Department of Health and Human Services

The Department of Health and Human Services supports and conducts Arctic health research through the National Institutes of Health and the Centers for Disease Control and Prevention.

National Institutes of Health

The National Institutes of Health is an agency of the Department of Health and Human Services. Comprising 27 institutes and centers, the NIH is headquartered in Bethesda, Maryland, and has satellite facilities elsewhere in Maryland and in North Carolina, Montana, and Arizona. The NIH's mission is to uncover new knowledge that will lead to better health for everyone. NIH supports research on Arctic-related health issues through grants and contracts to non-Federal scientists and through the projects carried out by scientists in NIH laboratories and clinics.

	Funding (thousands)	
	FY 02	FY 03
National Institutes of Health	21,292	32,776
Health Resources Services Admin.	500	0
Centers for Dis. Control/Prevent.	4,400	4,400
Total	26,192	37,176

National Institute on Aging

The NIA funded a major new initiative in FY 2001 under the U.S. Arctic Research Plan. The NIA and the Icelandic Heart Association are collaborating on the Age, Gene/Environment Susceptibility (AGES) Study: "The Reykjavik Healthy Aging Study for the New Millennium." This study was initiated by the NIA to examine genetic susceptibility and gene–environment interaction as these contribute to phenotypes common in old age. The clinical examination center at the Icelandic Heart Association near Reykjavik opened on September 1, 2002. Over the following four years, 8,000 participants from the earlier Reykjavik Study (1967–1996) will be examined in the clinic, with another 1500 examined in a home examination. The study has four major focus areas: neurocognitive conditions, cardiovascular health, musculoskeletal conditions, and body composition and metabolic disease. An examination of 9,500 surviving members of the Reykjavik Study will define phenotypes for candidate gene studies and will also be used as end-points of the cardiovascular risk factors. By September 2003 approximately 2,000 men and women had been examined in the clinic. Since the inception of the project, the National Eye Institute, the National Institute for Deafness and Communication Disorders, and the National Heart, Lung, and Blood Institute have joined the collaboration.

The NIA continues to fund the Resource Center for Minority Aging Research, titled the Native Elder Research Center (NERC), supported by a $2.5 million, five-year grant from the National Institute on Aging and the National Institute for Nursing Research, located within the Division of American Indian and Alaska Native Programs of the Department of Psychiatry, School of Medicine, University of Colorado Health Sciences Center in Denver. The center coordinates a research career development program targeted at American Indian (AI) and Alaska Native (AN) investigators, focusing on aging, health, and culture. Denise Dillard, a new Native investigator in the center, works for the Southcentral Foundation, an Alaska Native 503C nonprofit extension of the Cook Inlet Region, Inc., which is examining the relationships among depression, health status/functioning, service use, and medication patterns. The center augments partnerships with AI/AN communities to ensure access to systems of care in aging research.

Engaging the University of Alaska in aging research and enhancing research capabilities consistent with the goals of the Alaska Geriatric Education Center (AKGEC) were the main goals of a September 2003 Regional Meeting on Aging Research. NIA staff conducted workshops in Anchorage and Fairbanks, Alaska. Developed with input from the NIA Work Group on Minority Aging and the Task Force on Minority Aging Research, a subcommittee of the National

Advisory Council on Aging, the Regional Meeting format provides a framework for engaging underrepresented groups and populations in strategic activities designed to strengthen research on diseases and conditions of aging and optimize the NIA's research portfolio.

National Institute on Alcohol Abuse and Alcoholism

Alcoholism is one of the most important public health problems among Alaska Natives in the Arctic region. While Alaska Natives comprise about 20% of the population, approximately 50% of individuals admitted for alcohol treatment in the region are Alaska Natives. The NIAAA goal is to identify the causes and consequences of alcohol consumption and to develop and validate effective treatment and prevention strategies for adverse health and behavioral consequences of drinking. The institute supported two projects in the Arctic region in FY 2002–03, one to test the efficacy of pharmacological adjuncts in current alcoholism treatment of Alaska Natives, the other to test a theoretical model of pathways that facilitate recovery from alcohol abuse.

National Institute of Allergy and Infectious Disease

The NIAID conducts and supports scientific research on infectious and immunologic diseases. The institute's basic and applied research promotes the development of vaccines, diagnostic tests, and drug therapies to prevent and control these diseases.

Haemophilus influenzae type b

Before the introduction of a vaccine against *Haemophilus influenzae* type b (Hib) in the late 1980s, an estimated 16,000–25,000 children in the U.S. annually showed signs of invasive bacterial infection by Hib. Today, with use of a conjugate vaccine developed with support from NIAID, Hib infection has been reduced by 99% in the U.S. Interestingly there is evidence that the Hib vaccine decreases the rate of carriage of Hib among vaccinated children, therefore decreasing the chance that unvaccinated children will be exposed. In FY 2002 and FY 2003, NIAID continued its support of a three-year pilot intervention trial in three Alaska Native villages with high numbers of asymptomatic carriers of Hib. The goal is to determine if Hib conjugate vaccine can be given to persons of all ages to eliminate or reduce Hib colonization. The researchers hope to determine what treatment most effectively eliminates the Hib reservoir from a village. Several treatment regimes are being compared, including the comparison of treatment with the Hib conjugate vaccine with and without the antibiotic rifampin to that of treatment with rifampin alone (the standard treatment). Preliminary results indicate that mass vaccination with Hib conjugate vaccine is possible and may decrease the burden of Hib colonization and overall disease in communities where Hib disease is persistent.

Hepatitis C

Hepatitis C (HCV) is a blood-borne, liver-targeting viral infection and is an important cause of morbidity and mortality in this country. Approximately 80% of the people infected with HCV will develop chronic hepatitis, and all are at higher risk for cirrhosis and a type of liver cancer, hepatocellular carcinoma. NIAID continued to support studies of the relationships between hepatitis C virus replication, evolution, and disease progression in Alaska Natives. To date, over 900 HCV-positive patients have been enrolled in the study. Blood and liver specimens are being collected to examine levels of and variation in HCV virus and to compare these with disease progression. This well-defined Alaskan Native population may lead to many key answers regarding the natural history of hepatitis C.

Histocompatibility and Immune Recognition

In FY 2002 and FY 2003, NIAID, in conjunction with several other NIH institutes and centers and the Juvenile Diabetes Research Foundation International, continued its support of the International Histocompatibility Working Group, a network of more than 200 laboratories in over 70 countries that collect and share data on genes of the human leukocyte antigen (HLA) complex. Researchers analyzed HLA genes in Alaskan Yup' ik Eskimos to determine the different types of histocompatibility genes and their frequency in that population.

Organ Donation

NIAID continued its support of an education outreach program at the University of Washington Hope Heart Institute aimed at increasing organ donation and transplantation among Alaska Natives. The Hope Heart Institute developed an educational video on organ donation and transplantation that was culturally sensitive and specific to Alaska Natives.

National Cancer Institute

The Role of EBV in the Etiology of Nasopharyngeal Carcinoma

The University of North Carolina, Chapel Hill is determining the role of the Epstein–Barr virus (EBV) in the etiology of nasopharyngeal carcinoma (NPC), an epithelial malignancy that develops with high incidence in southern China, in northern Africa, and among Eskimos. The viral genes that are expressed in NPC include the latent membrane proteins LMP1 and 2 and a new family of mRNAs, transcribed through the BamHI A fragment. Glutathionein transferase fusion proteins will be synthesized to produce monospecific antisera to identify the proteins in transfected cell lines and in NPC tumor tissues. The proteins will be tested for interactions with cellular proteins and for transactivation of the LMP1 promoter.

Reports from the Alaska Native Tumor Registry

The Alaska Native Tumor Registry (ANTR) was initiated in 1974 in collaboration with NCI and the Centers for Disease Control and Prevention. Procedures and policies were those of the NCI Surveillance, Epidemiology and End Results (SEER) Program. The registry became a member of the SEER Program in 1999 as a supplemental registry, increasing SEER's coverage of minority populations. ANTR has completed two recent reports, "Cancer in Alaska Natives 1969–1998, 30 Year Report" and "Alaska Native Cancer Update, 1987–1999," distributed statewide to medical providers, tribal health board members, and key tribal personnel. In addition, ANTR has worked with the New Mexico Tumor Registry to complete a comparison of cancer rates between Alaska Natives and southwest American Indians.

New Studies Undertaken by Northwest Portland Tribal Registry

Over the last ten years, health care delivery for northwest American Indians and Alaska Natives (AI/AN) has evolved from a centralized system maintained by the Indian Health Service (IHS) to a diverse and complex environment. The Northwest Tribal Registry Project was developed in January 1999 by the Northwest Tribal Epidemiology Center, located at the Northwest Portland Area Indian Health Board (NPAIHB) in Portland, Oregon. The existing disease registry has linked with state data to ascertain the incidence and prevalence of diseases such as cancer among northwest AI/AN. A critical difference with previous studies is the longitudinal focus.

Patterns of Cancer Care Among Native Americans

Limited information is available about contemporary cancer care among Native American populations. Data have been combined from several sources, including SEER and the Indian Health Service (IHS), augmented by abstracting data from medical records in a sample of cancer patients. The first project focused on the linkage of SEER and IHS data files to evaluate the completeness and quality of data elements. A current effort involves gathering data on patterns of care for American Indians and Alaska Natives living in South Dakota. In 2003, three personnel were trained in cancer registration for South Dakota tribes, attending the "Principles of Oncology" course at NCI.

Native Cancer Information Resource Center and Learning Exchange

C.I.R.C.L.E. has been in operation as a national clearinghouse for cancer education materials specific to American Indian and Alaska Native communities since 1998. The center has become the educational arm for the American Indian/Alaska Native Leadership Initiative on Cancer, funded as a cooperative agreement. The center has the most up-to-date bibliography in the nation on cancer affecting American Indians and Alaska Natives.

Conference Support for American Indians and Alaska Natives

In 2003, NCI assisted C.I.R.C.L.E. in funding

- The Second Annual Northern Plains Regional Indian Cancer Conference, hosted by the Shakopee Mdewakanton Sioux Community in Prior Lake, Minnesota;
- The annual meeting of the Native WEB (Women Enjoying the Benefit); and
- The semi-annual meeting of the Network for Cancer Control Research among American Indian and Alaska Native Populations, in Rochester, Minnesota.

National Institute on Drug Abuse

NIDA supports over 85% of the world's research on behavioral, psychological, biological, medical, and sociological aspects of drug abuse and addiction. Since 1994, NIDA has been funding a series of grants to the University of Alaska Anchorage (UAA) dealing with the spread of substance abuse, related mental health problems, and HIV/AIDS and other infectious diseases (such as

STDs, hepatitis B and C, and tuberculosis). Out of this has come a large, five-year project with the University of New Mexico (UNM), the first systematic study of rural health care for stigmatized illnesses. Researchers are defining the unique health issues in rural and frontier populations, including the ethics of health care (such as the ability to maintain confidentiality in small communities); psychosocial issues of rural life; the effects of stigma in small, scattered populations; and the unique barriers to care. NIDA supports drug-abuse-related health issues in Alaska Native women, such as unsafe sexual practices and how they affect the transmission of diseases such as AIDS and hepatitis B and C. NIDA-funded researchers at UAA have been developing a model to predict and identify subgroups of women and their risk behaviors relative to the use of drugs and condoms.

The NIDA-supported extramural research initiatives at the UAA have also benefited from UAA's Telemedicine Project, which helps transmit important clinical and disease and drug use prevention information across Alaska in a series of "research at a distance" projects. These projects use desktop video teleconferencing and narrowband technology.

NIDA is also involved in Arctic research efforts in Russia, which has one of the fastest growing AIDS epidemics in the world; drug abuse is the primary transmission mode. The immune deficiencies caused by the HIV viruses have led to an explosion of opportunistic infections and drug-resistant tuberculosis. NIDA will continue to play a leadership role in conducting related research and research training on treating and preventing these diseases with the Russian scientists and other NIH institutes that are funding projects in the region. NIDA has participated since 1992 in the annual International Conference on AIDS, Cancer, and Related Problems, sponsored by the Russian Ministry of Science, the Russian Biomedical Center, St. Petersburg State University, and the NIH Fogarty International Center. In January 2003, NIDA was involved in a special meeting at St. Petersburg State University to establish the first school of public health in the former Soviet Union.

National Institute of Dental and Craniofacial Research

The NIDCR provides support to the Northwest/Alaska Center to Reduce Oral Health Disparities, located at the University of Washington in Seattle, for research projects that will impact on children in the Yukon–Kuskokwim Delta of southwestern Alaska. Objectives include the prevention and control of dental caries. Alaska Native children are disproportionately affected by early childhood caries, compared to all U.S. children. The cultural practice of pre-mastication of solid food for infant feeding amplifies the transmission of oral secretions from adult to child. The prevention of early *S. mutans* acquisition and subsequent caries in infants and toddlers requires efforts starting at birth. A community-based, randomized clinical trial will determine if the serial use of chlorhexidine and xylitol in mothers will reduce the vertical transmission of cariogenic bacteria between Alaska Native mothers and infants. This novel preventative intervention could have an impact on the prevalence of caries. Also, through the University of Washington Northwest/Alaska Center, NIDCR supports development of a web-based tool (EthnoDent) that focuses on reducing cultural barriers between providers and multicultural patients (including Native American/Alaska Natives) in the area of children's oral health.

National Institute of Environmental Health Sciences

The NIEHS is funding studies investigating the perinatal effects of peri- and postnatal exposure to endocrine disruptors, including several organochlorine pollutants and methylmercury in the Faroe Islands. Stored maternal serum from week 34 of pregnancy and neonatal serum will be used to evaluate the endocrine status. Data on growth and development from annual examinations up to age 5.5 years are available and will be supplemented by examinations at ages 7 and 9 years, when advanced testing will be applied to assess sexually dimorphic behaviors, domain-related neurobehavioral function, serum hormone concentrations, and developmental markers of early puberty development. The study assessing the effects of methylmercury showed mild deficits associated with prenatal exposures that were previously thought to be safe.

The effects of environmental contaminants and infant development are being investigated at Nunavik, Canada. The traditional diet of the Inuit from Nunavik includes ringed seal and beluga whale meat and blubber and other marine food. Since these species may contain high concentrations of environmental contaminants, the Inuit Cohort Study was initiated to investigate pre-

and postnatal developmental outcomes resulting from exposure to these substances. Inuit women reported eating large amounts of fish, beluga, and seal meat and fat during their pregnancies. Fish and seal meat consumption was associated with increased mercury exposure as measured in hair samples. Traditional food intake during pregnancy was unrelated to PCB body burden because it is more of a function of lifetime consumption and exposure. Many women increased their consumption of these foods because of pregnancy-related changes in food preferences and their belief that these foods were beneficial for the women and their fetuses. Studies will determine whether the children experience any learning disabilities associated with the diets of their mothers during pregnancy.

The Environmental Justice and Health for Saint Lawrence Island project is intended to serve as a model of the most effective way to exchange information among remote or isolated Alaska Native maritime communities, healthcare providers, and scientists concerning environmental justice and health. The primary objective is to establish self-sufficiency in Alaska Native communities, within existing healthcare systems, to minimize exposure to environmental contaminants. An advisory committee, a research team, healthcare providers, and members of the affected community will collaborate to set up communication among the collaborating groups, create a sampling program to test for environmental contaminants, establish a community health assessment program, and use the emerging data to implement an environmental justice and health training program. Elevated levels of PCBs were reported in soil, air, berries, greens, water from the Suqi River, and sediment samples at the Saint Lawrence Island Northeast Cape military site. All of the people tested had elevated levels of PCBs.

The Geographic Modeling of Traffic and Asthma Rates study is examining the factors associated with the incidence of asthma in young school children in Anchorage, Alaska. The purpose of the study is to evaluate individual risk factors and environmental proximity to traffic with the incidence of asthma in kindergarten and first-grade children in 12 neighborhood schools. The use of asthma medication among elementary schoolchildren was associated with particulate pollution in a locale where PM10 consisted primarily of coarse-fraction material derived from road sanding and re-entrained volcanic ash. All models showed positive and significant coefficients for PM10 during periods when asthma medication was administered to the schoolchildren.

The Dietary Benefits and Risks in Alaskan Villages project addresses dietary questions raised by Native people living in Atka, St. Paul, and other Aleut villages dependent on traditional foods collected from the Bering Sea and islands where they live. The project aims are to:

- Develop, utilize, and evaluate a model that requires greater community responsibility, involvement, guidance, and participation with researchers and government;
- Document the diets of two Alaskan villages, including the types, quantities, and methods of preparation, for the purpose of guiding contaminant research;
- Collect preliminary data on nutritional value, as well as levels of persistent organics, radionuclides, and heavy metals in subsistence foods for tracking of contaminant trends;
- Provide a balanced assessment of both the risks associated with environmental contaminants and the nutritional, cultural, and physical benefits of a traditional diet; and
- Develop, utilize, and evaluate a model for combining a variety of village-specific data streams including diet, epidemiological effects, and contaminant levels.

Accomplishments in the first two years of this project include a dietary survey in the community of St. Paul, creation of Village Advisory Groups in St. Paul and Atka, two films (*Alaska Native Diet: Introduction to Dietary Benefits* and *Risks in Alaskan Villages and Alaska Native Diet: The Importance of a Traditional Diet*), the beginnings of a risk assessment model process, and many community educational outreach activities. The next phase of this project is to sample selected traditional foods from both St. Paul and Atka. The Village Advisory Group in St. Paul has met several times recently and has decided to sample halibut for nutrients and contaminants. Atka is in the process of identifying and choosing the laboratories that will do the analysis for contaminants and nutrients.

National Institute of General Medical Sciences

The NIGMS, through a partnership with the Indian Health Service, is supporting several projects by the Alaska Native Tribal Health Consortium through a four-year grant. One applied study investigates the degree of concordance of

diagnoses of the effects of myringotomy via telemedicine versus live diagnosis. This study is important because of the challenges of delivering care to rural Alaska. Another study examines the prevalence of disabilities. For rural, subsistence, or working class families, disabilities can have profound effects. Two projects deal with nutrition. One is on the Alaska Native diet and an assessment of the nutrition of subsistence foods. Another is a study of maternal nutrition during pregnancy among Alaska Natives. Three studies, funded in part by co-funding from NIAID, examine infectious diseases. Chronic hepatitis B is examined to determine prevalence and serotype, which may aid in understanding modes of communication of the disease. The rates of re-infection with *Helicobacter pylori* after treatment is being examined, since infection rates are as high among Alaska Natives as anywhere in the developing world. Pneumococcal disease prevention is another high priority because of the alarming incidence of otitis media in Native populations.

National Institute of Mental Health

Mental and behavioral health in rural and frontier Alaska is tied to the emotional, physical, spiritual, family, social, and cultural well-being and health of individual Alaska Natives, their families, and the communities where they live. Among the leading causes of death for Alaska Natives are suicide, accidental injury, alcohol-related deaths, and homicide.

The behavioral health-related issues of alcohol, drug and inhalant abuse/addiction, depression, tobacco usage, violence, accidental and intentional injury, and lifestyle contribute to all of these leading causes of death. Unfortunately, very little mental health and behavioral research is being conducted in Alaska.

American Indian and Alaska Native Mental Health Research

NIMH continues to support the National Center for American Indian and Alaska Native Mental Health Research, at the University of Colorado Health Sciences Center, which provides an important resource for the American Indian and Alaska Native communities. Its mission is to promote the health and well-being of American Indians and Alaska Natives by pursuing research, training, continuing education, technical assistance, and information dissemination within a biopsychosocial framework that recognizes the unique cultural contexts of this population. One of the research projects is focused on understanding the dissemination of mental health practices and policies in American Indian and Alaska Native communities, and it began with a rural mental health program. Extensive work was completed on developing an appropriate data collection instrument containing a set of specific and detailed questions. The detailed instrument was tested with a focus group of people familiar with the state of human services in small, rural Alaska communities, as well as respected academics familiar with conducting ethnographic research in Native communities. Three documents were eventually created: a very general set of introductory questions, in both adult and adolescent versions, designed to make respondents familiar with the direction of the interview, a main tool consisting of 21 broad questions that allow the respondents to describe the dissemination process in their own words within the framework of the three theories, and a detailed set of questions that will be used by the researchers to aid in their analysis of the information from interviews. Data collection will begin using telephone interviews.

Health Survey of Two-Spirited Native Americans

This study at the University of Washington's Department of Psychology focuses on Native American gay, lesbian, bisexual, and transgender individuals (referred to as two-spirits), a drastically understudied and underserved group at risk for multiple health and mental health problems. There are no national, quantitative, representative studies of this population on any topic. Investigators will conduct structured survey interviews with 400 individuals to test a theoretical model of stress and coping in this population. The investigators plan to:

- Establish preliminary prevalence rates of trauma and health outcomes (HIV sexual risk behaviors, alcohol and other drug use, and mental health indicators);
- Test the direct associations between trauma and health outcomes;
- Determine how cultural and spiritual coping factors moderate the effect of trauma on health outcomes; and
- Examine the mediating role of substance use on the trauma–HIV sexual risk behavior and trauma–mental health relationships.

The last approach is to conduct a qualitative study involving 12 focus groups and 60 key informant interviews to identify emergent themes

regarding stressors and coping strategies specific to two spirits. This study is one of the first examining stress-coping processes among two-spirit populations and is the only AI/AN two-spirit HIV risk and mental health study in the country.

Alaskan Basic Neuroscience Program

The NIMH, along with the National Institute of Neurological Diseases and Stroke (NINDS) and the National Center for Research Resources, continues to co-fund the Alaskan Basic Neuroscience Program at the University of Alaska Fairbanks. This program is part of the Specialized Neuroscience Research Program (SNRP) at Minority Institutions initiative of NINDS. The purpose of the SNRP initiative is to establish and enhance competitive research programs in basic neuroscience at minority institutions. The research projects examine themes of interest to Alaskan peoples, including circadian rhythms, hibernation mechanisms, and neural development and repair. The program conducts outreach activities to Alaskan Natives with the goal of increasing diversity in the university's undergraduate and graduate programs, especially in the area of neuroscience and behavior.

Technical Assistance to University of Alaska Researchers

To gain firsthand knowledge of the challenges faculty members face in conducting biomedical research in Alaska research institutions, a team of government mental health scientists and researchers met with research staff from the University of Alaska at Anchorage and Fairbanks in 2002. This outreach effort resulted in UAF submitting a grant proposal to MARC (Minority Access to Research Careers), a grant program of the National Institute of General Medical Sciences, one of the NIH institutes. Technical assistance is also being provided as needed to various investigators developing research programs in mental health research, including a group of researchers developing a proposal to study psychiatric co-morbidity among Alaskans.

Centers for Disease Control and Prevention

Arctic research programs of the Centers for Disease Control and Prevention (CDC) are focused on improving public health in Arctic communities. Programs are conducted by the National Center for Infectious Disease (NCID), the National Center for Environmental Health (NCEH), the National Institutes of Occupational Safety and Health (NIOSH), and the Agency for Toxic Substances and Disease Registry (ATSDR). These programs represent an excellent example of interagency cooperation and collaboration with the State of Alaska Division of Public Health, the Alaska Native Medical Center, the Alaska Native Tribal Health Consortium, the Indian Health Service (IHS), the Alaska Area Native Health Service (AANHS), local and regional Native health corporations, universities, and other state and local agencies and organizations.

National Center for Infectious Diseases

The Arctic Investigations Program (AIP), located in Anchorage, Alaska, is one of three U.S. field stations operated by the National Center for Infectious Diseases or the Centers for Disease Control and Prevention. The mission of AIP is prevention of infectious diseases among residents of the Arctic and sub-Arctic, focusing on diseases of high incidence and concern among the indigenous populations of these regions, as well as recently emerging and re-emerging disease problems, especially via partnerships with other organizations.

Emerging Infectious Diseases

Infectious diseases are a continuing menace to all peoples of the globe, regardless of age, gender, lifestyle, ethnic background, and socioeconomic status. They cause suffering and death, curb sustainable economic development, and impose an enormous financial burden on all societies. Arctic populations have long endured the debilitating effects of both endemic and epidemic infectious diseases, the effects of which have impacted both social and economic development in circumpolar regions of the globe. Global surveillance is a critical component of prevention and control of infectious diseases.

International Circumpolar Surveillance Initiative

The International Circumpolar Surveillance (ICS) project, established in 1999, aims to create an infectious disease surveillance network of hospital and public health laboratories and authorities throughout the Arctic states. ICS was approved as an Arctic Council Sustainable Development Working Group project at the ministerial meeting

in Barrow, Alaska, in October 2000. ICS allows for the sharing of uniform laboratory and epidemiological data on infectious diseases and assists in the formulation of control strategies.

From 1999 to 2002, isolates of *Streptococcus pneumoniae* recovered from patients with invasive disease were collected in Alaska, northern Canada, Greenland, Iceland, Norway, and Finland and were sent to one of three reference labs for testing. A total of 5,283 cases of invasive pneumococcal disease were reported from Alaska (449), northern Canada (165), Greenland (26), Iceland (142), Norway (2643), and Finland (1858). Rates of invasive pneumococcal disease in aboriginals in Alaska and northern Canada were 43 and 45 cases per 100,000 persons, respectively. Rates among children less than two years old and persons two years of age or older were 39–154 and 11–25 cases per 100,000 persons, respectively. Invasive pneumococcal disease can be prevented through the use of vaccines. Continued surveillance is needed to determine the impact of vaccination programs in circumpolar countries. Surveillance of invasive diseases caused by *Haemophilus influenza*, *Neissera meningitidis*, and Groups A and B streptococcus was undertaken by ICS in Alaska and northern Canada (2000–2003) and Greenland (2002–2003). Initial findings indicate that aboriginals in Alaska and northern Canada have higher rates of invasive bacterial diseases caused by *Haemophilus influenza*, *Neissera meningitidis*, and Groups A and B streptococcus than the non-aboriginal population. In spite of vaccine programs for children, cases of invasive disease caused by *Haemophilus influenzae* type b continue to occur among children under two years of age in Alaska.

The prevention and control of certain high-priority emerging infectious disease issues have been targeted by CDC, including:

- Antimicrobial resistance;
- Food and waterborne diseases;
- Vector-borne and zoonotic diseases;
- Diseases transmitted through blood transfusions or blood products;
- Chronic disease caused by infectious agents;
- Vaccine development and use;
- People with impaired host defenses;
- Diseases of pregnant women and newborns; and
- Diseases of travelers, immigrants, and refugees.

The AIP focuses its prevention research activities on antimicrobial resistance among pathogens of concern, the prevention of food-borne diseases, the control of chronic diseases caused by infectious diseases, and the prevention of infectious disease through vaccine use.

Antimicrobial Resistance

In recent years, antimicrobial resistance has emerged in a number of pathogens causing disease among residents of the U.S. Arctic, thus limiting treatment options for those seeking medical care. Problem pathogens include *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Helicobacter pylori*, and *Staphylococcus aureus.*

Methicillin-resistant *Staphylococcus aureus* (MRSA) infections have been a common problem in hospitals in the U.S. for more than two decades. In the past five years in the U.S., MRSA soft tissue infections have become a problem among persons without known exposure to health care settings in certain populations. In Alaska, outbreaks of furuncles (boils) associated with *Staphylococcus aureus* have long been a problem, especially in rural villages. In 1996 the first documented outbreak of MRSA furunculosis in Alaska was reported in one rural village. An investigation showed that the risk of infection was higher among those who used a home sauna. In 2000 a marked increase in boils associated with MRSA infection was reported from a regional hospital in rural Alaska. An investigation revealed that 80% of all *S. aureus* infections were due to MRSA and that 77% of MRSA infections were community acquired (that is, among persons without significant health care exposure in the prior year). The response to this outbreak included revising treatment guidelines for the use of antibiotics and developing guidelines for proper cleaning of home saunas.

High rates of *Helicobacter pylori* infection have been documented in Alaska Natives. *Helicobacter pylori* causes stomach ulcers and gastritis in about 10% of persons infected and has been associated with iron-deficiency anemia and gastric cancer. A retrospective seroprevalence study performed in 1999 demonstrated that among Alaska Native 0–4 years of age and Alaska Native adults less than 20 years of age, 32% and 86% had antibody *Helicobacter pylori*, respectively. A study performed in 1996 confirmed that 60–98% of Alaska Natives tested using the C^{13} urea breath test had active infections. Seropositivity was age dependent. Treatment commonly includes a 14-day course with a proton pump inhibitor plus two antibiotics.

An early study had found that two years following successful treatment of infection with *Helicobacter pylori*, 55% of Alaska Native patients

were re-infected. Further studies have shown that 30% of *Helicobacter pylori* isolates cultured from gastric biopsies from Alaska Native patients seeking medical care were resistant to clarthomycin, and 66% were resistant to metronidazole, two antibiotics commonly used to treat *Helicobacter pylori* infection. Ongoing studies on *Helicobacter pylori* infection are focusing on three groups: urban Alaska Natives, rural Alaska Natives, and urban non-Natives following successful treatment of infection. An evaluation of laboratory methods used to diagnose *Helicobacter pylori* infection is also being undertaken.

Food-borne and Waterborne Diseases

Alaska has the highest rates of food-borne botulism in the U.S. Nearly 30% of all U.S. cases since 1973 occurred in Alaska, and almost all of these cases were among Alaska Natives. The majority of these cases have been associated with consumption of fermented foods prepared from fish or marine mammals. A high index of suspicion by health care providers, early diagnosis, and rapid antitoxin treatment has markedly reduced the fatality rates of food-borne botulism from 31% during 1950–1959 to no deaths among 80 cases since 1994 in Alaska. In 1998 a collaborative effort between the Bristol Bay Area Health Corporation and the CDC's Arctic Investigations Program designed a community-based botulism prevention strategy that included the production of an educational video and a web site titled "A Helping Hand: Keeping your Family Safe from Botulism" (http://www.phppo.cdc.gov/phtn/botulism/default/default.asp).

Food-borne botulism is not unique to the U.S. Arctic. High rates of botulism have been noted among the Canadian Inuit population as well. Observers in other countries have pointed to the increased use of plastic bags and buckets to ferment foods as a possible cause for the increased rates of botulism since the 1960s. This is plausible; *Clostridium botulinum* is an anaerobic bacterium and would be expected to thrive in the oxygen-poor environment of sealed plastic bags or buckets. Experiments performed by CDC in 1999 showed that *Clostridium botulinum* toxin production was greatest when fish head fermentations were carried out in sealed plastic buckets, compared to traditional methods such as placing fish heads into a grass-lined hole in the ground. Thus, more traditional fermentation practices, although not risk free, may be safer for persons who choose to consume traditional fermented foods.

Chronic Diseases caused by Infectious Agents

Hypochromic microcytic anemia has long been found to be common among Alaskan Natives despite a diet rich in bioavailable iron. In the 1990s it was found that fecal blood loss may be a major contributing factor to iron deficiency anemia in Alaska Natives and that hemorrhagic gastritis was associated with *Helicobacter pylori* infection. A large population-based serosurvey has shown that the seroprevalence of *Helicobacter pylori* in Alaska Natives is 75%. The rate increased with age. By 14 years of age 78% of children were found to have evidence of infection. Iron deficiency was found in 20% of males and 36% of females. A significant association between iron deficiency and seropositivity for *Helicobacter pylori* was found in those persons less that 20 years of age. Iron deficiency anemia remains common among Alaska Native preschool children. In one village surveyed in 1999, 38% of the 123 children between one and five years of age were iron deficient, and 17% were anemic. Serologic evidence of *Helicobacter pylori* infection was found in 41% of these children, and there was a strong statistical association between *Helicobacter pylori* seropositivity and both anemia and iron deficiency. In 2002 the State of Alaska Division of Public Health, together with the CDC's Arctic Investigations Program, initiated a randomized controlled trial of antibiotic therapy for *Helicobacter pylori* infection to treat iron deficiency among children in rural Alaska. Eradication of *Helicobacter pylori* infection using antibiotics should result in a greater resolution of iron deficiency in children than iron therapy alone.

Alaska Native children experience very high rates of lower respiratory tract infections (LRTI). The most common cause of LRTI hospitalization in infancy is respiratory syncytial virus (RSV). In 1993–1996, Alaska Native children from the Yukon–Kuskokwim Delta region experienced an RSV hospitalization rate (156 per 1,000 infants) five times higher than the U.S rates. Severe RSV infection in infancy can result in higher rates of recurrent wheezing in childhood. Between 1999 and 2002 the Arctic Investigations Program, together with the Yukon–Kuskokwim Health Corporation, evaluated RSV-hospitalized children and their non-hospitalized control subjects approximately five years after hospitalization. Children who were hospitalized with RSV infection had higher rates of wheezing, LRTIs, and asthma diagnoses during the first four years of life. The association decreased with age and was no longer significant by five years of age. However, hospitalization for

RSV infection was associated with increased respiratory symptoms, including chronic productive cough at five years of age.

Vaccine Use and Development

Rates of invasive pneumococcal infection (bacteremia and meningitis caused by *Streptococcus pneumoniae*) for Alaska Natives are the highest in the U.S. and are approximately five times higher than for non-Natives living in Alaska. The disease is most common in the very young and the elderly (73 cases per 100,000 Natives at least 55 years old). Fatalities from pneumococcal infection are highest in the elderly (greater than 15%). Once fully susceptible to antibiotics, *Streptococcus pneumoniae* has acquired resistance to commonly used antibiotics. In Alaska 13% of isolates recovered from patients with invasive disease in 2000 were found to be fully resistant to penicillin. A 23-valent pneumococcal polysaccharide vaccine has been licensed for use in adults in the U.S. since 1983. The overall effectiveness against invasive pneumococcal disease among immuno-competent persons of at least 65 years of age is 75%; however, the efficacy may decrease with increasing age. A new 7-valent pneumococcal conjugate vaccine was licensed in 2000 for preventing pneumococcal disease in infants and young children. In 2000, rates of invasive pneumococcal disease in Alaskan children less than two years of age was 36 cases per 100,000. In 2002, following vaccine introduction, rates of invasive pneumococcal disease in Alaskan children less than two years old fell to 13 cases per 100,000. In addition the percentage of pneumococcal isolates fully resistant to penicillin fell from 13% in 2000 to 2.6% in 2002, demonstrating the potential of this vaccine to reduce infections caused by pneumococci that are resistant to antibiotics.

Haemophilus influenzae type b was the most common cause of bacterial meningitis in preschool-age children prior to the development and widespread use of protein conjugate vaccines. Routine immunization of all Alaska Native infants with a *Haemophilus influenzae* type b conjugate vaccine began in 1991 and reduced the incidence of invasive *Haemophilus influenzae* type b infection more than ten-fold by 1993. The effectiveness of these vaccines are largely due to the induction of a circulating antibody and the interruption of oropharyngeal carriage, leading to the protection of susceptible children through herd immunity. Despite the success of *Haemophilus influenzae* type b conjugate vaccines in preventing disease in the rest of the country, cases continue to occur among fully and partially vaccinated Alaska Native children at a rate of 15 cases per 100,000 (1996–1997), ten times the rates found in children in other parts of the U.S. However, by 2002, rates in Alaska Native children had declined to 6 cases per 100,000.

National Center for Environmental Health

The National Center for Environmental Health's Division of Environmental Hazards and Health Effects will continue a study of human exposure to environmental pollutants in the Arctic. Maternal and umbilical cord blood samples from Alaska Natives are being evaluated for persistent organic pollutants, nonpersistent pesticides, and trace metals, as well as for various nutritional markers. This study is underway in Barrow and Bethel and in communities in the Aleutian and Pribilof Islands. Additional sites will be added as the study progresses.

A study of environmental contaminants as cofactors in breast cancer in Alaska Natives is nearing completion. Two hundred study subjects were enrolled, and analysis of their biological samples has begun. A unique aspect of this study is the analysis of serum collected from the women over time and stored in the CDC/AIP serum bank. By analyzing stored serum collected many years ago, researchers will be able to model exposure to organochlorines over time.

A protocol for assessing arsenic exposure and associated health effects in rural Alaska communities is in development. The study will evaluate current and long-term human exposure to inorganic arsenic among Alaskans by measuring arsenite and arsenate in urine and in hair or toenails. The health conditions of study participants will also be assessed. This study will be conducted in collaboration with ANHB and the State of Alaska's Division of Public Health.

National Institute for Occupational Safety and Health

Occupational Injury Prevention

NIOSH identified Alaska as having the highest risk of traumatic occupational fatalities compared to all states in the U.S. To address the unique hazards and work environments facing employees and employers in Alaska, NIOSH established a field station in Anchorage in 1991.

The Alaska Field Station (AFS) of NIOSH implemented a comprehensive surveillance system for occupational injuries, the Alaska Occupational Injury Surveillance System (AOISS). AOISS obtains risk factor information and permits quantitative epidemiologic analyses for sound public health and prevention. The database contains more than 800 fatality records, as well as for over 4,000 nonfatal injury records via the Alaska Trauma Registry (ATR).

NIOSH has collaborated with the Alaska Department of Health and Human Services, the Alaska Department of Labor, the U.S. Coast Guard, the National Transportation Safety Board, the Federal Aviation Administration, the U.S. Occupational Safety and Health Administration, industry and labor organizations, communications media, health care providers, universities and community colleges, and other public and private individuals and organizations. Since establishing the field station, Alaska has experienced a significant decline in all work-related deaths, including deaths in the high-risk industries of commercial fishing and air transportation. The trends in occupational fatalities for the periods 1990–1992 compared to 2000–2002 illustrate the following:

- Overall, the number of work-related deaths in Alaska declined 40%, from an average of 83 fatalities per year to 50 fatalities per year. The total of 34 deaths in 2002 was the lowest work-related mortality in Alaska since data have been collected.
- Occupational injury deaths in the commercial fishing industry declined by 59%, from 34 to 14 per year.
- Occupational deaths from aviation-related crashes showed a 39% decline, from 23 to 14 per year.

Trauma registries are a unique source of injury data, including information on demographics, geography, disability, medical cost, payment sources, cause of injury, discharge diagnosis, and injury severity. The ATR has proven to be a useful information source for monitoring non-fatal work-related injuries in Alaska. All 23 hospitals in Alaska report to the ATR, making it a population-based data source from which injury rates can be calculated. Analyses of the trend data and identification of hazardous processes have led to injury prevention strategies specifically targeted to high-risk areas. The objectives of this work include using information from the ATR to:

- Reduce the morbidity resulting from work-related injuries in Alaska by providing data for developing appropriate prevention strategies;
- Facilitate state, Federal, and international work-related injury comparisons;
- Improve awareness of nonfatal work-related injury as a significant health problem;
- Assist in evaluating work-related injury prevention strategies; and
- Facilitate research for the prevention of nonfatal work-related injuries.

An aviation accident investigator at a remote crash scene in Alaska.

Aviation Initiative

In FY 2000, Congress funded a Federal initiative to reduce aviation-related injuries and fatalities: the Alaska Aviation Safety Initiative. The initiative, begun in October 1999, is led by NIOSH with three other Federal agencies: the Federal Aviation Administration (FAA), the National Transportation Safety Board (NTSB), and the National Weather Service (NWS). The purpose is to reduce the number of aircraft crashes and deaths, to promote aviation safety in Alaska, and to evaluate safety interventions. The initiative's methods and objectives are to:

- Gather and analyze injury and fatality data to identify risk factors;
- Bring together aviation industry working groups to characterize the problems;
- Develop aviation safety information for pilots, companies, and the flying public;
- Evaluate the effectiveness of and changes in flight safety interventions; and

Commercial aviation crashes are one of the leading causes of death to workers in Alaska.

Reduced visibility is a frequent hazard in Alaska's flight environment.

- Evaluate progress and suggest additional improvements.

NIOSH contracted with the University of Alaska Anchorage's Institute of Social and Economic Research (ISER) to design and administer two statewide aviation safety surveys during 2001–2002, one of air carrier managers and one of active commercial pilots. Both surveys addressed pilot and company demographics, pilot flight hours (total hours, aircraft type, and instrument hours), Alaska flying experience, attitudes about safety, flying practices, and other salient risk factors. The purpose was to collect information on pilot and company practices and attitudes in order to design policy options that would reduce aviation fatalities. Return rates for the operator and pilot surveys were approximately 81% and 75%, respectively.

Although occupational aviation fatalities continue to be a problem, with Alaska commercial pilots having the highest occupational fatality rate during 1990–1999 (410 per 100,000, compared to 150 per 100,000 for loggers and 125 per 100,000 for fishermen), there has been a downward trend in occupational aircraft crashes and fatalities over the 12-year period of 1991–2002. Between 1990–1992 and 2000–2002, deaths from aviation-related crashes showed a 39% decline, from 23 to 14 per year. This secular trend is also supported using broader intervals. Thus, progress is being made toward the overall goal of reducing occupational aircraft crash fatalities in Alaska by at least 50% by the end of 2009 (comparing 1990–1999 to 2000–2009).

The busy fishing port in Sitka, Alaska.

Commercial Fishing

The commercial fishing industry is a major contributor to the high numbers of fatal and hospitalized nonfatal injuries in Alaska. Data from AOISS show 285 work-related fatalities in the Alaskan commercial fishing industry from 1990 through 2002. Commercial fishing deaths in 2000–2002 decreased 59% from 1990–1992. Many of the fatalities were vessel-related, caused by either a vessel capsizing or sinking (36%). Interventions to date, including the implementation of the Commercial Fishing Industry Vessel Safety Act, have been successful in reducing fatalities due to vessel-related events. Nonfatal injury data have shown that of the 648 hospitalized nonfatal injuries, 32% were machinery-related. Many of the machinery injuries occurred in the Bering Sea crab fishery while working around crab pots and crab pot launchers.

Several interventions have been identified to modify the equipment and environment to improve deck safety, including machine guarding, machinery placement, and increased visibility. From this first phase, a deck safety publication and demon-

Commercial fishermen haul crabs from the northern waters off Alaska.

stration deck model have been produced. The second phase is underway, with evaluation of the purse seining, long-lining, troll, gillnet, small crab, and dive fisheries.

International and Circumpolar Collaboration, Conferences, and Workshops

Through its Alaska Field Station, NIOSH has continued its international research in partnership with commercial fishing research scientists and injury prevention program workers; the Circumpolar Health networks; and the World Health Organization's International Safe Communities Program. AFS co-sponsored the Second International Fishing Safety and Health Workshop (IFISH II) in Sitka, Alaska, in September 2003. The conference was attended by 135 participants from 16 countries, including Sri Lanka, Pakistan, India, Australia, Chile, Indonesia, Sweden, Norway, Canada, and New Zealand.

The AFS also participated in the Twelfth International Congress on Circumpolar Health, in Nuuk, Greenland, in September 2003. In addition to co-chairing the Injury and Occupational Safety and Health Working Groups, AFS staff presented three scientific papers, one on hypothermia and cold-water drowning, one on the prevention of worker deaths in Alaska, and one on deaths of scientific fieldworkers in Alaska.

Commercial fishermen in Alaska work in one of the most hazardous environments in North America.

Agency for Toxic Substances and Disease Registry

The Agency for Toxic Substances and Disease Registry's Alaska Traditional Diet Project (ATDP) is a pilot project to assist consumers of Alaskan traditional foods in making informed dietary decisions to prevent potential adverse health outcomes from environmental contamination. The project, managed by the Alaska Native Health Board, is a collaborative endeavor with the State of Alaska, other Federal agencies, Native villages and corporations, and Native organizations.

The ATDP has identified and characterized regional traditional diets, including beneficial nutrient information. Using a comprehensive and comparable dietary survey, data are available for 13 villages representing several regions in Alaska. The ATDP is now conducting sampling and analysis for contaminants in traditional foods at two villages (a subset of the 13 survey participants). This project will assist in the development of a response to environmental contaminant issues in Alaska.

Substance Abuse and Mental Health Services Administration

Inhalant Abuse Program

The Tundra Swan Inhalant Program, funded by SAMHSA's Center for Substance Abuse Treatment (CSAT), is the only residential inhalant abuse treatment program in the nation. Statewide

outreach from its office in Anchorage enhances accessibility to the entire state, while the Tundra Swan Center provides residential treatment in Bethel. The statewide program trains providers regarding aftercare programs for youth returning to their home communities following residential inhalant treatment. The project has established close links with the Canadian substance abuse treatment system and its inhalant abuse experts.

Cooperative Agreements for the Comprehensive Community Mental Health Services for Children and Their Families Program

Under this program, SAMHSA's Center for Mental Health Services (CMHS) provides grants for state and tribal governments to develop systems of care for children with serious emotional disturbance, along with their families. Current grantees for these six-year grants are the Yukon–Kuskokwim Delta and the Fairbanks Native Association. Over 80 isolated villages are represented. The National Institute of Mental Health (NIMH) participates in an advisory committee for the cross-site evaluation of the grant program.

Circles of Care Program

Supported by CMHS, this program provides grants for tribes and urban Indian communities to plan, design, and assess culturally specific mental health service system models for American Indian and Alaska Native children and their families. Among current grantees are the Tlingit and Haida Tribes of southeast Alaska. Each of the three-year grants (approximately $350,000 per year) includes a cross-site evaluation provided through an Inter-Agency Agreement (IAA) with NIMH. An IAA with the Indian Health Service (IHS) provides for on-site technical assistance.

Targeted Capacity Expansion Program

A CSAT Targeted Capacity Expansion grant to the Norton Sound Health Corporation ($749,083) serves Alaska Native young adults and adolescents with co-occurring SA/MH disorders. This project is enhancing treatment capacity by making resources available to treat young adults and adolescents (ages 12–24) dually diagnosed as mental or emotionally ill and substance impaired in 15 remote villages of the Bering Straits region.

Alaska Fetal Alcohol Syndrome/ Alcohol-Related Birth Defects Program

Alaska has a relatively high incidence of FAS/ARBD births. The overall goal of this program, supported jointly by SAMHSA's Center for Substance Abuse Prevention (CSAP) and CSAT, is to improve the practice of identifying, preventing, and treating FAS/ARBD. It is a five-year, $5.8 million program that provides prevention activities for public school students and families and the general public. Interventions include family planning, alcohol treatment, and other services for women of childbearing age; screening and diagnosis for all children in state custody; and development of a centralized FAS/ARBD Information and Evaluation Center.

National FAS/ARBD Center for Excellence

Supported by CSAP and funded at $3.8 million a year for five years (through FY 2004), the Center for Excellence coordinates activities to ensure that advances in both science and practice are synthesized and efficiently disseminated to the field. Among the center's activities are:

- Studying adaptations of innovative clinical interventions and service delivery improvement strategies for children and adults with fetal alcohol syndrome or alcohol-related birth defects and their families;
- Identifying communities that have exemplary comprehensive systems of care for such individuals so that they can provide technical assistance to other communities attempting to set up similar systems of care;
- Providing technical assistance to communities that do not have comprehensive systems of care for such individuals and their families; and
- Developing innovative techniques for preventing alcohol use by women in childbearing years.

Health Resources and Services Administration

Telehealth is the use of telecommunications and information technologies to share health-related information, provide clinical care, deliver health profession and patient education, and support consumer health education outreach, public health, and health-care-related services at a distance. The Health Resources and Services Administration (HRSA) established the Office for the Advancement of Telehealth (OAT) to promote the use of telehealth for underserved populations. In 2001–2003 the office administered three telehealth grants in Alaska with the goal of delivering clinical services to remote areas in the state. The Eastern

Aleutian Tribes Telemedicine Program serves 12 sites encompassing 6,985 square miles of land, with a population of 2,800, spread over 8,029 square miles of Bering Sea and the Pacific Ocean. Clinical services initially focus on seven areas: dermatology; ear, nose, and throat; mental health; radiology; nutritional consultations; and obstetrics and gynecology. Recently they have added specialized services in diabetes and cardiovascular care, injury prevention, and emergency medical care. The network can also support two-way videoconferencing. Most recently they have added formal health aide training over the video and telepharmacy services. The project provides access to Internet library sites and closely coordinates with the Alaska Federal Health Care Access Network (AFHCAN).

AFHCAN is a 43-member organization with representation from Federal agencies, tribal health organizations, rural health care facilities, public health care organizations, tertiary health care centers, and the State of Alaska. The initial focus is improving access to health care services for Federal beneficiaries. The network includes 248 sites and is estimated to serve a population of 265,000, or 42% of the population. By September 2003 the program had conducted 9,494 cases, largely related to primary care; audiology; ear, nose, and throat; dermatology; and cardiology. Preliminary evaluation indicates that the AFHCAN system prevented travel 34% of the time, caused travel 8% of the time, and had no effect 59% of the time. A validation study determined if post-surgical follow-up of ear patients via store-and-forward telemedicine was as effective as an in-person exam. The simple conclusion is that store-and-forward telemedicine, with images taken by community health aides, is as good as an in-person exam for patients receiving pressure equalizing (ear) tubes.