



CLIMATE CHANGE *and* HEALTH : *research report*

Our mission is to help the people of Canada
maintain and improve their health.

Health Canada

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CLIMATE CHANGE AND HEALTH: RESEARCH REPORT

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“Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces, for they are not alike, but differ much from themselves in regard to their changes.”

Hippocrates, in "Air, Waters and Places" in Hippocratic Writings.
Lloyd G. E. R., ed. London, UK. Penguin. 1978

FOREWORD

There is growing evidence that global climate is changing and that these changes will have profound effects on the health and well-being of citizens in countries throughout the world. Canada is already feeling the effects of a changing climate, particularly in its northern communities. Elsewhere in Canada, we may experience even more extreme weather events, more frequent air quality problems, contamination of water and food, and new infectious diseases. As a result, health authorities and practitioners will need to understand how changing environmental conditions will affect the health of Canadians and who will be the most vulnerable to these changes in order to implement timely and effective solutions.

Health concerns resulting from a changing climate are complex and addressing them requires the collaboration of a broad range of societal partners, a multi-disciplinary approach and the timely exchange of information between researchers and health decision makers. As host of the Health Sector of the Canadian Climate Impacts and Adaptation Research Network (C-CIARN), Health Canada

has partnered with a number of leading research and community health organizations to bring together experts from across Canada to tackle this issue and help contribute to the knowledge that is necessary to protect the health of Canadians.

This publication highlights the work of Health Canada's research networks that make up C-CIARN Health in identifying the need for new knowledge to better understand the relationship between climate change and human health. It also profiles the accomplishments of selected Canadian researchers. It is our hope that it will encourage researchers and practitioners to join our multi-disciplinary effort to develop sound science as the basis for actions and policies to adapt to a changing climate.

Paul Glover
Director General
Safe Environments Programme
Health Canada



CLIMATE CHANGE: FACING UP TO THE CHALLENGE

Climate change is a complex environmental challenge facing Canada and the world. The international scientific community has concluded that the rapid increase in the concentration of greenhouse gases in the atmosphere can be expected to raise the earth's surface temperature, change our climate, alter our environment, and endanger our health. There is compelling evidence that human activity—particularly activities associated with energy use and deforestation—is accelerating this change.

Over the course of this century, it is generally agreed that we will see increases in the earth's average surface temperature ranging from 1.4 to 5.8 degrees Celsius. However, this temperature increase will not be evenly distributed around the globe. Greater and more rapid warming is expected in certain regions, including Canada's North. Canada is vulnerable to a broad range of climate change impacts.

Recognizing that the nations of the world must work together to successfully address the challenge of climate change, Canada has supported the United Nations Framework Convention on Climate Change, and has ratified the Kyoto Protocol, agreeing to meet specific targets for greenhouse gas emissions reductions. The federal government's Climate Change Plan for Canada sets out

a series of initiatives that will enable Canada to take steps towards meeting its climate change objectives, particularly in the area of reducing greenhouse gas emissions.

However, even if Canada and the world achieve rapid and sustained reductions in greenhouse gas emissions, the impacts of climate change will continue to be felt and adaptation actions will be required to protect the well-being of individuals and communities across Canada.

“On a global scale, the problem of climate change is creating new health and environmental risks and threatens to become the defining challenge for generations to come.”

Her Excellency, the Right Honourable
Adrienne Clarkson, Governor General
of Canada. Speech from the Throne. 2002

IMPACTS AND ADAPTATION RESEARCH: BUILDING A STRONG FOUNDATION OF KNOWLEDGE

Understanding the climate system and how humans and ecosystems interact with it is key to developing an effective response to climate change and variability. Canada made early investments and has developed a significant capacity and reputation in climate change science. Research work continues to be done to further our understanding of Canada's climate, the sources of greenhouse gases, and how they are absorbed in nature. Research on the potential impacts of climate change and Canada's capacity to adapt is required.

Climate change impacts and adaptation research is in its infancy. New researchers are being engaged and stakeholders are being consulted to build capacity in this relatively new, cross-cutting field. To this end, the federal government has created the Canadian Climate Impacts and Adaptation Research Network (C-CIARN), administered by Natural Resources Canada and composed of six geographic regions – British Columbia, Prairies, Ontario, Quebec, Atlantic, and North – and seven national sectors – Health, Landscape Hazards, Coastal Zones, Fisheries, Agriculture, Water Resources, and Forests.

C-CIARN: A CROSS-CANADA CONNECTION OF RESEARCHERS AND DECISION MAKERS

The Canadian Climate Impacts and Adaptation Research Network is a national network that facilitates the generation of new climate change knowledge by bringing researchers together with decision-makers from industry, governments, aboriginal and non-government organizations to increase our understanding of climate change impacts and adaptation, identify knowledge gaps and define research priorities.

The Health Sector of C-CIARN is co-ordinated by Health Canada's Climate Change and Health Office and is made up of distinct networks which promote research on specific human health concerns associated with the effects of climatic change on the natural and built environments. These concerns include illness and death related to air quality problems, heat and cold waves, water- and food-borne contamination, changing patterns of disease spread by animals and insects, stratospheric ozone depletion, and extreme weather events. Populations such as children, the elderly, the poor, disabled people, immigrant populations and Aboriginal Canadians will be more vulnerable to these risks. Each network in the Health Sector is headed by a coordinator in a partner organization who facilitates the cooperative work of the network's members.

Canada's Climate Change and Health Research Networks

- > Health effects of extreme weather events — coordinated by the Institute for Catastrophic Loss Reduction
- > Air pollution-related health effects — coordinated by the New Brunswick Lung Association
- > Water- and food-borne contamination — coordinated by the University of Guelph
- > Vector-borne and zoonotic diseases — coordinated by the University of Guelph
- > Population vulnerabilities in rural and urban communities — coordinated by Centre hospitalier universitaire de Québec
- > Socio-economic impacts of climate change on community health and well-being — coordinated by the University of Toronto

THE HEALTH IMPACTS OF CLIMATE CHANGE: WHAT DO WE KNOW? WHAT CAN WE EXPECT?

At a very basic level, the relationship between health and climate in Canada is seen in the strong seasonal differences in the incidence of infectious diseases and the consistent seasonal pattern of death, peaking in late winter when many deaths result from respiratory infections that cause pneumonia. Another strong linkage between human health and climate is observed in the effects of extreme weather events. Floods, droughts and severe storms can increase the risk of injury, illness, stress-related disorders and death.

Canadians are used to dealing with the extremes of our climate. However, increased weather variability and the effects of changing patterns of temperature, precipitation and winds could force Canadians to cope with health-related concerns that are more frequent, more severe, or occurring in communities that have not experienced them before.

Research on the impacts of climate change on human health is an emerging field in Canada. Studying the effects of global climate change on human health calls for the examination of the combined effects of the climate on natural and human systems and how these effects influence the health of Canadians. To progress in our understanding of current and future vulnerabilities to climate,

“Climatic conditions affect human well-being both directly, through the physical effects of climatic extremes, and indirectly through influences on the levels of pollution in the air, on the agricultural, marine and freshwater systems that provide food and water, and on the vectors and pathogens that cause infectious diseases.”

Climate Change and Human Health. WHO. 2003

research and analyses must integrate information on the built environment, ecosystems, social and economic systems, and human health, and examine what factors influence the relationships between them. This research draws on many disciplines and researchers can be found not only in universities across Canada but also in government research facilities, public health departments and non-governmental organizations. The Health Policy Research Program at Health Canada and the Climate Change Action Fund, administered by Natural Resources Canada, have been primary sources of funding. More recently, the Networks of Centres of Excellence programme, funded jointly by the three Canadian granting councils and Industry Canada, is investing \$25.7 million in ArcticNet to look at the scientific challenges resulting from Arctic warming, including adapting the public health system to change.

This publication seeks to profile the accomplishments of Canadian researchers and the work of Health Canada's research networks in identifying the needs for new knowledge to be developed in order to better understand the relationship between climate change and our health. By raising awareness of the importance of our climate in the chain of events that shape our lives, we hope that it will encourage researchers and practitioners in many disciplines to join our effort to develop sound science as the basis for actions and policies to adapt to a changing climate.

Climate Change Impacts and Adaptation: A Canadian Perspective

A summary of current knowledge on the impacts of climate change on human health and well-being in Canada and the role of adaptation in reducing vulnerabilities can be found in the chapter entitled "Human Health and Well-being" in Climate Change Impacts and Adaptation: A Canadian Perspective published by Natural Resources Canada. This publication acknowledges the work of Health Canada's Climate Change and Health research networks and highlights some of the completed and ongoing research that is expanding our knowledge of the vulnerabilities to health from a changing climate and how we can better adapt to it.

ArcticNet – a new Network of Centres of Excellence

The central objective of ArcticNet, involving researchers from 41 Canadian and foreign universities, is to translate our growing understanding of the changing Arctic into impact assessments, national policies, and adaptation strategies. Over the next four years, ArcticNet will conduct Integrated Regional Impact Studies (IRIS) in the Canadian High Arctic, the Eastern Arctic, and the Hudson Bay area which will contribute the knowledge needed to formulate policies and adaptation strategies for the Canadian coastal Arctic. Health concerns being addressed include: reducing human vulnerability to hazardous events; and adapting the public health system to change.

For more information, visit:
www.cases.quebec-ocean.ulaval.ca/arcticnet/accueil.asp

THE RESEARCH NETWORKS





HEALTH EFFECTS OF EXTREME WEATHER EVENTS

Climate change brings a general warming of climate, but also more variable and severe weather events such as tornadoes, lightning, floods, winter storms, heat waves, sea surge, hurricanes, and drought. The network investigates issues related to mental health, injuries, preparedness, population displacement, damaged public health infrastructure and occupational health hazards that are affected by extreme weather events. Network members identify critical research areas and work collaboratively to build effective research strategies that will ultimately lead to helping communities across Canada to successfully adapt to natural disasters and extreme weather events.

Knowledge gaps and research priorities:

In recent years, considerable progress has been achieved within the health sector to develop a more integrated and robust emergency preparedness and response capacity. However, there is a continuing need to consistently link research, policy and practice within the health care system, particularly in regards to climate change issues. More knowledge of climate change risks is required by emergency management professionals, and increased attention needs to be given to researching the adaptive capacity of the health system to climate change events. The role of volunteers in disaster response may also be more fully integrated into emergency management, including volunteer infrastructure and capacity to cope with large-scale and multiple events, volunteer training, and protection and compensation. There remains a need to establish business continuity plans and uniform assessment and planning guidelines based on evidence-based research.

Finally, the network has identified a need for more research in the social, psychological, and mental health impacts of disasters, so that communities will be able to better anticipate and cope with

these consequences. The psychosocial aspects of disasters, particularly in regards to how communities prepare for and respond to climate change events, can be more fully integrated into mainstream health emergency management. More in-depth research on both the immediate and long-term community psychosocial responses to climate change is also required.

> PROJECT PROFILE

CLIMATE CHANGE, EXTREME WEATHER EVENTS AND HEALTH-EFFECTS IN ALBERTA

The University of Alberta began this research project in May 2002, under the leadership of principal investigator Dr. Colin Soskolne. This research intends to investigate historical responses, at the local level, to extreme weather events and disasters in Alberta as documented in community newspapers. Four specific objectives will be met through the course of this two-year study:

1. provide the equivalent of a hazard assessment by identifying past extreme weather events and disasters in Alberta (from meteorological data and a disaster database), and relate them to print media reports as far back as 100 years ago;
2. identify the possible consequences of extreme weather events resulting from climate change on morbidity, mental health, injuries, death, and infrastructure/property loss in Alberta;
3. correlate the data from two existing databases (i.e., Emergency Preparedness Canada (EPC) and Environment Canada (EC) data) with print media reports; and
4. suggest how the combining of weather and health data could be integrated to advance Health Canada's Sustainable Development Strategy.

First, extreme weather events over the past 100 years were identified through meteorological data and the Canadian Disaster Database. Second, a content analysis framework was developed and applied to several thousand computerized newspaper reports extracted through extensive library archive research.

Understanding how people responded and adapted to severe events in the past, will inform future policies and programmes that will work towards minimizing the impacts of extreme weather events on the health and well-being of Canadians.

For more information, visit: www.phs.ualberta.ca/climatechange/index.html

“Extreme weather events directly cause death and injury and have substantial indirect health impacts . . . occur(ing) as a result of damage to the local infrastructure, population displacement and ecological change.”

Climate Change & Human Health. WHO. 2003



AIR POLLUTION-RELATED HEALTH EFFECTS

This network is facilitating research on the air pollution-related health effects of climate change. An important source of greenhouse gases is the burning of fossil fuels, such as coal, oil and gas, to create electricity or to power our vehicles. Climate has an important influence on what happens to these gases and other pollutants in the atmosphere and how they will ultimately affect us. Heat waves and very hot days may exacerbate air quality problems and increase the risks of respiratory or cardiovascular illness. The research network aims to foster investigations that examine the impacts of climate change and air pollution on human health, with a view to providing information that can help shape improved health-protection policies.

Knowledge gaps and research priorities:

Predictive modelling uses powerful computer-driven simulation methods for predicting future climate conditions and related health impacts. The network has identified a number of improvements in this field that would yield more valuable data for the study of pollution-related health effects of climate change. These include developing more accurate long-term climate models for smaller geographical areas. These models should be able to incorporate air quality data and have the ability to predict changes in air quality, given the change in climate, and the resulting impact on health.

There is also a need for new models that are able to produce outcome scenarios based on precise emission information. Integrating changes in air quality into health effects models to determine changes in exposure, resulting health effects and ultimately health costs would make them valuable tools for producing credible health and cost/benefit scenarios. In the interest of fostering a national approach, it will be important to develop compatible baseline data.

The relationships between weather extremes—both hot and cold—and air quality is also critical to our understanding of the risks to health. The network has identified crucial knowledge gaps requiring new research. These include the relationships between:

- > weather extremes and air pollution,
- > climate change and the production and transportation of pollen,
- > mitigation measures such as energy efficiency, technological improvements, and energy conservation programs, and air pollution.

A better understanding of health effects is required in many areas including:

- > individual versus population exposure,
- > long-term versus episodic exposure,
- > the effects of indoor versus outdoor pollution, and
- > the impacts of air pollution on vulnerable groups like children, the elderly, urban versus rural populations, and outdoor workers.

> PROJECT PROFILE

SYNERGISTIC IMPACTS OF WINTER AND SUMMER WEATHER POLLUTION DUE TO GLOBAL WARMING ON HUMAN MORTALITY IN SOUTH CENTRAL CANADA

The Toronto Public Health Department began this project in July, 2002, under the leadership of principal investigator Dr. Monica Campbell. The research is investigating the synergistic impacts of weather and air pollution on human mortality for selected locations in south-central Canada. The specific objectives are to:

1. determine impacts on mortality rates due to heat waves, cold spells, snow and ice storms from current and changed weather patterns by comparing mortalities;
2. investigate the synergistic impacts of outdoor air quality and natural pollutants on excess mortalities in both summer and winter;
3. estimate climate change related trends in severe weather event risks and recommend health and emergency adaptation policies to protect populations; and
4. use study results to assess modifications to a Heat-Health Alter/Emergency system that is currently being piloted in Toronto and could be considered for other Canadian cities.

Research results are expected to be available in March 2005. The outcomes from this research will improve the understanding of environmental health problems in south-central Canada by identifying the factors triggering excess mortality and assist in developing better health protection policies and programs.

For more information, contact: mcampbe2@toronto.ca

“The production of various air pollutants and of allergenic spores and pollens would be affected by warmer and wetter conditions.”

Climate Change and Human Health. WHO. 2003



WATER-AND FOOD-BORNE CONTAMINATION

The higher temperatures and heavier rainfall events expected to result from climate change may increase the occurrence of water-borne diseases, with overflow of sanitation services contributing to potential contamination of municipal water supplies. These conditions may also contribute to increases in infectious illnesses in people using recreational waters. Food-related concerns include outbreaks of toxic algae in saltwater which can contaminate shellfish, and increased incidence of food poisoning related to warmer temperatures that increase the survival of microbes in the environment.

Knowledge gaps and research priorities:

The network recognizes that interdisciplinary approaches are required to address the complex problems associated with research on infectious diseases and climate change. Researchers will need to be trained in interdisciplinary approaches. Research networks linking this relatively small research community are vital to creating the critical mass needed to accomplish the research.

Within this field, there is inadequate research in food- and water-borne contaminants and diseases, particularly research that captures the ecology of disease from the environmental source to the human case of the disease. As a result, it is very difficult to identify where and how a change in climatic conditions might alter the hazards posed by these diseases. Some aspects getting very little attention include impacts of climate variability and change on estuarine water quality and the implications for health; fungal diseases and vulnerability to climate variability and change; global climate change and human health risks associated with imported food and livestock; and long term temperature and concurrent rainfall increases on exotic

water- and food-borne diseases such as cholera and cyclospora.

The network has identified a number of specific areas where new research is required to address knowledge gaps in the area of water- and food-borne contamination. These include investigations into the role of climate in watersheds and in the contamination of water, and the role of climate on survival and transmission of pathogens in transportation of livestock and food processing. More research is required on the subject of climate impacts on toxic substances in food and water, as well as climate impacts on non-treated water (e.g. private wells, beaches) and health.

There is an immediate need to develop a process for rapid detection of contaminants and source identification, in order to respond quickly to climate-related contamination. It is also important to understand the factors contributing to individual, population, ecosystem, and infrastructural vulnerabilities to infectious diseases in the face of climate change, and to assess ways to encourage changes in behaviour aimed at reducing vulnerability to food-borne illness particularly as it relates to cultural, social, and societal preferences and food handling and processing norms.

➤ PROJECT PROFILE

CLIMATE CHANGE AND WATER-BORNE DISEASES IN CANADA

Led by Dr. David Waltner-Toews at the University of Guelph, this three year collaborative project is investigating the incidence of water-borne illnesses in Canada, describing the complex systemic inter-relationships between disease incidence, weather parameters, and water quality and quantity, and projecting the potential impact of global climate change.

Following a detailed review of the existing state of knowledge nationally and internationally, and the digitization and linkage of the necessary data, the association between weather parameters and water-borne illnesses in Canada will be described. A few regions will be selected for a more detailed risk factor analysis.

This work, due to be completed in April 2005, will help identify vulnerable Canadian regions, watersheds and communities at increased risk of water-borne diseases. With this information, Canadian policy makers will be better informed of the risks to Canadians and of the potential impacts of global climate change on those risks. This will enable the implementation of targeted monitoring, development of adaptive strategies, and emergency response plans to better protect Canadians from water-borne illness.

For more information, visit: www.eccho.ca

“Climate change
may alter the
ecology of many
food-borne and
water-borne
diseases ...”

A Synopsis of Known and Potential Diseases and Parasites Associated with Climate Change. Ontario Ministry of Natural Resources. Ontario Forest Research Institute. Sault Ste. Marie, ON. Forest Research Information Paper No. 154. 2003



VECTOR-BORNE AND ZOO NOTIC DISEASES

Vector-borne diseases are transmitted to humans and animals through blood-feeding arthropods, such as mosquitoes, ticks and fleas. Zoonotic diseases are capable of being transmitted from animal species to humans. Insect- and tick-borne diseases, such as West Nile Virus and Lyme Disease, already cause human health problems in some areas of Canada. Rodent-borne diseases (e.g. hantaviruses), capable of causing illness and death, although rare, do exist in much of southern Canada. There are concerns that changes of climatic conditions in Canada such as warmer seasons and changes in precipitation patterns could lead to conditions that are favourable for the establishment and proliferation of vector-borne diseases in some regions of the country. This may result from changes that favour the vector species, or the development of the pathogen itself.

Knowledge gaps and research priorities:

As is the case with food- and water-borne contamination, there is insufficient research in vector-borne and zoonotic diseases that captures the full ecology of disease, making it very difficult to identify where and how changing climatic conditions might alter the hazards.

Specific knowledge gaps in the area of vector-borne and zoonotic diseases have been identified by network members. There is a need for improved knowledge about tick-borne diseases and climate, rodent-borne diseases and climate, and the role of climate in the spread of West Nile Virus. Study is required on the impacts of climate change on diseases not yet in Canada but geographically nearby, and on exotic vector-borne diseases where travel and unintentional vector importation are possible. There is also a need to know more about zoonoses in wild species, including marine mammals and wild ungulates, and to undertake expanded surveillance, as vectors are indicators of risk to human populations.

Of particular concern is the adequacy of current surveillance systems to detect significant changes in the prevalence and distribution of pathogens in humans, and even more so, in non-human species. There is a need to assess surveillance systems and improve the linkage between pathogen surveillance and climate information where climate is an indicator for a potential disease event.

There is a pressing need to develop a better understanding of the impacts of extreme weather events on public health infrastructure and vulnerability to infectious disease outbreaks. For example, heavy rainfall may contribute to water supply contamination as well as provide breeding areas for mosquitoes.

> PROJECT PROFILE

IMPACTS OF CLIMATE CHANGE ON THE SPREAD OF LYME DISEASE IN CANADA

This research project is co-led by principal investigators Dr. Dominique Charron (Health Canada) and Dr. Chris O'Callaghan (Queen's University).

Lyme disease is a tick-borne zoonotic bacterial infection. The disease is rare in Canada, but can occur where populations of infected ticks are endemic (parts of southern Ontario and coastal and central British Columbia) with sporadic cases reported across the country. Most infections in people result from exposure to ticks during recreation or occupational activities where infected ticks are endemic. The initial symptoms of Lyme disease are mild but may progress to a more serious systemic illness, which in turn may, if untreated, become chronic. As climate and land use change, the disease may pose a greater threat to Canadian public health in future.

The goals of the project are to determine the role of climate in Lyme disease distribution and ecology in Canada, the potential impact of climate change, and to assess the Canadian response capacity to impacts of climate change on Lyme disease. These goals will be met through the following activities:

1. overview of the current distribution of vector ticks and possible links with climate;
2. development of dynamic transmission models for Lyme disease in Ontario and BC;
3. development of models of the potential impact of climate change on the disease; and
4. assessment of the Canadian response capacity to Lyme disease.

This research, based on the best available quantitative models, will provide public health policy makers and practitioners in Canada with tools to formulate and assess appropriate interventions as an adaptation to climate change.

For more information, visit: www.eccho.ca

“Vector-borne diseases — including malaria, dengue fever, and Lyme disease — may expand their ranges in North America.”

Climate Change 2001: Impacts, Adaptation, and Vulnerability.
Intergovernmental Panel on Climate Change. 2001



POPULATION VULNERABILITY IN RURAL AND URBAN COMMUNITIES

How individuals understand and react to the effects of climate and climate change on their health is an issue that has received little attention to date.

A concerted effort is required to integrate the social sciences into climate-related health impact assessment in Canada, in order to better plan interventions.

Developing a clear picture of the vulnerability of specific populations to climatic conditions and events and expected future changes is a key objective of the network. Also important is the assessment and improvement of knowledge transfer on health and climate change issues.

Knowledge gaps and research priorities:

Research on population vulnerability seeks to understand how various segments of our society are affected by change. These segments can be identified by, for example, age, geographical location, gender or cultural group. We know that children, the elderly, and the chronically ill have less means and ability to adapt and often require special considerations in the face of a negative change circumstance. We are also building a good basis of knowledge on the way in which residents of Northern Canada are being impacted by climate change. There is, however, little data or information on how various groups react, their coping range and their ability to adapt in the face of specific impacts that can be exacerbated by a changing climate. There is also a need to improve our understanding of the interactions between traditional health practices of Canadian cultural communities and climate change related risks.

There is also a notable gap in the evaluation of how small-scale disasters affect social services and other support systems, what stresses they place on the community and individuals, and what the long term impacts may be. Such research

would aid in our understanding of how to manage risks associated with natural hazards and extreme weather events. Across all health and climate change issues, there is a need to better understand current risk management practices at the individual and institutional level and examine how the use of warnings and other communications influence the behaviour of people in communities.

> PROJECT PROFILE

IMPACT OF CLIMATE CHANGE ON FOOD SECURITY IN THREE NORTHERN ABORIGINAL COMMUNITIES – PLANS FOR ADAPTATION

The overall objective of this project, led by principal investigators Dr. Laurie Chan of McGill University's Centre for Indigenous Peoples' Nutrition and Environment (CINE) and Dr. Christopher Furgal of Laval University, is to investigate the potential health impacts of climate change on three northern aboriginal communities—one coastal (marine mammal based diet) and two taiga (terrestrial mammal and fish based diet)—and to develop strategies for adaptation to minimize potential impacts.

Project personnel will work with the communities to develop a comprehensive resources management scheme that will integrate local and traditional ecological knowledge, wildlife biology, information on the toxicology of environmental contaminants, food composition and nutrient requirement, food availability and the effects of environmental changes, and cultural and socio-economic factors. Education and communication initiatives are also planned to assist individuals in making their own informed decisions on food choice. The participatory nature of the research will ensure northerners' involvement and training in all stages of research projects, including the initiation, planning, implementation, and results communication.

The goal of the study is to help communities and health professionals characterize the specific nutrient and contaminant related impacts resulting from changes in country food availability related to climate change. Appropriate adaptation strategies will be cooperatively developed in the three communities including a comprehensive resource management model that will assist in planning for aspects of food security. This model will be of value for environmental and health planning exercises throughout the Canadian North in the face of climate-related changes.

For more information, contact: chan@macdonald.mcgill.ca

“Decreasing the vulnerability of socio-economic sectors and ecological systems to natural climate variability ... will, in many cases, reduce the long-term vulnerability of these systems to climate change.”

Intergovernmental Panel on Climate Change. 2000



SOCIO- ECONOMIC IMPACTS OF CLIMATE CHANGE ON COMMUNITY HEALTH AND WELL-BEING

This recently established network promotes the investigation of the social and economic impacts of climate change on community health and well-being. While the scope of the field needs to be defined, as a starting point, research will need to take into consideration the impacts of climate change and climate variability (including increased frequency and severity of extreme weather events, changes in patterns of diseases transmitted by insects and animals, and influences on air and water quality) on the determinants of health within a population health context.

“Climate change will place greater demands on the social infrastructure (including emergency services and social support systems) supporting public health and well-being. These health and social impacts will result in significant costs to Canadian society, including increased health care costs, loss of productivity, and broader damages to the well-being of Canadians.”

Expert Panel Workshop on Climate Change and Health & Well-being in Canada: Key Findings and Recommendations, Institute for Population Health, University of Ottawa. 2002

CROSS- CUTTING HEALTH ISSUES

There are additional health issues which Health Canada expects to be of concern due to climate change and variability. These include temperature related death and illness and increased exposure to ultra-violet rays. While no formal networks exist for these two specific issues, research is ongoing and, with respect to the impacts of temperature extremes, is being undertaken by researchers in the other networks.

COPING WITH EXTREME TEMPERATURES

The Intergovernmental Panel on Climate Change has stated that an increase in the number and intensity of heat waves will increase the risk of death and illness, principally in older age groups and the urban poor. The greatest increases in heat stress are forecasted for higher latitudes putting Canadian cities in the geographical risk zone. Several Canadian research studies are expanding our knowledge of the human effects of temperature extremes, highlighting areas and groups that are more at risk and identifying effective adaptation strategies.

> PROJECT PROFILE

FEASIBILITY OF IDENTIFYING HEAT-RELATED ILLNESS AND DEATHS AS A BASIS FOR EFFECTIVE CLIMATE CHANGE RISK MANAGEMENT AND ADAPTATION

This study, led by Dr. Yang Mao at Health Canada, examined whether health care records for hospital visits were suitable for assessing heat-related health effects. Researchers looked at relationships between heat-related illnesses and heat stress periods (air temperatures greater than or equal to 30°C) in 1992 and 1999 in Ottawa and London, Ontario. They found that Ottawa experienced almost twice as many heat stress periods in 1999, and Ottawa hospitals treated more than double the amount of patients for heat-related health problems. The researchers concluded that medical records may be useful for monitoring health effects of heat, and identifying vulnerable population groups in different cities and regions. A followup study is currently underway using and evaluating the administrative health databases in different centres across Canada and linking them to climate conditions over an approximate 10 year period. This will provide new knowledge regarding the vulnerability of certain populations and regions. It can then be used for more accurate assessments of the health implications of climate variability and climate change for population health in Canada.

For more information, contact: yang_mao@hc-sc.gc.ca

➤ PROJECT PROFILE

HEAT-RELATED EFFECTS ON CHRONICALLY ILL PATIENTS IN MONTREAL

This ongoing project, led by Dr. Tom Kosatsky, involves a collaboration between the Montreal Public Health Department, the Nursing School of the Université de Montréal, and two McGill University Health Centre clinics. Its aim is to assess the knowledge, attitudes, and behaviours of Montrealers with chronic lung and heart conditions faced with extreme heat or poor air quality.

The pilot phase was implemented during the summer of 2003 and involved recruiting over 50 patients at the McGill University clinics. A bilingual questionnaire was developed to assess whether and why patients have and use air conditioning, drink extra water, reduce activities, and/or institute other protective measures during heat waves. This data is currently under analysis and is being used to improve the questionnaire for use in the full study.

For more information, contact: tkosatsk@santepub-mtl.qc.ca

“Our society was
not prepared”

Hubert Falco, Secretary of State for the Elderly, France
in the aftermath of the August 2003 heatwave
that killed 15,000 people in that country

ADAPTING TO CLIMATE CHANGE IN THE HEALTH SECTOR

Adapting to the health effects of a changing climate refers to taking actions at the national, community or individual level to reduce the impacts of climate change on the health of Canadians. These adaptation strategies will be either reactive, responding to climate impacts, or anticipatory, reducing the vulnerability of specific populations to the effects of a changing climate. These strategies can be implemented through policies and legislative regulations, engineering innovations, or personal behavioural changes. Canadian research is examining the collaborative nature of adaptation strategies at the local level.

Assessing Adaptive Capacity and Future Risks from a Changing Climate

The extent to which individuals, communities and regions are vulnerable to the climate and its effects on the natural environment depends largely on their current capacity to cope with the potential impacts and ability to adapt to the changes. Research that examines the capacity of Canadian society, particularly the health sector, to cope and adapt to current climatic variability is important but not sufficient to deal with all the risks to health from climate change. Potential future scenarios of climate change and socioeconomic dynamics must be examined to understand future vulnerabilities. There are many techniques of quantitative and qualitative analysis that can be used to evaluate future climate-related risks and much work is required to apply or adapt these techniques to assess the impacts of future climatic change on health outcomes.

> PROJECT PROFILE

ADAPTATION STRATEGIES TO REDUCE HEALTH RISKS FROM SUMMER HEAT IN TORONTO

In the summer of 2001, led by the Toronto Atmospheric Fund, public health adaptation measures were implemented in Metropolitan Toronto to help protect residents from extreme heat and cold events. Extensive collaborations between many different governmental (e.g., emergency services, housing services, libraries) and non-governmental organizations (e.g., pharmacy chains, seniors' networks) were established to help protect more vulnerable population groups, such as seniors and homeless people from thermal extremes.

Several adaptation strategies were implemented, including:

- > extreme cold weather and extreme heat announcements via news media;
- > active intervention by public health and volunteer agencies;
- > increased availability and accessibility of heated and air conditioned public buildings, drop-in centres and shelters; and
- > new guidelines for managing long-term care facilities.

For more information, contact: eliget@tafund.org



BETTER UNDERSTANDING FOR A HEALTHIER FUTURE

Climate change will challenge Canadians' ability to cope with climate—and many related environmental and economic impacts—as never before. Climate change will also bring new challenges to public health decision makers. Greater consideration will have to be given to the anticipated impacts of a changing climate in the development of strategies and policies to manage potential health risks.

Health Canada, with its partners, has established the health research networks to mobilize the interest of researchers

across the country in studying the health impacts related to climate change, identifying vulnerable populations, and measuring the adaptive capacity of Canadians and their communities. This work will be key to effective action on reducing the risks resulting from a changing climate to the health of Canadians.

The new knowledge gained through the research will enable researchers, health policy makers, decision makers in all levels of government, and the Canadian public to have a better understanding of the impacts of climate change on human health and to plan effective adaptation strategies. To a large extent, protecting Canadians from the health effects of a changing climate will mean revising, reorienting or strengthening current public health policies and practices.

Today, there is significant variability in public health capacity and preparedness across the country to effectively address the health risks that climate change may pose for Canadians. Governments, the Canadian health research community, and the health care and public health sector must collaborate to improve our understanding of the potential impacts and work with all sectors of Canadian society to take action and develop effective strategies to protect the health of Canadians in a changing climate.

For further information:

C-CIARN Health Sector coordinated by
Climate Change & Health Office
Health Canada

4th floor, Tupper Building, 2720 Riverside Drive., Ottawa, ON, K1A 0K9

Tel: (613) 954-9676, Fax: (613) 952-8857

climatinfo@hc-sc.gc.ca

www.c-ciarn.ca/health