

STUDYING HEALTH IN GREENLAND: Obligations and challenges

ABSTRACT

Health research in Greenland has contributed with several findings of interest for the global scientific community and has documented health problems and risk factors of importance for planning the local health care system. The study of how health develops in small, scattered communities during rapid epidemiological transition carries prospects of global significance. The Inuit are a genetically distinct people living under extreme physical conditions. Their traditional living conditions and diet are currently undergoing a transformation, which may approach their disease pattern to that of the industrialized world, while still including local outbreaks of tuberculosis. Health research in Greenland is logistically difficult and costly, but offers opportunities not found elsewhere in the world. A long tradition of registration enhances the possibilities for research. A number of research institutions in Denmark and Greenland have conducted health research in Greenland for many years in cooperation with, among others, researchers in Canada and Alaska. National and international cooperation is supported by the Danish/Greenlandic Society for Circumpolar Health, the International Union for Circumpolar Health, and the Commission for Research in Greenland. Health news are regularly reported to international and local congresses and to the scientific journals.

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INTRODUCTION

Hans Egede, the first missionary to Greenland, in 1741 remarked that the "... Greenlanders were strong and able-bodied. You seldom see someone with a natural ailment, or disease, except for a weakness of the eyes caused by the keen winds of spring and the snow and ice, which hurt the eyes. I have also seen a few who resembled lepers. It is strange, however, that even though they have free intercourse with other people, these are not infected. Those who live far north also often suffer badly from dysentery, bloody diarrhoea, weakness of the chest, boils, convulsions etc. No other epidemic diseases as plague, smallpox and their like was known to the Greenlanders until 1734..." and, thus, fathered the descriptive epidemiology in Greenland (1). Resident physicians contributed narratives of epidemics during the following centuries and, around the mid-20th century, Dr. Alfred Bertelsen compiled his own experience and the observations of previous physicians into four volumes, which are still a valuable source of information on the history of diseases in Greenland (2).

Modern health research started after World War 2 with descriptions and analyses of measles epidemics, tuberculosis, eye diseases, sexually transmitted diseases and hepatitis. Studies of chronic diseases were added, among which the studies by Bang and Dyerberg of the biochemical effects of fatty acids, in particular the long chain n-3 fatty acids, in the traditional marine diet of the Greenlanders (3). Bertelsen's tradition was followed by others with descriptions of the disease patterns of present-day Greenlanders (4, 5). The Commission for Scientific Research in Greenland has repeatedly given priority to health research in Greenland and has established a more formal contact between the Greenland Home Rule Government and the Danish Ministry of Health's two research units in Denmark, i.e. the National Institute of Public Health and the State Serum Institute.

Until recently, health research in Greenland has been carried out by a few scattered torch bearers, who had a background in the Greenlandic health care services, but who subsequently became based in diverse research institutions in Denmark. This holds true even today to some extent, but, during the latter part of the 1990s, a number of small research environments have emerged. The total number of active researchers in the field is probably not more than 50, of whom less than five are engaged full-time in circumpolar health research. Health research in Greenland has a dual purpose. It aims at provid-

ing the Home Rule Government with part of the information it needs to run the health care system for improving health conditions in Greenland and, at the same time, for studying health under unique genetic, social, environmental and climatic conditions. The study of how health develops in a small society, scattered over a huge area, during rapid transition and under extreme climatic conditions, carries prospects for the research community at large.

More information on published research results may be found in reviews and bibliographies (5-7). A further place to look for what's happening in the field is the proceedings from the triennial international congresses on circumpolar health (8-10).

RESEARCH OPPORTUNITIES

Environment and genetics

The Inuit, including the Greenlanders, are genetically distinct and live under very special conditions. They therefore offer interesting opportunities for the study of the natural history of diseases under circumstances that differ significantly from those in Western Europe and Northern America. The Greenlanders are descendants of the Inuit, who started their eastward migration from Alaska a thousand years ago. For the last 3-400 years, they have, to a varying extent, absorbed genetic material from European and American whalers, explorers, workers, missionaries, physicians and civil servants and, in particular, the population on the west coast of Greenland has a substantial admixture of European genes.

The physical living conditions in Greenland are characterized by cold through most of the year; not extreme cold in the most populated areas, but with monthly mean temperatures in February, the coldest month, between -10 and -20°C, with spells reaching down to -30°C and below. The annual shift between winter darkness and continuous light during the summer affects human biology *via* melatonin and possibly other hormones. Housing conditions are generally modern, but are more crowded than in many European countries. The rapid post-World War 2 socio-cultural development has affected various regions of Greenland to a different extent, and socio-economic conditions vary significantly among regions, being generally lower in the villages than in the towns. The relative isolation of the Greenlanders is breaking up; television, telephone, movies and

access to the internet, along with a better command of languages, such as Danish and English, all contribute towards an increased involvement in global affairs. Travel, although still expensive, has vastly increased both internally and to Denmark and the rest of the world. HIV came late to Greenland, but spread much more in the heterosexual population that was seen in Europe and the USA. The history of widespread epidemics of sexually transmitted diseases was not repeated for HIV, probably because spread *via* needle sharing or homosexual contacts is limited. Many HIV-infected individuals leave the country and the pool of prevalent cases is apparently too small to pose a real threat for a wider spread of the infection.

The Greenlandic diet is rich in seal, other marine mammals and fish. The marine diet is replete with both n-3 fatty acids, which are generally believed to be favourable for good health, and toxic anthropogenic contaminants (PCB, pesticides, mercury). This constitutes "the Arctic dilemma". A very large proportion of the adult population smokes daily (70-80%). The alcohol consumption is as high as in Denmark, in spite of heavy taxation, and is much higher than in the other Nordic countries. The average of 13 litres of alcohol (calculated as litres of pure alcohol per person 15 years old and above) that each adult in Greenland consumes per year is often consumed in binges.

The lifestyle of the Inuit is currently undergoing a rapid transformation that will influence important health parameters for the next several decades. Epidemiological research into the impact of lifestyle on health and disease can, if carried out within the coming years, provide valuable information on the impact of the traditional lifestyle on, for example, cardio-vascular disease, diabetes and cancer, and on the impact of social transformation on psycho-social health and chronic diseases.

Diseases and causes of death

Infectious diseases have always been a major public health issue in Greenland and the study of infections is still of major interest. Some of the most common infectious diseases are respiratory infections and genito-urinary chlamydia infections. Tuberculosis and many childhood infections are still much more common in Greenland than in most of the western world. The Inuit cancer pattern differs from that of western countries in many aspects and, while lung cancer and certain viral cancers are common, hormone-dependent cancers are

relatively infrequent (11). The reported mortality from ischemic heart disease is low, but that of other heart diseases is high. In addition, stroke mortality is high and the combined mortality from cardiovascular diseases is higher than in most other regions of the world, including Western Europe and North America. Diabetes was very infrequent in the 1960s, but the prevalence is now as high as, or even higher than, in Denmark. The incidence of tobacco-related diseases is high. Mental health is stressed by unstable family relationships, and suicides, especially among youth, have increased tremendously (12). Accidents, including alcohol-related accidents, and homicides are very prominent causes of death. Together with a high infant and child mortality, the injuries contribute towards a low life expectancy at birth: 60.8 years among men and 67.5 years among women, compared with 73.4 years and 80.5 years, respectively, in Finland. Intervention models developed under quite different circumstances cannot be expected to work in Greenland and intervention studies are highly needed. About 800 million DKK is spent annually on health care. For this amount of money, much better health status should be achievable.

Health care and prevention

The health care system in Greenland is based on a number of small hospitals, one in each of 15 towns, and a referral hospital in the capital, Nuuk. Difficult cases are referred to Denmark for specialist treatment. The small hospitals are staffed by 1-4 physicians and support staff and serve communities of 550 to 5,500 inhabitants; on average 22% of these live in villages located up to hundreds of kilometres from the town. Nuuk, the capital, has 14,000 inhabitants. In combination with the absence of roads between the towns, this presents practical problems when the aim is to maintain a modern, specialised health care system. The health care system in Greenland is currently undergoing changes and studies of both economical outcome and service delivery are needed.

Without doubt, the balance between money spent on care and on prevention is out of balance. Much more should be spent on preventing diseases and promoting health. How best to do that raises a number of research questions. Since many of the expected chronic diseases are related to habits that start early in life, and perhaps to organ programming that starts even earlier, it is of the utmost importance to develop preventive strategies to de-programme these

possible disease trajectories. Health promotion is a life-long process that will not succeed unless it starts early. It should cover physical activity, good dietary habits and safe and stimulating challenges. Promoting health in Greenland not only requires new research, but also a political will.

Research conditions

For logistic reasons, research in the Arctic is expensive. Transport and travel is costly and there are only connections once or twice a week to many towns and less often to the villages. For much of the year, the weather can delay travel. The populations are small and scattered and there are no research laboratories around the corner. From many practical perspectives, excepting the population size, research in the Arctic resembles more that in developing countries than in Europe. Even in moderately large provincial towns of Africa and Asia, a good morning's walk will bring the researcher into contact with a population the size of the whole population of Greenland. It is thus obvious that research into problems that can be solved elsewhere in the world is not sufficiently cost-effective to carry out in the Arctic. Nevertheless, Greenland has still much to offer.

It has modern communication systems, well-educated health personnel and an infrastructure for research superior to that found in many other remote areas. Good data on health are also available for research, including population data and data on mortality and births. The Danish Cancer Registry covers Greenland and hospital records are about to become computerized. Plans are to make research data more accessible to all researchers.

Health research in Greenland must be approved by an ethical review committee just like everywhere else. At present, the Commission for Scientific Research in Greenland is responsible for this. The results of arctic research are often published in relevant international scientific journals or, in the case of Greenland, in the Danish-language journal of the Medical Association of Denmark (*Ugeskrift for Læger*). The *International Journal of Circumpolar Health* is a peer-reviewed journal that accepts good manuscripts from all aspects of circumpolar health.

Institutions and data sources

Over the last decade a number of research units with special interests in circumpolar health issues have emerged in Denmark and Green-

land. Each unit has its own specific area of interest, but the overlap is large enough to justify a close cooperation and exchange of ideas. Each research group can contribute to a joint, world-class research agenda with special skills and data materials. The major units are listed and briefly described in the following paragraphs.

The Department for Research in Greenland, National Institute of Public Health, Copenhagen

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The permanent staff includes the professor in arctic health, other health professionals, a statistician and a cultural sociologist. There is a local office in Nuuk. Both epidemiological and qualitative research methods are employed. The main research field, undertaken in close cooperation with the Steno Diabetes Centre, comprises population-based health interview surveys focusing on cardio-vascular health and diabetes. Psycho-social and environmental health are other main research themes. The department is currently engaged in preparations for a large prospective study of diet and health among the Inuit in Greenland, Canada, and Alaska. The unit has a copy of the register of causes of death in Greenland (currently with 12,379 records for 1968-1998), a register of a Health Interview Survey from 1993-94 (1728 records), a register of a Health Examination Survey from 1998-2001 (4162 records), as well as several smaller registers. The department is associated with the WHO/PAHO Collaborating Center on Environmental and Occupational Health Impact Assessment in Québec.

The Centre for Arctic Environmental Health, University of Aarhus

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The centre was established in 1992 at the Department of Environmental and Occupational Medicine, University of Aarhus. Since 2001, it has been recognized as a research unit at the University of Aarhus. The centre's Director is Chairman of the board, which has representatives nominated by the Greenland Home-rule Government, the Faeroese Government, the National Institute of Public Health, Copenhagen, the Danish/Greenlandic Society for Circumpolar Health, the Faculty of Health Science and the Department of Occupational and Environmental Medicine, University of Aarhus. In 2002, a local branch was established at the Institute of Natural Resources of Green-

land, Nuuk. The Centre has a permanent staff of two permanent scientists and one secretary. Two scientists are associated with the centre in Greenland. The Centre takes care of the secretarial function for the International AMAP Human Health Expert Group and coordinates the implementation and assessment of the AMAP Human Health program in Greenland. The main research activities include mechanistic effect models of environmental contaminants at the molecular level and studies of the effects of marine fatty acids.

The Section for Greenlandic Research, Department of Epidemiology Research, Statens Serum Institute, Copenhagen

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The Section for Greenlandic Research is a part of the Department of Epidemiology Research, one of the largest epidemiological research sites in Denmark. The Section has a staff of four researchers, all physicians, including one professor of epidemiology, one senior researcher, and two PhD students. The main research fields include the epidemiology of infectious diseases, cancer and allergic diseases in Greenland. Since 1996, the Section has carried out population-based field studies in towns on the west coast of Greenland, primarily in Sisimiut, in cooperation with the local hospital. The Section has established the Greenlandic Research Registry, which builds on data from a number of registers, including the Civil Registry System for Greenland, the Greenlandic Birth Registry, the Sisimiut Birth Register and the Cancer Registry. Much research also takes advantage of large collections of biological material that includes four serum collections from persons living in Greenland and that were obtained in 1979-81, 1987, 1998 and 2001, respectively.

The Primary Health Clinic, Nuuk, and other institutions in Greenland

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Several of the physicians and nurses at the Centre of Primary Health Care in Nuuk are active researchers, generally cooperating with research institutions in Denmark, Canada or USA, with project contracts and research associations with different universities. One part-time post doctoral researcher is placed at the clinic, and an office for Environmental and Public Health was established at the Institute of Natural Resources in Nuuk in 2002. This constitutes an active health research environment in Greenland, but research is also carried out in a few other hospitals. The Chief Medical Officer has registers of

births and deaths and Statistics Greenland houses the central population register and the register of causes of death.

The Copenhagen University Hospitals

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In 2001, the “Forum for Greenlandic Medical Research” was established at the Copenhagen University Hospitals. The purpose of the forum is to encourage and consolidate Greenlandic Medical Research Projects at these institutions and to establish a meeting forum for researchers. The Research Forum also aims to initiate, coordinate, develop and secure the continuity of clinical research concerning the population in Greenland, both at the Copenhagen University Hospitals and bilaterally. In addition, the Research Forum offers expertise in different clinical areas to researchers in Greenland. Finally, the Forum for Greenlandic Medical Research at the Copenhagen University Hospitals aims to strengthen national and international cooperation with other arctic medical research institutions. The Forum has a steering committee consisting of seven persons, including a representative from Greenland. Currently, the centres of interest include the departments of Clinical Immunology, Genetics, Paediatrics, Internal Medicine, Eye Diseases, Ear-Nose-Throat Diseases, Neurology, Anaesthesiology, Cardiology and Para- & Tetraplegy. Research topics include allergy, asthma, tuberculosis, paediatric genetic diseases, epilepsy, para- and tetraplegic patients, age-related macula degeneration, including diabetic retinal disturbances, and middle-ear infections, including otosurgery.

Networks and international cooperation

In addition to the above-mentioned research units, cooperation takes place in a number of non-institutional arenas. The Danish/Greenlandic Society for Circumpolar Health (in Danish: Grønlandsmedicinsk Selskab) was established in 1970 and has currently 275 members. It arranges two scientific meetings per year in Copenhagen and two or three in Nuuk. The members include physicians, medical students and others with an interest in health in Greenland.

The Danish/Greenlandic Society for Circumpolar Health is one of five adhering bodies that constitute the International Union for Circumpolar Health. The IUCH council meets every year to discuss issues of common relevance to arctic health research in Alaska, Canada, Greenland, the Nordic countries and Russia. The IUCH is

also responsible for the triennial circumpolar health congresses and is co-publisher of the International Journal of Circumpolar Health.

Of special interest to researchers in Greenland and Denmark are the NunaMed congresses, which, with more than 200 participants, have taken place in Nuuk every three years since 1991, and the research seminars in Kangerlussuaq, with 35 active researchers as participants, which last took place in November, 2001.

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