healthy. If you believe you are healthy for your age, then you are (*3*). That perception is forged through a personal assessment of many social and cultural factors. These include the availability of and access to health services that are culturally based. The role that one plays in the community appears to be both an important personal factor as well as an external indicator of social health. How individuals perceive their level of contribution to their communities, with solid and reliable relationships, may thus be a key factor in determining resilience (*4*). The desire to engage and the level of participation in one's community are not typically assessed in reports of health.

Limits of health statistics

Basic health parameters show that the Arctic nations are doing quite well. Sanitation is available for 60% of the population, water available for 82%, and life expectancy at birth is 65.2 years (*5*). Clearly, the Arctic is made up of some of the most developed nations in the world. However, national averages do not necessarily reflect the state of the people who live in this region. Moreover, it is not possible to extract consistent and comparable health data for just Arctic people as each nation has its own definitions and means for collecting data and they do not delineate their "Arctic" regions as places for which data is collected separately. Another limitation with health statistics is that the factors that relate to wellness are not regularly tallied by government agencies.

Key Health Indicators for Eight Arctic Nations and Three Southern High Latitude Nations (*5*)

	Canada	Denmark	Finland	Iceland	Norway	Russia	Sweden	USA	Argentina	New Zealand	South Africa
Child <5 Mortality/1000	5.5	5.5	3.5	3.5	4.5	18.5	3.5	8.0	18	6.5	83.5
Life Expectancy at birth, in years (2002)	79.8	77.2	78.2	80.1	79.1	64.8	80.4	77.3	74.4	78.9	50.7
Healthy Life Expectancy at birth, in years (2002)	72.0	69.8	71.1	72.8	72.0	58.6	73.3	69.3	65.3	70.8	44.3
Total Population, [000] (2002)	31,271	5,351	5,197	287	4,514	144,082	8,867	291,038	37,981	3,846	44,759
% of Population aged 60+ years (2002)	17.1	20.4	20.3	15.3	19.6	18.3	22.9	16.2	13.0	15.3	5.2
Total Fertility Rate (2002)	1.5	1.8	1.7	2.0	1.8	1.2	1.6	2.1	2.5	2.0	2.6
% Total Water Supply Coverage (2000)	100	100	100	N/A	100	99	100	100	N/A	N/A	76-90
	(100 U,					(100 U,					
	99 R)					96 R)					
% Total Sanitation Coverage (2000)	100 (100 U, 99 R)	N/A	100	N/A	N/A	N/A	100	100	N/A	N/A	76-90
Suicide Rate per 100000 M/F (Year)	19.5/5.1 (1998)	20.9/8.1 (1998)	35.6/10.9 (2000)	19.1/5.2 (1997)	19.5/6.8 (1999)	70.6/11.9 (2000)	19.7/8.0 (1999)	17.6/4.1 (1999)	9.9/3.0 (1996)	23.7/6.9 (1998)	N/A

U = Urban R = Rural M = Male F = Female

From World Health Organization Country Indicators and Water and Sanitation Data Bases

The factors that relate to wellness may not be regularly tallied by governmental agencies, see box. In particular, statistics do not focus on factors that improve the perception of health such as participation in culturally important activities and locally based civic involvement (*6*). They do not take into consideration that a strong reliance upon cultural values serves as a protective factor against chronic social problems and can reduce the probability of a negative outcome and strengthen adaptation, as has been shown for Alaskan men (*4*). Consequently, this chapter cannot provide baseline statistics on well-being in the Arctic. Instead, it will focus on selected key trends that can give insights into the factors that guard health.

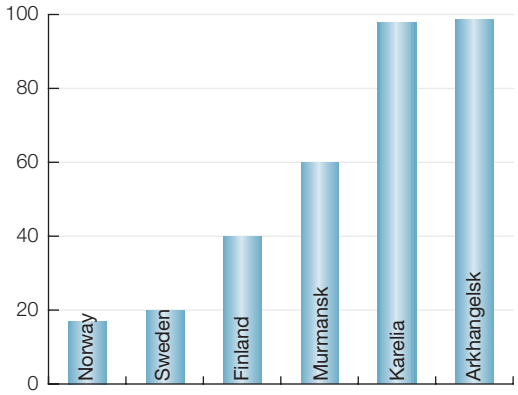
Well-being and local control of services

In the rapidly changing world of the peoples of the Arctic nations, there is a need to establish and maintain an environment that promotes health. This environment is made up of physical, social/cultural, mental, and spiritual aspects. The physical includes not only the biosphere and atmosphere but also the buildings and utility systems of each community. The social/cultural includes the economic, educational, and basic behavioral values of the community. The mental includes the attitudes of the citizens about their future and the role they and their children will play in building lives with quality. The spiritual includes that inner sense of belonging to place, in a relationship with the world at large and with a greater sense of the whole. Signs that all is not well in the factors that maintain health include the high suicide rates in parts of the Arctic and the decline in life expectancy in Russia. Experience shows however that new approaches in local control that engage the community can dramatically reduce such health disparities.

High suicide rates

In the Arctic, a major health disparity is the high rate of suicide, especially among young men, when compared with the populations as a whole. Rates of completed suicide among this sub-population in the North are much higher than the national averages, ranging from a slight increase to a factor of nearly ten (*7-11*) (see also *Chapter 11. Gender Issues*). There are many contributing factors to these startling numbers. When there are dynamic changes in the government, in culture, and in community and family values, there is stress on the individual. The inordinate level of change in the Arctic may well contribute to the increased rates of suicide (*6*).

Males in northwest Russia commit suicide at a higher rate than males in Scandinavia. And the Arkhangelsk oblast has the highest rate of suicide among males in the Leutire Barents Region (*12*).



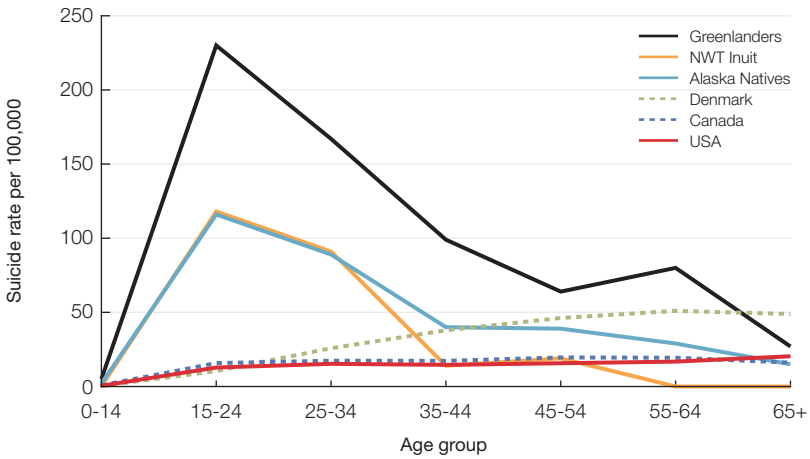
Number of suicides per 100,000 of male population in western Russia and neighboring nations 2000-2001(*12*)

In Norway there is no difference between Saami and Norwegian youth as to suicidal thoughts. Neither are there any differences between the two ethnic groups as to suicide attempts. There are regional variations however, depending for example whether you live in the areas where the Saami constitute a majority of the population or not (*13*). There is also a gender difference: more girls than boys have had thoughts of suicide. Among Saami youth, more girls than boys attempt suicide.

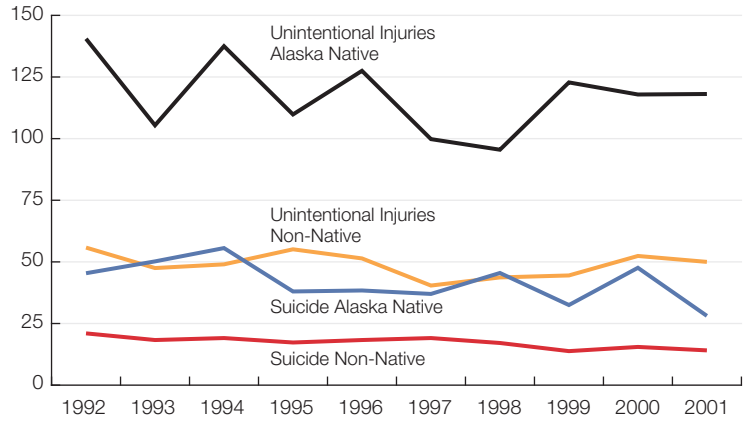
Among the Inuit, suicide rates among young adults are much higher than national or regional averages. While young women in Alaska attempt suicide more often, it is the young men who more frequently complete the act (*9*). This pattern has been associated with a view of

Inuit suicide rates per 100,000 for Greenland, NWT and Alaska with their national averages for Denmark, Canada and US by age group 1980-89 (*8*)

Suicides in Alaska, Greenland and Canada



Mortality rates (per 100,000) by race, cause and year Alaska, 1992-2001



Rate per 100,000 age-adjusted to the US Year 2000 standard population (*7*)

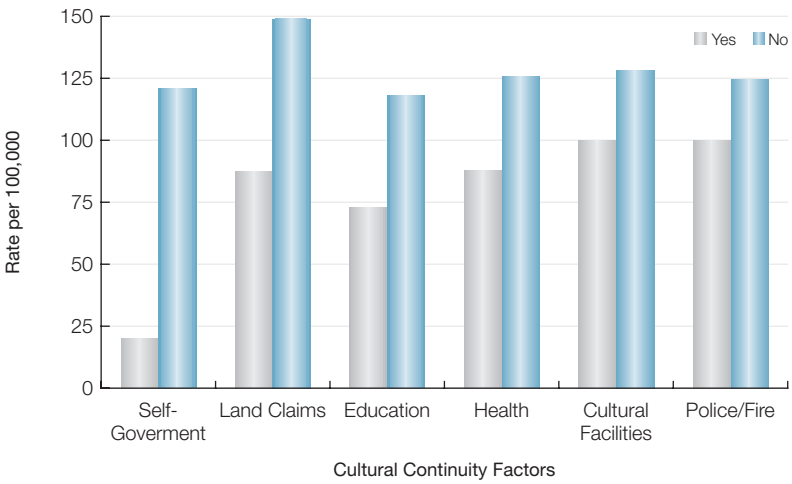
young males not seeing a future for themselves as hunters or contributors to their community and at the same time not fitting into the cash employment structures that are becoming the dominant lifestyle (*8*).

Within Alaska there has been research that links greater levels of acculturation with an increased risk of youth suicide (*9, 11, 14, 15*). The data on cause of death is unfortunately such that it is difficult to separate unintentional injuries that result in death, which may have been high risk behavior of depressed individuals, and confirmed intentional suicide events. This is a continuing problem in collecting and comparing data from the circumpolar region. The data is also organized and quantified differently with mixed genders, varying age groups, and there is no standard assessment of the definitions applied.

Self government and cultural continuity may help to prevent suicides

There are indications of ways to address the problem of high suicide rates. In some areas where there have been efforts to allow local self-government, mental health has improved.

Youth Suicide Rates by Cultural Continuity Factors (*6*)



Studies of 195 First Nations in Canada showed a decrease in adolescent suicide rates with an increase in self-government (*6*). Suicide risk also showed a strong linear relationship to the number of factors of cultural continuity that were present in the community. The six factors assessed were self-government, land claims, education, health services, cultural facilities, and police/fire service. Self-government was associated with the single largest percentage decrease. All in all, the suicides dropped from 137.5/100,000 with no factors present, to no suicides for the five-year study period when all six factors were in place in the target community. In subsequent research, child protection and women in government have been factors added to the assessment (*16*). The reduction of suicide from these alarming rates to zero is a result that other communities will want to examine.

Unfortunately the data from Greenland, where there has been local control and Home Rule for a number of years, show no such noted decline in youth suicide. The findings among the First Nations in Canada need to be further assessed and compared to the circumpolar populations that have the highest disparity for youth suicide.

Decline in life expectancy in Russia

In general, life expectancy has improved in the Arctic. In recent years, however, there has been a decrease in life expectancy throughout Russia, where there have been dynamic changes in economic and cultural conditions. From 1990 to 1995, four factors have been studied for their impact on life expectancy: alcohol consumption (- 1.5 years), economic environment (- 1 year), medical care system (+ 0.2 years), and stress (- 2.5 years). In spite of the improvements in the medical care system over this five year period, the net effect of dynamic change has been a decrease in life expectancy of 4.8 years. The most important factor was stress, which may also be reflected in other factors, such as poor economy and alcohol use (*17*).

In Russia, there have been recent attempts to quantify the impact of modernization (*18*). Blood pressure and blood glucose concentrations along with anxiety levels were measured for two groups of indigenous Siberians. Results indicate that the more urban the living conditions, the higher the blood pressure and glucose concentrations. The conclusion reached is that "modernization" and urbanization have serious health consequences on the indigenous people in Siberia. As people

move from remote settings into larger communities, not only do they perceive themselves as having less control over their health services, they also become more stressed overall.

Community engagement can foster resilience

Local control has been a recurring theme in Arctic health policy discussions. There have been calls to involve indigenous peoples in all levels of setting priorities for health research and health care (*19*). Other examples include the need to understand how people, in the face of pervasive social and cultural change, can retain a sense of control over their lives and an ability to cope with the changes they confront (*20*). Moreover, the United Nations has for decades maintained that local involvement in the development of solutions and active community engagement are critical in making health programs successful (*21*). Numerous studies have also documented that local control and an ability to predict actions for the future enhance the individual's physical and emotional well-being (*22*). The gradual implementation of local health programs in the circumpolar region provides new support for mechanisms that shift authority over health care into local hands. The following are some examples that illustrate factors that contribute to success in indigenous peoples' communities.

A large cohort study focused on indigenous children on the Hawaiian island Kauai has detailed some key factors for resilience (*23*). It shows that children who have supportive families, are given a second chance, and build strong relationships within their community, tend to go on and become successful contributing members of their society. The same factors have been identified in other longitudinal studies of children from the time of the great depression, and from other countries such as Great Britain, Denmark, and Sweden. The term that is being used to combine many of these factors is "resilience."

Some traditional indigenous groups in Alaska talk about their children being asleep. When they become adults they "wake up." It has been observed, however, that many young people, no matter what their cultural background, are waking up, and growing up, at a later age than before. For example, students can remain in Western-European-culturally-based schools well into their thirties, and not move to independence for decades. In contrast, a young hunter who brings home a seal or takes a reindeer herd through a yearly migration can be considered adult while still a young teenager. Rites of passage had their value and this is perhaps something worth revisiting.

Substance abuse programs in Alaska and Canada have begun a process of assessment for "best practices" (*24*). These programs are steeped in cultural values and provide services to entire families, and even to extended families. The understanding is that cultural environment for any one individual is dependent upon a foundation of family and friends that support the healthiest behavior. If one person needs treatment, then it is viewed as the entire supporting structure being in need of assistance. A popular poster states "It takes an entire village to raise a child." It seems to follow also that it takes the same community to keep that person healthy as an adult. This group approach should help improve services to everyone in need of support in dealing with behavioral health problems in remote communities.

Spiritual values contribute to well-being

Another component that has been mentioned as key in improving health among the indigenous peoples of the North is spirit. It was nearly a century ago that the mind was formally seen as topic of study, albeit separate from the physical aspects of the body. The field of psychology and later social work began to look at the mind and personal relationship environment as areas worthy of study. New techniques were devised to understand behavior. It became clear that behaviors could not be determined just by a person's ethnic background, upraising, or patterns of bumps on the skull. There is no way currently to quantify love from one's family or enthusiasm for a community organization, but these factors do influence resilience (*4*).

Many northern people continue their firmly embedded tradition of relating to their ancestors as well as to a strong spiritual world. While most have shifted from the understanding of the Inua or life spirit, to the concept that the Holy Spirit passes among living things, there is still a strong respect for life and for those who have lived before. Thanks and acknowledgement are an important part of gathering local food, as is saying a blessing before many meals purchased in cans or plastic containers.

New research in the field of complementary and alternative medicine indicates that the spiritual aspects of life contribute significantly to a

"This is the greatest error in the treatment of illness, that there are physicians of the mind and physicians of the body and yet the two are indivisible."
Plato

person's well-being (*25, 26*). In order to combine both the cultural and spiritual aspects of communities for addressing the well-being of the individual, there needs to be a change in the dynamics of the current medical models as applied in the eight Arctic nations.

For some northern peoples, the spirit is maintained by consuming locally obtained foods. A recent review has found potential associations in the changing diet, a shift in key nutrients and subsequent brain development and function (*10*). The group proposes that an epidemiological study be done to further assess the possible link between food, mental health, and even suicide.

Local control improves health services

Over the past four decades there has been a growing trend toward more local control of services in the Arctic. This includes home rule and tribal authority over the provision of health services. Two cases illustrate this trend, one from Norway and one from North America.

In Norway the Saami Parliament has stated that they have the responsibility for developing a comprehensive health policy for the Saami, one which ensures respect for Saami patients and takes their special needs into consideration. In 1995, after considerable pressure from Saami health professionals and political bodies, the Norwegian Ministry of Health and Social Affairs launched a white paper on integration of health and social services to the Saami population. In 2002, a four-year plan came into being, whose goal includes increasing the cultural competence of the health personnel working with Saami patients. Local as well as regional health service providers were invited to come forward with project proposals. In 1999, some of the money and responsibility of this program was transferred to the Saami Parliament. The evaluation of this program so far is generally positive.

Even though health care to the Saami is to be integrated into the general provision of services, there are specialist programs in both physical and mental health that have additional obligations. These services came into existence because both individual Saami doctors and their own professional organization established the services as a private initiative. They also put political pressure on regional authorities to establish a psychiatric service in the Saami core area. This is an example of young people taking positions of leadership and responsibility in their own community. This fits well with the experience from other parts of the Arctic where well-trained young people taking positions of leadership and responsibility in their own communities will contribute more than any other single factor in ensuring a satisfactory future (*27*).

In Sweden, Finland and Russia, there has not been a comparable development in health services. The Saami psychiatric and mental health services of Norway do, however, provide care in the northernmost part of Finland. These services are now in the process of becoming a national competence center in Norway; the Norwegian Saami Parliament's goal is a national competence center that comprises physical health as well as research. There is currently a Saami research center, which is funded by the Ministry of Health until 2005. Though its locus is in a Saami community, organizationally it is part of the University of Tromsø.

Throughout North America, tribal control of health care has been shown to increase client satisfaction, improve community awareness of health issues, and improve relationships between health care providers and local residents (*28-31*). One study has found improved health outcomes under local control; less rigorous studies have also shown indications of such trends (*32*).

There are two distinct forms of the local empowerment process. One is psycho-political empowerment where local individuals receive the resources and authority from others to implement change. The other is psycho-symbolic empowerment, which raises self-esteem or the ability to cope, but where the local circumstances remain basically unchanged (*33*). So while there are indications of improved perception of health and well-being with more local control, there are great inconsistencies in the various nations and regions of the Arctic on how this local control is to be implemented and what its impacts may be.

Trend summary

The rapidly changing world of the peoples of the Arctic nations has been connected to health problems, especially to high suicide rates and stress. There is thus a need to establish and maintain an environment that promotes health. This environment is made up of physical, social/cultural, mental, and spiritual aspects. There are unique issues in each and every community and various peoples may have significantly different approaches for addressing the problems that they themselves identify. With greater local control of community service pro-

grams there is some apparent improvement in both the perception and the outcomes of health-promoting activities. There needs therefore to be enough fiscal support to have quality programs and enough flexibility to allow for community ownership of the endeavors.

Environmental oneness – you are what you eat

A second trend in human health issues is the increasing number of community-based participatory health research programs, especially regarding traditional foods. Much of the impetus for these programs has come from the fact that activities beyond local control contaminate traditional food.

On food and self determination

In 1961, indigenous peoples in northern Alaska came together in Barrow to create their own "bill of rights" (*34*). The events that lead to the meeting included concerns about local control over education, hunters being arrested for taking birds out of season, and government plans to use nuclear explosives to excavate a harbor. The people called for local control of services and management as well as a total cessation of planning for nuclear excavation. This may have been the first time in the United States that a small group of concerned individuals stopped a major federal initiative on environmental grounds. The rights document called for local control of health and education programs along with wildlife management collaboration.

In the 1950s and 60s, concerns were raised throughout the Arctic about nuclear fallout from atmospheric testing and what this meant to reindeer and caribou, as well as to the people who depended upon them for food. This concern also led to community awareness about other contaminants that could impact the quality of subsistence species. In Canada, at McGill University, staff began to work with northern indigenous peoples on their food concerns. In 1993, the Centre of Indigenous Peoples' Nutrition and Environment (CINE) was established. This program has been a model for other nations in dealing with subsistence food sources.

The work of CINE has been recognized by the World Health Organization (WHO) through the production of a new guide on participatory health research for indigenous peoples (*35*). The process of working through community-based participatory research with indigenous peoples has been documented and the following factors were found to be particularly important for success: collaboration in the sharing of funding and credits for the work, common efforts on ethics and consent, joint partnership decision making, and benefits coming back to the community. Researchers are now learning how to be good community partners, while communities are learning how science works on their behalf. Both groups are becoming more sensitive to the needs of the other and the resulting research is more relevant to the communities. Throughout the world, these types of collaborative investigative endeavors are beginning to follow the lead of health programs that were established in the circumpolar regions. Through the program "Achieving Household Food and Nutrition Security in Societies in Transition," WHO has stated that community-based participatory health research is a basic human right.

Similarly, the Alaska Native Science Commission received support for holding meetings to discuss environmental concerns that have been summarized on their websites (*36*). What was learned is that there are many different observations of change and a growing number of questions as to what they mean. Some people have offered very clear explanations of what is changing in complex systems. Others have offered cautionary comments. What is clear is that the world as it has been known throughout the circumpolar regions is changing rapidly. In 1986, an international meeting discussed the use of traditional knowledge with science and included several presentations on the advantages of empowering communities to assume local control of health services (*37*).

Alaskan communities are following CINE's lead in establishing community-initiated research partnerships. The Aleutian/Pribilof Islands Association requested support from local, Alaska state, and US federal experts along with representatives from the University of Alaska and private sectors to prepare a proposal on environmental justice. They were successful in securing the research grant and now contract with others to conduct the work they designed. The focus of the work is reflected in the title of the project – Dietary Benefits & Risks in Alaska Villages. Tired of the emphasis placed on contaminants research, they decided to focus on the benefits of what people are eating. They are developing research questions, sampling design, and a communication strategy for dissemination of what is learned to the target communities.

Global political impact

In the early 1990s, the people of northern Finland took the opportunity to foster international dialogue with Russia after two events: the Chernobyl nuclear power plant incident and Mikhail Gorbachev's 1987 speech in Murmansk, where he proposed breaking down the old barriers and working for the good of all people in the North. The Finnish initiative provided the basis for the eight Arctic nations collaborating on producing an assessment of the state of the environment with directly comparable data (see also *Chapter 12. Circumpolar International Relations and Geopolitics*). The work was coordinated by the Arctic Monitoring and Assessment Programme (AMAP).

The AMAP assessment documented that contaminants from all over the globe reached the Arctic and became part of the food web, including people. At the 1997 Arctic Council Ministerial Meeting in Alta, Norway, the Norwegian representative received permission to take the new report to the United Nations in order to institute a larger process for controlling some of the persistent organic pollutants. That action, along with other documents and concerns, moved the world's nations into discussions that eventually resulted in the "Stockholm Convention on Persistent Organic Pollutants," which went into effect May 17, 2004. In addition to phasing out the production of twelve toxic and persistent organic pollutants, the convention establishes a process which will include other persistent and toxic chemicals in the future.

This global agreement was moved forward in some significant steps due to the work that had been done by circumpolar communities concerned about individual health and locally obtained foods. During the early negotiations, the United States had been cautious about the proposed intent and language. The Alaskan participants in the delegation urged greater participation by indigenous peoples from the US Arctic. Alaska Natives actively participated, attended key meetings, and put a very human face to the concerns about contaminants that were moving to the North and ending up in local food. Other northern nations had similar participation from their indigenous peoples.

During the early planning of AMAP's work, there were lengthy discussions on how the information in the report was to be organized. At first the idea was to look at the marine system, the terrestrial system and the freshwater system, but the approach shifted to looking at heavy metals, radiation, acidification, and organic pollutants as they move through all of the biological systems. It was felt that the chapter on human health would bring all of the concerns together. In a similar way the Arctic Climate Impact Assessment report of the Arctic Council uses health implications as a way to pull together a number of themes which provide a sense of our exposure to risk. The Arctic Council work has thus put a very human face to physical and biological research. The programs and work of the Arctic Council in environmental monitoring now include community and individual health impacts.

Trend summary

Human development in the Arctic is dependent on working within the environment. Health research has been conducted through local engagement and active participation, and the results have been shared to document the global influences that affect foods that are important to peoples of the Arctic. The Arctic nations have also been successful in the international application of grassroots environmental concerns, for example in the work leading to the Stockholm Convention on Persistent Organic Pollutants. This process of national governments working with local communities within an international forum is bringing global attention to regional concerns. Moreover, community-based health research as practiced in the Arctic can become a model for how health-related research is conducted throughout the world.

Merging traditions with new technologies

The third trend in Arctic health is the increased use of the latest technology in addressing community health concerns and delivering health services throughout the circumpolar North. Many of the tried and true health programs have now moved into the computer-technology age and are becoming models for others to use. The Arctic is moving from the 19th century to the 21st century in one generation.

Immunization and prenatal care illustrate successes of the past

In many areas of the Arctic, the successes of new technologies in promoting health have been recognized only in the past few decades.

Immunizations have increased life expectancy

through decreasing infant mortality. While the elimination of tuberculosis, increased and regularly available food resources, improved water quality, advanced housing, and other public and clinical services have improved overall well-being, immunizations have been the key to extending life.

Women are gaining near universal support for prenatal health care. It is realized that the healthier the child during the first few years of life, the better the long-term health outcome. Iceland took the position after World War II that they would focus their attention on pre- and postnatal care, as well as establishing a National Registry for coordinating health data (*38*). That effort has evolved into computerized health and genetics records for the entire population of the nation. Icelandic life expectancy is one of the highest in the world. With a nurturing health care system in respect to child bearing, mothers return to receive their well-baby checks and the full series of recommended immunizations. These health behavior patterns, once established, are long lasting and improve overall outcome.

Genetic mapping as a tool for public health

Iceland has also been a forerunner in looking at the genetics of large, yet isolated, populations. Greater understanding of the genetic factors, the health histories, the environment, and the behaviors of one group of people may offer opportunities to develop both preventive and restorative health programs.

The Icelanders began this research in 1975, based on a "natural laboratory" that was created a hundred years ago when 18,000 Icelanders – 20% of the population – moved to Canada to establish a new community there (*38*). The physical health of these two populations of Icelanders has been assessed and their genetic family heritage has been traced (*39-44*). The comparison of these two groups has provided insights into the genetic-environment linkages that influence general well-being. The genetic assessments have included a review of a wide variety of conditions, the person's family lineage, and information in a number of registries that are all linked through increasingly sophisticated computer systems.

A similar bi-national genetic project has been considered in Alaska on another divided northern population. Saami reindeer herders were brought to Alaska in the early 1900s to train people to husband caribou. Among the mixed-heritage descendents, some Saami genetic conditions have been found that are not common among the Yup'ik populations of the western part of Alaska.

Genetic projects in Alaska are currently looking at patterns that are associated with obesity and weight-related health conditions, such as heart disease and diabetes. There have been recommendations to assess some populations due to the high incidence of the eye condition myopia. The ability to use the latest technologies on health surveys with community participation allows for a fuller assessment to be made of the status of northerners.

Nowadays genetic research is carried out using the latest technologies in bioinformatics and genomics. Bioinformatics is the computerized analysis of the various bits of genetic code that are being inventoried. With a combination of modern genetics and computer technology, it is possible to make inventories of the genetic heritage of whole populations, and Iceland has taken the lead in this development as well.

Such programs raise a number of questions. While many national health leaders are calling for a greater understanding of the contributing factors to health and well-being such as behavior, environment, and genetics, there are increasing concerns about the control of information that may come from personal investigations (*45*). For example, genetic tests can assess the likelihood of future conditions arising in apparently healthy individuals decades prior to their onset. This is quite in contrast with individual health problems connected to one's behavior. Moreover, if one person in a family agrees to genetic testing, information about all family members may be derived which could be considered a breach of their right to confidentiality, and personal desires for privacy. While the technology of our time has provided us with the opportunity to learn more about our past and future health, our laws and ethics have not kept pace with our inventions.

Local health aides: from tuberculosis to telemedicine

The scourge of tuberculosis in the Arctic is legendary. In Alaska the problem was so severe that once it was documented in the early 1950s, the US Government shifted the health care of its indigenous people to a newly formed Indian Health Service that was created just for them. It was constructed out of the Public Health Service that had existed for treating other special popu-

lations in the nation. Within a few years, major programs targeting tuberculosis had their impact and the disease all but disappeared. A system in which individuals selected from the community saw to it that everyone took their full course of medication played a key role in controlling the disease. There continues to be concern for tuberculosis in some areas where proper treatment is not followed and new drug resistant strains are appearing. This is especially the case in Russia, where a local system for control is not in place and where many people only receive partial treatment. Instead of being eradicated, the disease-causing agent has modified itself and become drug resistant, resulting in a new epidemic and concern of its further spread.

One group of health professionals that has received support in Alaska and Canada is that of the Community Health Aides or Representatives. This concept, based on the 1830s Russian "feldsher" system, was formalized in Alaska in the 1960s. Every community, no matter how small, could have a person trained to provide basic health services. Over the years, these people have become the backbone of primary health care delivery in remote communities for all people (*46*).

In the first years of the 21st century, these health aides are being trained in the use of new computer-based telemedicine systems and analytic tools. This system allows for physical health parameters to be put into electronic form for review, storage, and distant expert consultation without having the client move from the home community (*47*). Having the basic community support structure was critical to the implementation of the new program for providing even greater access to health care providers. In Scandinavia, the field of telemedicine has been extended with mobile units that are taken with reindeer herding groups throughout their range.

Waste management illustrates two faces of modern technology

A problem with a long history in the Arctic is sanitation. Potable water is difficult to access for communities built on rock or permafrost. Wastewater is difficult to dispose of in these same areas. Solid waste at one time consisted only of left over organic materials, but now has expanded to include plastic bags, aluminum cans, and styrofoam packing materials that do not degrade, but collect and then blow about. The more materials that are brought into the Arctic, the more trash become a problem. The more people who live in the Arctic, the more things they need from the south. In addition, the more resource extraction that takes place, the more waste that is also left behind. Fishing nets foul shores. Fuel drums dot remote landscapes. Broken vehicle parts can be found throughout most remote districts.

New techniques of securing fresh water from the ocean or generating electricity from the wind or through oceanic heat pumps provide for more comfort in life in the North. However, these same successes have required more building, which creates local heat-island effects, and have generated trash from all of the packaging that is shipped north. There are some agreements about shipping aluminum and cardboard back, such as the "Flying Cans" program supported by the Alaskan air carriers at no charge. The overall impact, however, has been an increasing need for local landfills where there is little or no gravel or other material for capping. Even when waste is segregated so that the glass and tires can be chipped to provide cover for the organic wastes, these programs need personnel. Small communities do not have the tax base to provide such services and governmental funds are limited for small communities.

Recent work has included looking at using some combustible wastes to burn and reduce the overall volume of waste materials. The use of super-filtration units to reduce the amount of waste crankcase oil that needs to be disposed of has cut the volume. Once oil replacement is required, filtering the old oil makes it possible to use it to burn other materials. A note of caution is that waste incineration without proper technology can generate dioxins and other persistent and toxic pollutants (*48*).

Mind, body, and spirit in new health care partnerships

The communities of the Arctic desire the latest that our global society can provide. The application of new technologies to more traditional practices appears to some as a discord, but for those living in the circumpolar region these are new tools to make life a bit better. Two examples illustrate how mind, body and spirit are integrated in new health initiatives.

Russian researchers have developed a device that combines a number of traditional and technical concepts: The Gas Discharge Visualization camera. Based on the meridian system known from acupuncture and the photonic energy emissions from living bodies, the camera cap-

tures light emissions after an individual is subjected to electrical stimulation. A computer then models the individual's health profile. This devise links traditional healing, oriental philosophy, and the latest electronic and computer technologies in a new diagnostic tool that may assist in the quantification of health and well-being (*49*). This device is also now being used in research projects in the United States.

The second example involves the University Hospital in Tromsø, Norway, which has had a project where a healer was invited to provide services. This is an illustration of a way in which northern communities are working on incorporating traditional practices into the regular health services. In Alaska there are two officially sanctioned programs where traditional healers are co-located with health practitioners, and this collaborative health care model is growing in acceptance.

There are efforts currently underway to assess some traditional practices for their effectiveness, especially in dealing with chronic pain. At the University of Tromsø, there is a research center financed by the Research Council of Norway for 5 years (2000-2005) on "complementary and alternative medicine."

It is only recently that western health care systems have started to integrate the spiritual health of their individuals with social, physical, and mental well-being. To many indigenous peoples, the concept of separating these four components is beyond comprehension, while combining them is seen as equally ludicrous to those whose educational systems atomize every topic. The inclusion of local values in the promotion of health, well-being, and self-esteem are seen by many indigenous people as the foundation of any healing system. Broadening our ideas about what constitute health services and the best ways in which to provide help in cross-cultural settings will help create new approaches to solving old problems in well-being.

On the topic of linking traditional knowledge and information technology, the book "Inuit in Cyberspace: Embedding Offline Identities Online" points to innovative uses of the internet by the Inuit (*50*). Another example of how indigenous peoples are creating new innovative uses of technology is illustrated by the fact that students from a very small school in Gambell, Alaska, won the International Future Problem Solving competition. This is considered possibly the most difficult academic competition for young people, as it combines research, creative thinking, essay writing, and verbal skills (*51*). Not only did they win, but for the first time ever, the same school won in both the Junior High School and the High School team categories in the same year; in addition, the High School team set the record for the highest score ever to that date.

Different ways of thinking about the applications of new technologies can open amazing new ways of perceiving the world. These examples of fostering local cultural strengths in order to diversify health care services and alter perceptions of the quality of health offer a positive link for moving forward. Students should be encouraged to use their cultural framework for creating new solutions and look at new ways of thriving. These skills are building a foundation from which new endeavors can be created. These cross-culturally-wise students will construct the successful and sustainable communities of tomorrow's Arctic.

Trend summary

There have been many successes over the years in applying technology and new approaches to addressing health concerns in the Arctic. Lessons learned from not-so-distant histories of the region indicate that learning from the people and being flexible in approaches to solutions will offer the greatest opportunity for long-term success. Local provision of health services as well as community-initiated research partnerships will lead to a better understanding of the quality of life in northern communities. The shift of responsibility and leadership will be followed by an increase in the perception of one's own health as a contributing member of the society.

Key conclusions

The international collaboration of the Arctic Council has been successful in sharing health information among a number of its programs. However, data that delineate indigenous peoples groups as well as regional health disparities and emerging concerns are often lacking. Moreover, there is a need to include a greater number of directly comparable health parameters.

Arctic communities have gone from communicating by citizen band radio when doctors and health aides needed to consult to the latest in telemedicine diagnostic tools in less than 30 years. In many cases, medical advances and innovations, such as immunization and new forms of local health care, have improved well-being. The rapid pace of change, however, and

the questioning of cultural practices and traditional community values have also resulted in mental health problems in many communities. In this case, the chapter has shown that there may be an association between the amount of local control over services and well-being in Arctic communities. We need therefore more information about the programs that are delivered in remote communities, especially how they are controlled. Such a review should include a broad range of programs many of which are provided specifically as "health" services.

Traditional healers who were previously disdained by health care professionals are now working in hospital settings. This is part of a growing trend of combining traditional values with modern technology. New partnerships and shifts in responsibility to local communities, can lead to a more positive perception of one's own health, which has been shown to be the most significant predictor of well-being.

The Arctic Council and a number of its associated programs have shown leadership in developing new cooperative efforts in health research and applying new technologies for health care in remote and isolated communities (*52*). The best practices that have been implemented can be shared to reduce health disparities in remote communities and with minority populations. These efforts have been reflected in the pages of the International Journal for Circumpolar Health and during the meetings and in the proceedings of the International Congresses for Circumpolar Health and the meetings of the International Arctic Social Sciences Association (*53-55*).

The lessons learned in the circumpolar region are of global interest. Here are the developed nations developing their remote communities. These are the nations who can best afford to be flexible and innovative. These are the technically and economically successful countries attempting to improve the well-being of populations who are identified as having health disparities, whose communities have long struggled with problems of cultural identity and the erosion of local values during the storms of political and economic upheaval. It is imperative that these hard-won lessons be shared with the developing nations.

Gaps in knowledge

On many issues of health and well-being in the Arctic, there is a lack of information. In order to be able to make more comprehensive reports on this topic in the future, a number of issues need to be addressed by the Arctic Council and by the research community.

Of highest priority is the gathering of consistent and directly comparable health data for the Arctic, including birth weight, birth outcome, umbilical cord blood screening, maternal blood screening, breast milk, child development measures, emergency visits, immunization records, hospitalization rates, laboratory outliers, tumor registry, incidence of illness, health educational evaluation measures, and unit costs for specific health services (*56*).

More research is needed on how best to give the children of the North supportive home environments. This includes gathering information about the training they desire in order to be contributing members of their own communities.

Home rule exists in a number of forms throughout the Arctic. There are some studies that indicate that this form of local control leads to a dramatic decline in suicide, with an overall improvement in mental health, while other studies do not find a similar improvement in suicide statistics and quality of life. More research is needed to understand these conflicting results.

"Community cohesion" and individual and community "resilience" are important for well-being, but these factors are seldom reflected in health statistics. We need to find ways to quantify these factors and their role in "quality of life" in a way that makes it possible to compare the situation across the Arctic nations.

Finally, more knowledge is needed about how to best promote the development of the skills that are necessary for life in remote communities, where resilience and self-reliance are critical.

Chapter summary

Arctic communities and cultures are keeping pace with the latest health technologies and desire the accompanying benefits. Many innovative approaches build on a combination of tradition and new approaches. However, the coverage of new technologies is inconsistent.

Concerns about food and environmental pollution were a starting point for community-based research, with new partnerships between indigenous peoples and the scientific community. This has been important in connecting local Arctic concerns to global environmental policy discussion.

Health challenges are unique to each Arctic community and there is thus a need for flexibility in community-based services. This chapter shows that many factors that are not usually considered part of health care are important for well-being, including cultural continuity and local self-governance. The values and decision-making processes of local communities need to be identified in order to establish and maintain the best working partnerships for preserving and promoting health.

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