

# National Arctic Health Science Policy

American Public Health Association

Task Force

# National Arctic Health Science Policy APHA Task Force

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## **Executive Summary**

The purpose of a National Arctic Health Science Policy is to assure that the United States is prepared with adequate knowledge to execute its policies for national development, environmental protection, and national defense in circumarctic lands and seas and mid-latitude cold or mountain regions in a manner that protects and promotes the health and quality of life of people living and working in those regions. The magnitude of federal financial and program commitments to the provision of health services in the Arctic dictates vigorous research to make federal operations more effective and efficient. Additionally, the Arctic provides opportunities for research that can enhance the health of all Americans.

Resources for arctic health research currently fall short of national needs; progress is restrained by the absence of policies to coordinate and promote research. This National Arctic Health Science Policy provides a clear statement of national commitment to a vigorous, continuing program of arctic health research.

The following are recommended to strengthen arctic health research:

- "Arctic Desks" should be developed within the National Institute of Health (NIH), the Alcohol, Drug Abuse and Mental Health Administration (ADAMHA), the Environmental Protection Agency (EPA), and the National Science Foundation (NSF).
- Task forces should be convened within NIH, ADAMHA, EPA, NSF, and other agencies to define arctic health research priorities within the mandates of those agencies. Interagency collaboration and coordination are essential.
- International cooperation should be promoted vigorously between scientists researching health issues in the Arctic.
- Mechanisms should be improved to publish, review, translate, and abstract scientific literature relevant to health in the Arctic.
- A computerized directory of scientists with arctic health expertise should be developed.

- An arctic health information repository and clearinghouse should be developed and maintained to provide mechanisms for ready access by health care and research professionals to previously published and unpublished articles and reports pertinent to the Arctic and to provide a system for rapid dissemination of new results.
  
- A series of working groups should be convened to:
  - recommend standardized definitions and measurement parameters for health and environment-related data collection in arctic areas;
  
  - assure maintenance of a system for collection, analysis, and prompt reporting of vital and other health statistics necessary to accurately monitor morbidity and mortality of arctic populations;
  
  - assure a system of collection and reporting of demographic data of arctic populations that are timely, accurate, and sufficiently detailed to provide baseline data to monitor health and to use as a guide for appropriate distribution of health-care resources and personnel;
  
  - develop a program to establish baseline data and to monitor environmental factors such as ambient air and water quality data.
  
- An arctic health research resource system should be developed to:
  - maximize quality, cost-effectiveness, and productivity through a multidisciplinary, international network of researchers affiliated with diverse institutions and assisted by an organization for coordination, logistic support, training, and research in the American Arctic;
  
  - maintain appropriately trained personnel and logistic support so that these personnel can respond rapidly to unusual reports of illness.
  
- Agencies, organizations, and individuals involved in arctic research should:
  - assure health research in the Arctic is appropriate and addresses unique and/or important problems of the Arctic and its populations;
  
  - assure health research in the Arctic is done only with the participation, full consent, and approval of the people to be studied as well as the professionals and agencies involved in providing health care;
  
  - assure that results of all research are reported back to all those involved in a timely and appropriate fashion.

# National Arctic Health Science Policy

## APHA Task Force

### 1. Purpose

The purpose of a National Arctic Health Science Policy is to assure that the United States is sufficiently informed to execute its policies for national development, environmental protection, and national defense in circumarctic lands and seas and mid-latitude cold or mountain regions in a manner that promotes and protects the health and quality of life of people living and working in those regions.

A National Arctic Health Science Policy is a set of guidelines and principles to stimulate:

- identification of research needs;
- development, coordination, sustenance, and evaluation of research programs;
- dissemination of research results in order to enhance health and advance biomedical knowledge in regions where arctic environmental and living conditions prevail.

Most importantly, a National Arctic Health Science Policy is a clear statement of a national commitment to develop a vigorous, continuing program of arctic health research.

### 11. Findings

#### *History of National Policy on Arctic Health Research*

Between the end of World War II and about 1970, there was a significant expansion of research facilities and capabilities to address issues of health and disease in the Arctic. In 1948, Bob Bartlett, the Delegate from the Territory of Alaska, addressed his colleagues in the House of Representatives during the 2nd Session of the 80th Congress:

We Americans have long known the importance of research and careful studies to get at the basic causes for disease and I cannot emphasize too strongly how urgently this type of work is needed in Alaska. I fear that we have already delayed too long. We knew before World War II that Russia was making great progress in scientific investigation, research, experimentation, in Siberia-which you know is only 54 miles across the Bering Sea from Alaska-but nowhere in the United States of America or Alaska are the simplest academic scientific facts known about conditions as they exist in the arctic and how they affect all of the various aspects of health .

Following studies by the American Medical Association and the American Public Health Association (APHA), the 81st Congress appropriated \$7.8 million in 1949 to establish an Arctic Health institute "for the use of the Public Health Service in carrying on research ...with particular emphasis on health problems pertaining to the Arctic regions, and in cooperating with the medical departments of the armed forces and with other public and private agencies carrying on such activities"<sup>2</sup>. The University of Alaska donated land on what is now the Fairbanks campus for the facility. From the beginning, it was a recommended policy that "the facilities of the proposed Arctic Health Institute be made available to all qualified research workers interested in studying problems relating to Arctic health"<sup>3</sup>. As the perceived research needs were urgent, a field station, the Arctic Health Research Center (AHRC), was established in Anchorage in 1949; plans for the Arctic Health Institute were shelved.

Through the 1950s, operational funding for the AHRC remained at approximately \$400,000 per year<sup>4</sup>. The AHRC focused on six broad areas of study: environmental sanitation, biochemistry and nutrition, zoonotic diseases, entomology and insect control, physiology, and the epidemiology of infectious and other diseases. During this period, the AHRC was housed in three rented buildings and 18 makeshift structures in Anchorage. A decade later, in 1967, the activities were moved to the new, specially designed AHRC on the University of Alaska campus in Fairbanks. By 1970, the AHRC had 85 full-time employees and two field stations in Anchorage and Bethel<sup>5</sup>. The Center also housed one of several U.S. water pollution laboratories that had been established by the EPA in 1968.

From 1948 until 1967, the U.S. Air Force operated an Arctic Aeromedical Laboratory in Fairbanks, which researched cold thermophysiology, survival nutrition, and the development of cold weather equipment for the armed services<sup>6</sup>. In 1967, the facility was turned over to the U.S. Army, which operated a frostbite research center there.

The importance of the Arctic to national interests was reaffirmed on December 22,1971, in National Security Decision Memorandum 144, which stated:

The President has decided that the United States will support the sound and rational development of the Arctic, guided by the principle of minimizing any

adverse effects to the environment; will promote mutually beneficial international cooperation in the Arctic; and will at the same time provide for the protection of essential security interests in the Arctic, including preservation of freedom of the seas and superjacent air space<sup>7</sup> .

That memorandum also approved the development of a coordinated plan for scientific research in and concerning the Arctic. Nevertheless, in the decade that followed, federal health research programs in the Arctic were dismantled. The Arctic Health Research Center was closed in 1973; the building and equipment, valued at \$9.3 million, were given to the University of Alaska<sup>6</sup>. The Army's cold weather research laboratory was also closed that year. The EPA Water Research Laboratory was closed in 1979.

In 1981, the Polar Research Board of the National Research Council formed the ad hoc Committee on Polar Biomedical Research to define polar biomedical research needs. Summarizing the past and future needs for arctic health research, the Committee provided the following overview of research strategies:

Whenever people enter environments that are extreme for them, the principal objective of medical science is to ensure human survival. This strategy characterized polar expeditions up to the 1940's. Once it has been established that human populations can survive, or even thrive, in a particular environment, the medical objective becomes delineation of those qualities and characteristics that will predict survival. This strategy dominated polar biomedical research from about 1940 to 1970 in the southern polar regions. However, when what was once experienced by but a few is experienced by many, the medical strategy shifts again. The emphasis is on conditions that will facilitate human adjustment, that is, on providing a situation in which a person can expect to be healthy, happy, and effective in family life, work, and community relationships, without crippling emotional symptoms, such as fear, anger, loneliness, envy; or greed. We believe that U.S. development in the high latitudes in the next decades demands this third biomedical research strategy<sup>8</sup> .

This effort became the springboard for the more broadly based activities of the APHA Task Force on National Arctic Health Science Policy, appointed by the APHA Executive Board in 1983 to involve a broad range of people with interest and expertise in formulating recommendations for a National Arctic Health Science Policy.

#### Current Status of Arctic *Health Science*

On April 14, 1983 President Reagan issued a Presidential Statement on United States Arctic Policy affirming his support for the development of a national arctic science policy:

...the United States has unique and critical interests in the arctic region related directly to national defense, resource and energy development, scientific inquiry, and environmental protection. In light of the region's growing importance, it warrants priority attention by the United States.

However, there continues to be a void in health research in the Arctic. Organizations focusing primarily on health-related research have few personnel, limited funding, and specialized missions.

The only active organization performing health-related research as its primary mission is the Arctic Investigations Laboratory, Center For Infectious Diseases, Centers for Disease Control (CDC). This laboratory, located in Anchorage, has a professional staff of six researchers. It concentrates its research on infectious diseases, recently focusing on hepatitis B and invasive *Hemophilus influenzae* type B disease. Epidemiologic investigations of streptococcal disease and its sequelae, cancer and other chronic diseases, infant morbidity and mortality, and anemia have been undertaken in the past and are continuing. Additionally, the Alaska Department of Health and Social Services has an Epidemiology Office. It has one professional employee, who divides his time between program administration, field investigations, and research.

Various organizations that are health science resources for the Arctic do execute some research, but the primary mandate for each is frequently clinical service or training. As a result, they have not served as focal points for comprehensive research programs. For example, the University of Alaska supports an Institute of Arctic Biology, which is predominately concerned with studies of ecology and animal physiology, and a Center for Alcohol and Addiction Studies, which has a teaching and research staff of four. Research studies are conducted as well by clinicians and other health professionals through the Alaska area Native Health Service, Indian Health Service, USPHS, DHHS. In addition, the Arctic Health Science Library in Anchorage provides MEDLINE, a computerized retrieval system for published literature.

Research efforts in the Arctic are hampered by the absence of funding sources supporting arctic research, and trained and experienced personnel. For the most part, health researchers in the Arctic have been unable to attract support from the National Institutes of Health; the National Institute of Mental Health; the Alcohol, Drug Abuse, and Mental Health Administration; the Environmental Protection Agency; or other federal sources of extramural grants. In part, this reflects the American health research community's lack of awareness of research needs in the Arctic. It is also because there is a limited academic base from which such researchers could operate.

Health science in most regions is supported by an academic infrastructure which provides facilities and a base of operations for researchers, integrates and applies research knowledge, and trains personnel. This infrastructure is poorly developed in the case of arctic health research. Alaska has no doctoral

training programs in psychology, anthropology, or sociology, and no masters degree program in public health, epidemiology, or demography. Nor do U.S. institutions outside Alaska with advanced degree programs in these disciplines offer an emphasis or focus on the Arctic.

In addition, the absence in North America of a multidisciplinary journal of arctic health limits communication between arctic health researchers. Much research is done by agencies that have primary missions to deliver health services-agencies that place little emphasis on research and its publication.

Large quantities of data, now of interest for internal comparison, were lost when the various federal arctic health research facilities closed. Potentially useful health information on the Arctic collected by extant agencies is buried in files or discarded. Data collected in the Arctic are often repositied in their institutional files, where they remain unpublished and inaccessible to other researchers. The only forums for health researchers in the Arctic are the International Symposia on Circumpolar Health, held every three years, the annual meetings of the Alaska Public Health Association, and the annual meetings of the Arctic Division of the American Association for the Advancement of Sciences. The result is that research efforts often do not produce useful results.

Historical conditions have resulted in the reduction and fragmentation of health research on the American Arctic. Research opportunism, lack of dissemination of findings, noncollaboration among researchers, lack of responsiveness to local concerns and needs, lack of a clear federal commitment to arctic science, and other factors have contributed to uncertain and discontinuous support for research on Arctic health. The resulting decline in health science productivity is occurring at a time when research findings are most needed in the region. An explicit and forceful policy is needed to rectify this situation.

#### *Health Research Needed for Arctic Development*

A number of changes have produced an increasing need for more researchbased knowledge relevant to health and disease in arctic areas. Increasing economic activity, related especially to natural resource development, has led to increase in the size of the resident population and has produced dramatic changes for residents of existing Native and Euroamerican communities. Work environments in arctic areas expose workers to processes and substances under conditions not previously studied. There is a continuing need for personnel to operate in the arctic regions for purposes of research and exploration, and the persisting potential of military activities in arctic regions.

As a consequence of these developments and conditions, large numbers of people are living and working in arctic communities under conditions where health effects are not well known. For example, the deleterious consequences of hard rock and asbestos mining on workers are well known, but not under arctic conditions.

The strategic and economic importance of the abundant supplies of oil, gas, coal, minerals, and seafood in Alaska has generated an irreversible and increasing demand for the development of these resources. Development of these resources-directly or indirectly through such activities as the construction of houses, water supplies, waste disposal facilities, other utilities, industrial sites, dams, harbors and piers, artificial islands and pipelines-poses significant challenges for health researchers<sup>10,11</sup>.

In other cases, development cannot proceed until basic health-science questions are resolved. For example, our understanding of such feared diseases as botulism and paralytic shellfish poisoning has progressed little in past years. Obvious benefits to afflicted individuals will result from research to improve understanding of the pathogenesis, natural course of disease, specific therapeutic interventions, and preventive strategies. Apart from prevention of human suffering, research could have vast economic benefits. A potential multimillion-dollar clamming industry could develop in Alaska if research discovered a method to prevent paralytic shellfish poisoning.

Current environmental regulation requires governments and developers to demonstrate that project development will not produce significant adverse effects, including health and environmental effects, before a project is approved. Further, health problems of workers and families add significantly to labor turnover and to labor costs. Thus, efficient development of some resources requires research to identify, prevent, and treat adverse health effects associated with development.

Because of the extreme environmental conditions which prevail in the Arctic, people as well as all living organisms are under constant environmental pressure and are subjected to a wide variety of physical strain and mental stresses: low temperatures, battering winds, reduced visibility in icy fogs or whirling snow, prolonged periods of darkness, and transportation hazards, for example. This aggressive and demanding environment impairs individual performance and affects social life in remote communities. There are indications that low frequency atmospheric pressure waves, wind-generated noises, shifting photoperiods, and disturbances in circadian rhythms may profoundly influence psychological balance, modify sleep patterns and endocrine function, affect mood and behavior, and cause deep anxieties associated with depression and psychotic disorders<sup>12</sup>. Studies of circadian rhythms and their alterations in the Arctic have enormous implications for clinical medicine, behavioral science, and public health<sup>13,14</sup>.

Work settings and work patterns under modern arctic conditions are hypothesized to create stresses on workers and their families that generate health problems or disruptive behavior. Commuting to work, which may involve extensive absences from families and intensive periods of work in isolated settings, demands a type of adaptation for workers and their families that is not well understood. Commuting requires transportation over distances of hundreds or

thousands of miles, across numerous time zones, and from vastly differing climates.

In the Soviet Union, which has ambitious plans for exploitation of circumpolar areas, research on ways to facilitate the adaptation of settlers has been extensive. Soviet scientists have studied extensively differences between the "sprinters" and "stayers"<sup>15</sup>. Yet, political and social conditions in the American Arctic differ dramatically from those in the Soviet Arctic, making the transfer of these research findings limited.

The federal government has unique relationships with and responsibilities to Native Americans, who constitute a significant portion of the arctic population. Many Alaskan communities and individuals have been affected socially, as innocent bystanders, by resource development and associated projects, particularly in the last decade. Some of the basic changes in Native traditional life are the reduction in subsistence activities to produce family incomes, the increased use of a cash economy, and an increase in the availability of alcohol and other drugs. Contact with the dominant American culture is intensified—a result of the introduction of television and other mass media to the villages, and of the presence of increased numbers of non-Native immigrants to the villages.

The dominant and pervasive use of the English language has resulted in loss of Native language and oral traditions. Anthropologists predict that most Alaskan Native dialects may be extinct within 20 years, leaving only two to three commonly spoken. Thus, the rate of cultural change escalates, producing stress and undermining traditional social support systems. As a consequence, traditional modes of adaptation are no longer adequate, and new modes of adaptation are emerging.

These far-reaching consequences of development in the Arctic are poorly understood. Research is needed not only on social processes in Alaska Native communities, but also on public policy to ascertain developmental options that could minimize the negative impact on these communities.

Expanding resource development and defense activities have led to larger, denser populations in the Arctic. Arctic development creates potential, but poorly understood, threats to health and well-being. More information is needed on indoor living conditions. Problems of indoor air pollution are particularly severe in air-tight, highly energy-efficient buildings that preserve heat by scrubbing and re-circulating air. Special attention must be given to toxic gases released through degassing of polymers, coatings, and paints or by heat and energy production. Known gases, such as carbon monoxide, carbon dioxide, and formaldehyde, and a multitude of unknown or less-well-studied gases, are recycled through ventilation systems<sup>16</sup>. Research is needed on air and water quality, storage, distribution, recycling, and control. Further research is also needed on the design, construction, operation, and maintenance of equipment related to sanitation, hygiene, and family life<sup>17</sup>.

For goals regarding national development to proceed in the Arctic in a responsible manner, provision of health services to the persons living and working in the Arctic must be adequate. This is a particular challenge: communities and work camps in the Arctic are often too small to provide an economic base for traditional private medical practice. What's more, people are distributed over vast geographic areas without surface transportation to connect them. It is also difficult to attract highly trained health professionals to live and work in isolated, arctic settings. The opportunities for innovation regarding health care in the Arctic are tremendous-in technology, manpower, and organizational systems<sup>18</sup>.

Research is needed to evaluate existing, as well as new and innovative, approaches to the delivery of health services; to develop appropriate medical technology for arctic conditions; to discover how best to train, recruit, select, and retain health manpower in isolated areas; and to analyze national policies and guidelines to discover which are appropriate for arctic conditions and which need to be adapted.

### *Environmental Factors Related to Public Health*

Recognizing its responsibility to protect the environment, the federal government does support environmental studies in the Arctic on the impact of certain types of commercial development-including fishery, forestry, mining, and oil development-as well as community development and hydropower. However, additional research is needed to assure a healthy environment. Construction and resource development projects in the Arctic may disrupt permafrost, which in turn might affect dust formation, water table levels, currents, and other environmental conditions; if so, public health could be affected. Frozen earth creates challenging problems for sewage and waste disposal. Research and development are needed to produce low-energy, compact, and unsophisticated alternate processes for waste disposal and sewage treatment in arctic conditions<sup>17</sup>.

Agricultural development is proceeding at an unprecedented pace in Alaska, both to assure that the State could feed its inhabitants were supplies from the contiguous 48 states to be cut off, and to make vast acreages of Alaska commercially productive as a renewable resource. Because of harsh arctic conditions, new methods of tillage have been developed to preserve limited topsoil. These methods are highly dependent upon the use of herbicides and pesticides. The health effects of these chemicals are incompletely understood in temperate climates; their short or long-term effects are virtually unknown in an arctic environment. Insufficient data are available to provide reassurance that surface and ground water contamination will not lead to major long-term health and environmental problems.

Global patterns of atmospheric circulation transport air masses to the Arctic

from lower latitudes. These air masses, often heavily polluted by industrial or human-related activities, are responsible for "arctic haze"<sup>19-20</sup>. As a consequence of this long-distance atmospheric transport, mineral dusts, biological materials, microorganisms, chemicals, and radionuclides are deposited on land, where they remain entrapped in the thin, biologically active layer above the frozen ground and enter the trophic chain. Of particular significance for public health are radioactive substances, polychlorinated hydrocarbons, mercury, and other toxic agrochemicals that might reach high concentrations in basic indigenous foods and become bioconcentrated in selected tissues of the human organisms. Extensive research is needed to get a better understanding of atmospheric pathways, deposition schemes, concentration and uptake processes, and cumulative impacts on sensitive arctic ecosystems<sup>21</sup>.

The goal of research on the dynamics of toxic chemicals and radionuclides, man-made and natural, in the arctic environment is to determine whether the dispersion and clearance of chemicals and radionuclides in the arctic environment are unpredictably different from more temperate environments. If differences are found, the mechanisms or explanations for these differences need to be elucidated, allowing development of models for prediction of amounts and concentrations of chemicals and radionuclides in the environment. Definitive areas for study include pesticide degradation and movement in soil, water, and air; identification of potential bioconcentration chains; and atmospheric movement of chemicals and radionuclides. A program to establish baseline data and to monitor systematically ambient air and water quality as well as other important environmental factors also is needed.

Particularly among Native people in Alaska, there is an urgent demand for continuous monitoring of radionuclides in the air, water, ice, and soil and in plants, animals, and man. The essential cohort studies of Eskimo and Indian populations with known exposures to radionuclides from fallout have never been done. Such empirical investigations of population effects from fallout radionuclides in these populations should be initiated as soon as possible. These populations include people living in the vicinity of Anaktuvuk Pass and in other areas with known exposures to high levels of fallout radionuclides<sup>22-26</sup>.

#### *Management Needs of Federal Programs*

The federal presence in the American Arctic is massive; so is the need for a National Arctic Health Science Policy. In 1980, 20 percent of all jobs in Alaska were with the federal government and 86 percent of the land was in federal ownership. Even after all the State and Native land selections are completed, the federal government will retain ownership of 60 percent of Alaska's total land. Although the federal government spent \$2.1 billion in Alaska in 1980, its earnings from Alaska in 1981—primarily due to resource development—were estimated to be 3.6 times as great as its expenditures<sup>27</sup>.

In fiscal year 1982, federal expenditures for the Indian Health Service in Alaska were \$87.9 million<sup>28</sup>. Additionally, the federal funding for Medicaid and Medicare, block grants, and other health-related programs is substantial. The magnitude of the federal financial and program commitment to provide health services in Alaska should dictate vigorous research to make federal operations more effective and efficient. Such research should be directed at health promotion, health policy, and prevention of health problems, especially those that result in high use of health services.

Types of health policy research that could be helpful to federal program management include research on health manpower; the integration of traditional Native health practices into the western health-care delivery system; the impact of innovative health policies; client involvement in policy making; and the social and cultural patterns that affect the delivery, use, and effectiveness of health services in arctic communities.

### *Social and Behavioral Aspects of Health and Illness*

A significant amount of mortality and morbidity in arctic communities originates in social and behavioral processes rather than in organic conditions and infections. Since the leading causes of morbidity and mortality in Alaska are behaviorally based, prevention is closely related to modifying behavior and changing social conditions. General discussions of social and behavioral aspects of health in the arctic advance various hypotheses about the etiology of different diseases, and concomitantly, the conditions that generate health. These hypotheses need to be more systematically explored. Existing literature from areas and populations where comparable processes are occurring could be examined, for example. Or focused studies could be conducted in various arctic contexts. Such research might include the following steps:

1. Development of an adequate, more-sensitive classification of those disease conditions and behaviors that are considered socially generated or socially disruptive;
2. Documentation of patterns of social life in arctic communities, work contexts, and other social settings that have particular importance to health and illness;
3. Identification of those social patterns in the lives of arctic residents that seem to foster health and positive behavior, as well as those associated with stress and difficulties;
4. Generation of better data on the types of morbidity and mortality that result from different socially generated or socially consequential diseases or conditions;

5. Creation of better data bases on the epidemiology of different diseases and conditions of social concern;
6. Elucidation of the specific etiologic processes of such disease; this should include identification of the extent that both general social conditions and individual or family characteristics contribute to its occurrence;
7. Translation of the knowledge gained from such research into programs for the prevention, identification, and treatment of disease, and for the enhancement of health, giving due consideration to cultural appropriateness of intervention strategies.

This type of research program is needed to deal more effectively with the complex problems of murder, suicide, assault, family violence (spouse abuse, child abuse, child neglect), accidental injury and death, alcoholism and drunken behavior, alcohol-related diseases, mental illness, and psychological impairments. Such studies could also contribute to the prevention of birth defects, such as fetal alcohol syndrome, that are the result of certain behaviors<sup>29-31</sup>.

### *Research Opportunities*

Studies need to be conducted in the Arctic with particular emphasis on those conditions whose solutions may have broad application to other circumpolar arctic nations and to the United States as a whole. Numerous research areas which fulfill these requirements presently are not being investigated or are being investigated inadequately.

Of particular concern are areas where past research has led to conclusions, which upon modern examination, rest upon tenuous scientific data. A number of assumptions based on past research need to be tested periodically for their validity, particularly when; technologic advances now can be applied. For instance, the prevalence of atherosclerotic disease among Alaskan Eskimos is widely held to be less than that among other North American populations. This information, however, is based on a limited series of less than 100 autopsy examinations performed 20-30 years ago. No subsequent research has been done to verify these earlier observations. Data to follow time-trend changes in prevalence of atherosclerotic disease do not exist.

These findings are of obvious importance in view of recent technological advances that have led to dramatic breakthroughs in our understanding of lipid metabolism and the association of increased levels of high-density lipids with protection from atherosclerotic disease and its complications. New technology to increase understanding of the role of prostaglandins in coronary artery vasospasm, platelet aggregation, myocardial infarction, and stroke have yet to be extended to arctic-indigenous peoples. Yet, initial knowledge of these cru-

cial relationships emerged from earlier studies that demonstrated the relative freedom from occlusive vascular disease of arctic populations subsisting on traditional diets. Dietary influences on prostaglandins, levels of high-density lipids, and platelet aggregation associated with traditional Native food consumption patterns offer exciting possibilities to further our knowledge of fundamental mechanisms for biological homeostasis. The consequences to the nation, whose number one cause of death and morbidity is ischemic heart disease, could be sweeping if increased consumption of seafood (salmon, cod, halibut) reduced atherosclerosis<sup>32,33</sup>

Examples of arctic research that will affect national health policy include vaccine trials currently being conducted by the Arctic Investigations Laboratory, CDC, for the control of hepatitis B disease and invasive *Hemophilus influenzae* type B disease<sup>9</sup>. Diseases such as these have unusually high incidence and prevalence among arctic occupants. Arctic studies will provide the information needed to develop policies for use of these vaccines for the entire country. The studies can be done most efficiently among Arctic occupants even though the majority of cases of illness occur, although at a far lower frequency, among the general population.

In past years, research and health services have reduced tuberculosis, gonorrhea, syphilis, diseases preventable by immunization, infant mortality, rheumatic fever, and the debilitating long-term effects of otitis media. However, a 1983 report from the CDC's, Arctic Investigation Laboratory identified the following infectious diseases-together with their complications-and nutritional problems that still contribute to the morbidity of Alaskan Native people:

Among these diseases are meningitis and pneumonia, post-streptococcal glomerulonephritis, and nutritional anemia. Certain unique conditions such as alveolar hydatid disease, botulism, and arctic rabies, though affecting relatively few people, are often fatal and methods of prevention and early diagnosis are still needed. Infections with hepatitis B virus and also agents of the herpes virus group are very common among Alaskans; epidemiologic studies will contribute to an understanding of their public health importance and to methods for their prevention<sup>9</sup>.

As increased exploration and natural resource development take place in the North, new interest is being directed at adapting technology for use in cold environments, for example, in the prevention of frostbite and hypothermia. This interest and need have become more urgent with the growth in the rate of northern civilian and military populations (now increasing at a rate of over a thousand people a month in Anchorage alone). The Arctic provides an opportunity to test the efficacy of new technology under extreme climatic conditions.

In many ways, the American Arctic is similar to developing countries. Innova-

tive approaches to the cross-cultural delivery of health services under extremely rural conditions provide an opportunity to test models for the organization of health services-models that might be replicated in rural areas in the United States as well as developing countries. For example, the Community Health Aide Program in Alaska has been used as a model in Brazil, Egypt, and other countries<sup>34</sup>.

The isolation of communities in the Arctic provides a natural control for variables, a situation that permits the design of research on health and social policy. For example, the health and social impact of policies on the sale of alcoholic beverages may be studied by comparing "wet" and "dry" villages.

Construction camps for large projects, such as the trans-Alaska oil or gas pipelines, provide an opportunity to compare the results of various approaches to the prohibition, restriction, or sale of alcohol on worker safety and community violence. Crowded housing conditions, subsistence activities as an alternative to government transfer payments, and other naturally occurring social conditions in the Arctic provide additional opportunities to study the effects of various public policies that may have health implications.

The Arctic has a social environment that is often classified as a "frontier," a place that has a less-entrenched social establishment, where social mobility is easier to achieve, where rapid change creates changes in the social order<sup>35</sup>. Opportunities to study new approaches to social policy are more abundant in a frontier than in most societies, which "prefer to continue with existing policies and small incremental developments unless strong pressures have built up for reform, because pressures for change threaten the social order and established social relationships"<sup>36</sup>. The Arctic provides an opportunity for developmental planning in health services, as contrasted to incremental planning. For the developmental planning model to be fully implemented, several steps are required: "researching the issues, selecting from alternative choices, making and taking decisions, operationalizing the changes, evaluating and feeding back results"<sup>37</sup>. An additional step of assessing the applications of newly developed arctic models outside the Arctic is rarely taken.

Finally, the circumpolar regions and populations might provide a particularly interesting and suitable avenue and subject of studies on "positive health" or "wellness." The extreme conditions of the circumpolar areas provide an opportunity to test the validity of the positive health approach and, if applicable, the results might provide a starting point for encouraging lifestyles and habits that promote health"<sup>38</sup>.

### *Demographic and Epidemiologic Data*

Good research demands that basic epidemiologic studies define the morbidity and mortality rates of arctic populations to compare them to other

populations. These studies are not currently receiving attention or support. Misconceptions based on past research that was incomplete or scientifically tenuous can become accepted as facts, leading to inappropriate priorities and policies.

Major problems exist with the data collected on surveillance of disease in the Arctic. Both these and demographic data are too incomplete to allow for adequate arctic research. In the American Arctic, basic vital statistics data such as birth and death registry are far below standards ordinarily accepted for routine data collection and use. Existing statistics and data collection methods often do not differentiate population subgroups, thus obscuring trends. Basic data about human diseases collected through surveillance and reporting mechanisms require extensive and well-tested verification procedures to ensure validity.

For many health and social conditions in the American Arctic, the basic aggregate data result from official reports of public agencies. Data from such reports vary with the proportion of cases that come to the attention of agencies and with the reporting practices of the agency. Given the social context of reporting, it is unlikely that statistics derived from such official reports can provide an adequate data base for most research needs. Therefore, other types of research, such as community and household studies, are needed to provide more accurate data on the prevalence and incidence of health, behavioral, and social conditions.

Even when the prevalence of diseases is reported, interpreting such data is difficult when demographic data about population size and composition are inadequate. One of the most characteristic features of Native Alaskans as well as migrant populations living in circumpolar areas is rapid demographic change.

the rapid turnover of the population of a given locality may render such statistics totally meaningless because they will not accurately reflect the situation. Although the profound impact of demographic changes on all aspects of life renders a detailed study of demographic changes in the Arctic vitally important, the monitoring of vital statistics and demographic variables is considered to be a routine task of the U.S. Bureau of Census and the State Division of Vital Statistics, not scientific researchers.

There are some epidemiologic trends in the Arctic that are well known, such as persistently high infant mortality among Native peoples; yet these trends have not been subjected to a detailed study to determine the causes. Likewise, the dramatic decline in the incidence of tuberculosis in the American Arctic has been well documented, but the data are insufficient to determine if this disease has been replaced by something else<sup>38</sup>. Similar claims that most communicable diseases are losing their importance as a factor in morbidity and mortality in the Arctic also need to be investigated.

Rapid cultural change has heavily influenced the diets of arctic peoples. Increasing rates of dental decay, obesity, and diabetes reflect these shifts. Further nutritional research should contribute to our understanding of vascular health and disease, anemia, and to distinctive dietary requirements imposed by arctic living conditions.

One advantage of conducting epidemiological investigations among groups such as Alaskan Natives is their genetic, cultural, and social uniqueness. However, these populations are relatively small. As a result, collaborative arrangements for international studies must be developed. The most likely type of collaboration is with other circumarctic countries that have populations of similar genetic and cultural origins. However, this requires compatible reporting systems<sup>9,38</sup>. Comparisons of research findings between these disparate areas require data that can be adjusted by reliable demographic variables<sup>28</sup>.

### *Science and Arctic Communities*

This arctic health science policy will facilitate a research program that addresses behavioral and social aspects of health, including the following areas:

- diseases with a rather distinct social etiology;
- diseases or conditions that have disruptive consequences in family, community, work, or other social contexts;
- social conditions that increase susceptibility to diseases of various types;
- the delivery of services directed at conditions that have social causes or disruptive social consequences; and
- the ways in which social conditions affect the delivery of medical services in general.

Such a research program can be executed most effectively within a community health perspective because the constellations of diseases and conditions as they occur within communities are what concern both residents and healthcare providers, and because community conditions contribute largely to both the etiology of pathologies and states of health and to the provision of medical services.

Social and behavioral research in the Arctic should adopt a community health focus for several reasons:

- Geographic isolation, a challenging physical environment, and crowded housing conditions result in particular significance of the community to the Arctic resident.
- Communities (whether towns, villages, work camps, or stations) provide the basic context of Arctic social interactions, supports, and pathologies.

- The interdependence of the individual and community in the Arctic makes it impossible for health-care providers to ignore community social and cultural conditions.

A community health focus should encompass not only issues of individual and aggregate survival and well-being but also those of family, community, and cultural integrity, continuity, adaptation, and health. It should also encompass the working and living conditions of arctic industry and the welfare of permanent and transient work forces. It should incorporate the following basic research steps:

- The classification of arctic social conditions that precede, coincide with, predict, or result from specific physical or psychological conditions, whether health or illness.
- The development of a more accurate, standardized, and complete data base on the types, incidence, and prevalence of positive and negative social health indicators.
- The clarification of the causes underlying epidemiological findings to determine the role of individual, familial, community, cultural, economic, and other social factors that contribute to reported rates.
- The dissemination of etiological and epidemiologic findings to improve identification, prevention, and treatment efforts that are consistent with cultural factors.
- The evaluation of identification, prevention, and treatment efforts to determine their health and cultural consequences.
- The identification of those social and cultural factors that affect the delivery, use, and effectiveness of health services.

Communities in the Arctic are small; most range in size from 25 to 2,500 people. People in the communities are easily identifiable on the basis of a few characteristics, such as age and sex, which might otherwise make them indistinguishable in a larger population. Identity with community is strong in the Arctic, as are community political and social forces.

Thus, the presence of scientists in an arctic community can be a disruptive activity, and presentations of scientific findings have the potential to be destructive to both individuals and communities. For these reasons, the relationships between scientists, science, and community are especially important in the Arctic.

At the same time, the process and results of scientific inquiry can be useful to

an arctic community. Because of some unique demographic and cultural aspects of both the resident and transient populations, the nature of arctic social settings and conditions, and the prevailing cultural practices, arctic populations often find it difficult to achieve consensus about hazards posed by these behaviors and solutions to them. Health science research can provide an avenue for arctic residents and others to recognize and define problems and to agree on appropriate solutions. Useful research may be conducted among the affected populations or transferred from comparable social and physical environments.

Since so much of the change in the Arctic occurs as a direct result of government and industry decisions, enlightening these decision-makers about research findings is likely to reduce the number of arctic casualties and the severity of impacts of major changes. And populations should respond more positively to changes based on informed decisions. Information provided directly to communities, their local governments, local planners, and industry can assist these parties in creating their own preventions and interventions and in making daily life more normal for residents and transient work forces.

Many people living in the Arctic, particularly Native people, feel that they are "over studied". They are asked too often to participate in interviews, to give blood, urine, feces, or other samples. They feel that they help scientists too often to achieve the researcher's goals without ever being the recipients of the information or the beneficiaries of the project. They resent being regarded only as subjects of experiments, and they feel that their health, reputation, and privacy are not being adequately protected. Further, they resent that they give freely of their own knowledge of the Arctic without being acknowledged as contributors in scientific publications.

This arctic health science policy recognizes the mores of arctic peoples, the necessity of their involvement as partners in planning research programs, the value of their advice and experience, and a commitment to their health needs. Information that is gathered and results that are synthesized must be reliably returned to study communities and groups. Thus, this arctic health science policy provides guidelines that include using local arctic populations to help assess the need for and relevance of proposed studies. Local populations should be informed of the methods, risks, and benefits of research and research findings. Opportunities should be available for local communities to be involved in approval, analysis, and interpretation of behavioral health science research, as they are the principal audience for research findings. Clear standards for protecting the health, reputation, and privacy of individuals and communities must be established.

Ensuring confidentiality of specific health data may require extra precautions for arctic researchers because of the special attributes and relatively sparse population of many arctic communities. For example, describing a village as a fishing community of 30-40 families on a particular coastal area could amount

to naming that village, which could have negative consequences for the community and the people living there. By aggregating the data reported or by generalizing descriptions, the likelihood for anonymity is greater and confidentiality is maintained.

### *Interdisciplinary Studies*

Studying the Arctic requires interdisciplinary approaches that present some rather specific problems. Some of these concerns have been outlined briefly by Dr. Juan G. Roederer, Chairman of the ad hoc Committee on Arctic Research Policy for the Polar Research Board of the National Academy of Sciences:

One problem is that the scientific questions per se are often very special, requiring scientific specialization and experience that take years to gain. Another is the requirement of complex, unusual, and very costly logistic support. A third problem is that physical and biological phenomena in the Arctic have a tendency of crossing disciplinary boundaries, in part due to the strong interactions and delicate equilibria, both physical and ecological, that we find in polar regions. The result of all this is that arctic science is eminently interdisciplinary in nature, that arctic phenomena and processes cannot be studied in isolation, that these studies are very expensive, that the need for coordination is dictated more by logistic considerations than by strictly scientific arguments, that these studies have to compete with more traditional science endeavors at lower latitude, and that they often fall between the cracks of agencies and peoples' frames of mind<sup>39</sup>.

While Dr. Roederer was making reference specifically to the physical and biological sciences, an analogous situation exists for the medical, social, and behavioral sciences.

Health science research in the Arctic requires multidisciplinary approaches, including but not limited to epidemiology, demography, anthropology, psychology, sociology, economics, history, and the basic and applied biological and medical sciences. Many of the research problems and opportunities in the Arctic do not fit neatly into the goals of existing funding agencies. Officers in funding agencies facing tight budgets find it difficult to support costly research in the Arctic when the same dollars might be spent on research on urban populations in less costly areas of the United States. Because of higher costs incurred conducting research in the arctic, emphasis must be placed on responding to the "opportunities of nature" that are not found outside the Arctic. Unless the United States makes a specific commitment to support health research in the Arctic, these many important opportunities will continue to be neglected. Research dollars will likely be spent elsewhere.

## **111. Recommendations for Guidelines on the Conduct of Research in the Arctic**

The APHA Task Force on Arctic Health Science Policy recommends the following guidelines for the conduct of research in the Arctic.

### *Quality of Research*

Research needs to be well designed, particularly in light of the small populations and thereby small sample sizes in the Arctic. Hypotheses should be clearly stated. Definitions should be clear-cut, objective, and simple. Past research should be reviewed critically to evaluate changing patterns, to dispel inappropriate conclusions based on tenuous or inaccurate scientific research, and to avoid unnecessary duplication of research. There should be adequate controls, and if possible, data should be comparable to pre-existing or current research. A peer review process for research proposals is recognized as an effective way to improve research designs and enhance the quality of research.

### *Community Involvement in Research*

Communities should be involved in research only after they have been fully informed of the nature and type of work planned and consented to it. Procedures that have been developed by local communities or institutions involved in health research should be followed and appropriate approvals should be obtained. The funding agency must have written assurance that such approval has been granted. The research project must provide for reporting back to the community in a language and style that is easily understood by the layperson. Funding for research should include a scientist's visit to the community to present the results of the project and to solicit comments and questions from the community. In addition, a mechanism should be implemented to ensure that recommendations made as a result of research are reviewed and brought to the attention of the agencies capable of and responsible for implementation.

### *Informed Consent*

When there are substantial language barriers between research subjects and those performing the research, special pains must be taken to be certain that subjects understand fully what is being done to them or to their surroundings. Both to the community collectively and to the subject individually, the potential risks or disadvantages of procedures must be explained, together with the benefits, if any. Subjects must be given the opportunity to ask questions before they give informed consent. Verbal as well as written translations should be available where illiteracy is possible. A record indicating that informed consent has been given should be preserved.

### *Confidentiality of Research Data*

Special precautions need to be taken to preserve the confidentiality of information obtained from small, isolated communities to avoid identifying individuals or communities.

## **IV. National Science Policy Recommendations for Arctic Health Research**

### *Funding for Interdisciplinary Studies*

Health science research in the Arctic must be multidisciplinary, including but not limited to epidemiology, demography, economics, anthropology, sociology, psychology, history, and basic and applied biological and medical sciences. Training and support for arctic specialization of research in all these disciplines is needed for a productive, sustained arctic health science program, preferably by direct appropriation. However, if funding is to be made available from competitive programs through the National Institutes of Health (NIH), National Science Foundation (NSF), Alcohol, Drug Abuse and Mental Health Administration (ADAMHA), Environmental Protection Agency (EPA) and the National Center for Health Services Research, policymakers in those organizations must be made aware of arctic issues and become organizationally responsive. Five actions are recommended:

- A program should be developed to acquaint key personnel in national science policy formulation and funding with arctic health research needs and opportunities.
- "Arctic desks" should be developed within NIH, ADAMHA, and EPA.
- An office of Arctic Research should be established in NSF and charged specifically with identifying neglected areas of health research in the arctic.
- Task forces should be convened within NIH, ADAMHA, EPA, and other agencies to define arctic health research priorities and to identify neglected areas of research within the mandates of these agencies. Intra-agency collaboration and coordination are essential.

These task forces should have representation from the arctic health research community, the Alaska Area Native Health Services, Alaska Department of Health and Social Services, and quasi-tribal entities in the Arctic. Specific appropriations for the conduct of arctic health research should be included in agency budgets.

Also critical are provisions for increased, sustained funding over 5-, 10-, or

15-year cycles so that arctic researchers maintain continuity over long periods of time. Few problems can be adequately addressed with definitive conclusions by short-term prevalence studies. Funding sources should also have the flexibility to respond to experiments of nature, which cannot be predicted in ordinary year-to-year fiscal cycles.

### *International Cooperation*

National Arctic Health Science Policy includes promotion of international scientific cooperation, including but not limited to:

1. Standardization of health, demographic, and environmental monitoring to produce compatible data sets;
2. Design and execution of research using populations with similar genetic, cultural, or social attributes from several countries;
3. International scientific meetings open to the scientists of all nations interested in health research in arctic regions;
4. International exchanges of health research personnel to promote a global perspective on the conduct, policies, and priorities of arctic health science, and to promote the international exchange of information;
5. Circulation, translation, and accessibility of appropriate literature among interested researchers of all nations;
6. Collaboration with existing international scientific organizations such as the World Health Organization, Nordic Council for Arctic Medical Research, Comité Arctique Internationale, and Arctic Institute of North America.

Scientific research is best pursued in an environment of international peaceful relations. We encourage all international efforts to eliminate the Arctic as an area for the storage, testing, or transportation of nuclear, chemical, and biologic weapons.

### *Information Management*

Information management for arctic health research should include the following components:

- Information Transfer

The interdisciplinary nature of arctic research makes it impossible for researchers and health practitioners to follow every journal that publishes articles about arctic health. It is important that some mechanism should be developed to publish, review, translate and abstract the scientific lit-

erature relevant to arctic health research.

- Data Repository

An arctic health information repository and clearinghouse capable of accepting, organizing, preserving, and retrieving published and unpublished data must be developed. Data accumulation activities of state, federal, and local agencies, industry, and researchers in educational institutions should be reviewed, responsibilities elucidated, and appropriate agreements negotiated for data preservation and access. Existing data sets should be surveyed and catalogued. The catalogue should include custodian, description, and rules of access. A centralized information repository and clearinghouse should develop mechanisms for controlling access to preserve confidentiality of data and to adhere to stipulations under which data were collected and donated.

- Standardization

A series of working groups should be convened to recommend standardized measurement parameters in health- and environment-related data collection. These groups should explore the compatibility of data collected in the American Arctic with that collected in other arctic countries, and the potential utility of converting existing data sets through the development of standardized definitions, units, population groups, etc. Additionally, the working groups should identify topics for continuous monitoring over time, such as the levels of radionuclides and toxic chemicals in the arctic environment.

- Identification of Expertise

A comprehensive directory of researchers experienced in the Arctic could be organized by name and by subject areas of expertise. This directory could be used to identify persons as consultants to health-care providers and researchers, reviewers for proposals, collaborators on research projects, advisors, sources of unpublished information, and as part of a network able to assist in logistics of arctic health research.

### *Coordination and Support of Arctic Research*

An organization is needed for catalysis of regional, national, and international collaborative efforts; for coordination and logistic support; for information management and exchange; and for research and training. Cost-effectiveness of a national arctic health research program will be maximized through the involvement of existing centers of expertise in the United States and abroad and provision of technical research assistance to motivated service personnel in remote communities.

The organization providing these centralized functions should be geographically accessible and in proximity to headquarters of major arctic health-care, military, and industrial organizations. It should provide logistic assistance to guest workers in the Arctic, contingent upon guest investigators' adherence to appropriate requirements for community consent, informed consent by research subjects, feedback of information to involved communities in a timely manner, respect for intercultural differences, and negotiated agreements for data deposition. The organization could provide the following types of assistance to guest researchers: identification of potential field stations in arctic communities; facilitation of negotiations with potential communities and subject groups; negotiation of guest worker agreements with arctic hospitals, laboratories, and other existing resources; provision of basic specimen-processing equipment and other field gear; networking with translators and other field personnel with arctic expertise who could be employed on research projects; and advice regarding research design, data sources, and the conduct of research.

A relatively small cadre of heavily research-oriented investigators should be developed within this organization. This core group of salaried researchers would be responsible for the development of interest in the Arctic within existing centers of expertise; technical assistance to and collaboration with part-time researchers in remote communities; Arctic-specific orientation and training for researchers trained elsewhere, including postdoctoral fellows; and conducting original research. In addition, this core group would be responsible for maintaining liaison relationships with communities and groups under study—particularly Alaskan Native, military, and industrial groups—and with physicians and other health-care providers and organizations in the Arctic.

Financial support for centralized functions should come from several sources. It is envisioned that the organization should have at least three types of support:

- sustained support for facilities, programs, and a core group of researchers;
- funding for specific research projects from competitive proposals to funding agencies;
- contracts with other existing research organizations and with government and private entities.

In addition to receiving funding, the organization should be able to provide funding for training fellowships, grants to agencies to offset their expenses related to research collaboration, and mini-grants to part-time research collaborators who work in health service positions in remote communities. Requirements for space, laboratory facilities, and analytic and data-processing equipment remain to be defined. These should be developed in concert with appropriate university, state and federal collaborating bodies.

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## Appendix

8202 Arctic Health Science Policy Principles

The American Public Health Association,

Noting that a National Arctic Health Science Policy has never been developed and that, in general, health research has received little attention;<sup>1</sup> and

Noting that the absence of cohesive health science research policy has led to numerous adverse consequences including, but not limited to: 1) lack of appropriate facilities and logistic capabilities to support both health sciences and industrial development in the Arctic region; 2) insufficient education and training of enough Arctic health scientists and technologists to fulfill national needs in the region; 3) conflicts between indigenous peoples and governmental and resource development interests in the Arctic; 4) conflict between public health, environmental, and developmental interests; and 5) critical health, trauma, and morbidity conditions among Arctic occupants;<sup>1,2</sup> and

Recognizing that the pace and scale of developmental activities and resource development projects in the Arctic are accelerating with resultant increased human health impacts to Native populations and other Arctic occupants; and

Noting that health science discoveries by numerous private and governmental agencies involved in Arctic science policy and research in past decades have resulted in considerable knowledge useful to the United States of America; and

Knowing that Alaskan--Arctic resources, climatology, and geology have many similarities in other northern states in the United States and in the Provinces of Canada; and

Realizing that a bill (S.1562) has been introduced into the United States Senate in July 1981 for an Arctic Research and Policy Act to provide a comprehensive national policy dealing with national needs and objectives in the Arctic; and

Noting that S.1562 is devoted primarily to economic and security factors and not to health science needs and principles; and

Being cognizant that personal and environmental health are essential prerequisites in order to realize fully the economic values and security assets; and

Recognizing that large gaps exist in our scientific knowledge of the Arctic and its application about the nature, causes, effects, and control measures which will require extensive and costly effort; and

Believing that the current institutional framework for the conduct and support of the nation's Arctic health research effort is inadequate; therefore

1. Supports heightened status and visibility for Arctic Health Science; and
2. Requests the Congress and other legislative bodies to address health science research needs and principles in S.1562 and in any related legislation and programs.

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