



# Mapping Cardiovascular Disease in Canada

Cardiovascular disease (CVD) is the number one killer of Canadians and accounts for the greatest financial burden on the health care system across Canada. The burden of CVD on health in Canada is expected to increase in the next 20 years. Thus, it is imperative that current patterns of CVD and treatment practices are measured in order to control the epidemic of CVD, and to ensure that Canadians receive the best quality of CVD care in a sustainable manner.

The Canadian Cardiovascular Outcomes Research Team (CCORT) was formed in 2001 through funding from the Canadian Institute for Health Research and the Heart and Stroke Foundation. CCORT consists of CVD outcomes researchers and physicians from across Canada who are working together to measure the delivery of cardiac health care in order to improve the quality of care and outcomes of cardiac patients across the country.

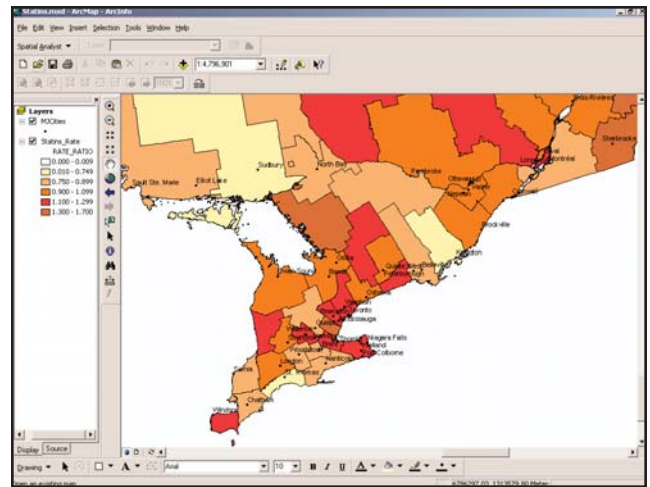
In order to properly plan, manage, and monitor health in Canada, it is vital that up-

geographic and environmental features. One of the projects within the CCORT program is the CCORT Canadian Cardiovascular Atlas, which is a national report on cardiovascular population health, CVD treatment patterns, and patient health following treatment. This project uses an integrated approach to managing georeferenced CVD health data, reporting data at the sub-provincial administrative level of health region, through the use of interactive maps created using ArcIMS. These maps have been highly effective at presenting a large amount of data in a clear and comprehensible manner to a variety of audiences.

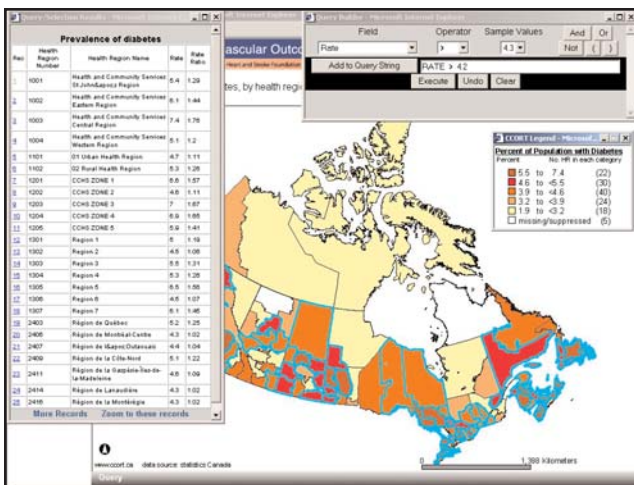
The primary objectives in creating this system were to automate health data aggregation of georeferenced health data, and improve national access to spatial health information.

By combining data from several sources such as administrative, clinical, and population health survey databases, the CCORT Atlas geodatabase consists of detailed data regarding the health of Canadians and the use of health services with respect to CVD. In particular, factors or health indicators reported in the Atlas maps include risk factors, use of health services by CVD patients (i.e. hospitalizations, physician visits, and CVD drug use) and mortality

were used to convert and georeference the SAS data into a geodatabase for the production of the CCORT Atlas maps. Using ArcIMS, the basic maps were created for the CCORT website. The online map displays were then customized using Visual Basic and Java.



Using ArcMap to develop CCORT Atlas maps.



Using the Query tool to search a CCORT Atlas map for specific data.

to-date, relevant information at the national and local levels is available to health care providers, administrators, and decision-makers. This must be done with the best available data and take into consideration treatment dynamics, demographics, availability of and accessibility to existing health and social services as well as other

rates in-hospital due to CVD events. Each health region's rate for a particular health indicator was determined using Statistical Analysis Software (SAS). These rates were geo-coded using the ArcInfo-based GIS automation system.

Specifically, ArcCatalog and ArcToolbox

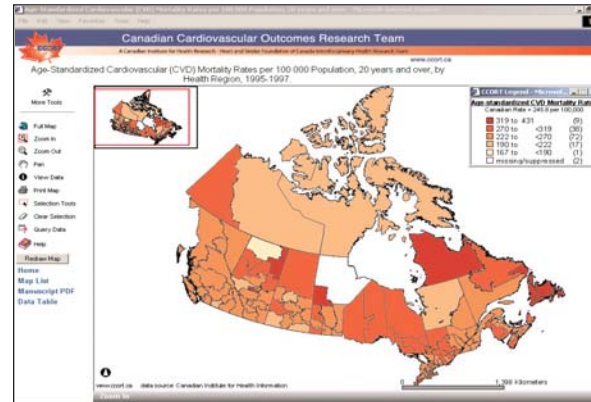
The colour coding of the health regions on each map is based on specific colours representing standardized categories of health indicator rate ratios based on clinical relevance. To determine the rate ratios, each health region's rates were compared to the Canadian average. Rate ratios 10-25% less than the Canadian average were coloured darker and lighter yellow; ratios similar to the Canadian average were coloured orange; and ratios 10-30% higher than the Canadian average were coloured darker orange to red. Regions shaded in white indicated that the data were not available or suppressed for that health region.

The CCORT interactive maps developed using ArcIMS are located on a public website ([www.ccort.ca/maps.asp](http://www.ccort.ca/maps.asp)), allowing easy, unlimited access to the CCORT data. A variety of customized tools are available for the user to navigate the maps. Users can zoom into particular areas of interest, view the data for a particular health region or group of adjacent health regions, and print maps in several views including the entire map of Canada, or the specific area enlarged with the zoom function. A "print map"

function allows the user to set up their own print page of the desired area of the map. In addition, under “More Tools”, a query function is available that allows the user to search for specific data such as health regions with the same rates, or health regions with rates lower than the Canadian average. These interactive maps allow users to gain the maximum amount of information from the CCORT geodatabase.

“Overlaying quantitative graphics on a map using ArcIMS enables the user, regardless of academic background and training, to access a large amount of data in a clear manner,” said Nemir Alazzawi, Programmer, Canadian Cardiovascular Outcomes Research Team & Registry of the Canadian Stroke Network. “Indeed, to date several stakeholder groups such as researchers, physicians, health professionals, decision makers, and the general public, have used the

CCORT Atlas maps created with ArcGIS and ArcIMS to gather data regarding CVD within



*CCORT Atlas map on the CCORT website*

their health regions and provinces. Making this data accessible allows stakeholders to gain valuable knowledge regarding CVD in Canada, current treatment practices, and to identify areas that require improvement.

This knowledge can be applied not only to public health initiatives, but can also lead to cardiac care quality improvement initiatives within health regions and provinces.”

The innovative use of GIS software solutions in the creation of the CCORT Atlas has far-reaching implications for the Canadian health care system. With the appropriate collaborations of researchers and merging of data, chronic disease trends, treatments, and outcomes across the country can easily be mapped and made available to a wide audience of stakeholders.