

Position Statement

AIR POLLUTION, HEART DISEASE AND STROKE

FACTS

- Heart attacks, heart failure and stroke make up an estimated 42%-69% of deaths and 60% of the hospital admissions linked to poor air quality^{1,2}.
- Respiratory illnesses make up the other large category of deaths and illness resulting from air pollution³.
- Short and long term exposure to air pollution are estimated to result in 21,000 premature deaths in Canada in 2008 as well as 620,000 doctor visits, 30,000 emergency department visits, 11,000 hospital admissions and an annual economic impact of over \$8 billion⁴.
- Air pollution is composed of particulate matter (PM) and gaseous (e.g. ozone, nitrogen oxides) components. Most of the studies on the cardiovascular impacts of air pollution have focused on fine particles or particulate matter 2.5 (PM_{2.5}) which includes particles that are two and one half microns or less in diameter.
- Air pollution comes from many different human sources such as automobiles, factories and power generation, as well as natural sources including wind-blown dust and forest fires. During the winter months in Canada, wood-burning stoves and fireplaces can be sources of dangerous air pollution, contributing 28% of the fine particulate matter in the air⁵.
- Anyone can be affected by high pollution levels, but the risk is greater for people with heart conditions such as angina, congestive heart failure, heart rhythm problems and for those who have had a previous heart attack; people with respiratory conditions such as asthma or Chronic Obstructive Pulmonary Disease (COPD); people with diabetes; the elderly; children; and pregnant women⁶.
- A Heart and Stroke Foundation survey in 2008 found that only 13% of Canadians are aware of the links between air pollution and cardiovascular disease⁷.
- The Heart and Stroke Foundation's 2008 report card on air quality and heart health showed significant variation in air pollution levels across Canada. Air quality also varies enormously by time of day and season.
- In order to help Canadians understand the health risks associated with air pollution and how short-term changes in air quality may impact health, Environment Canada, and Health Canada, in collaboration with provinces, NGOs and other stakeholders, have developed a new Air Quality Health Index (AQHI). The AQHI:
 - has a scale from 1 to 10+ that gives hourly reports about the level of health risk associated with the level of air pollution as well as a 24 hour air quality forecast.
 - provides risk reduction advice for both general and more at-risk populations.
 - is intended to raise awareness of the health impacts of air pollution and encourage action to improve air quality in Canadian communities.
 - is available in some parts of Canada (online at www.airhealth.ca) and will soon be expanding to include more locations.



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RECOMMENDATIONS

Canadians

- Take action to reduce air pollution – for example, by limiting where possible the use of cars for commuting to work and other purposes, wood burning, and energy consumption. Learn more about how to reduce air pollution at www.cleaironline.ca.
- Help raise awareness about the health impacts of air pollution by talking to friends, family members, neighbours and others.
- Become informed about the AQHI and familiar with the numbers on the scale in terms of their own individual level of risk. Use the AQHI as a tool to make decisions about when to reduce or reschedule strenuous physical activity and outdoor exposure due to elevated pollution levels.
- Encourage your federal/provincial/territorial and municipal government representatives to bring the AQHI to your community/province/territory if it is not currently available.

Governments

- Strengthen federal and provincial legislation governing air quality to ensure that industrial and emission controls result in cleaner air.
- Roll out the AQHI to all parts of the country.
- Provide public awareness and incentive programs to encourage consumer and industry action to reduce air pollution.
- Increase investments in public transportation both within and between urban centres across the country. Where possible, make use of vehicle fleets which produce less pollution.
- Consider the air quality health impacts of investment in transportation at all levels of government.

BACKGROUND INFORMATION

Many studies have shown that air pollution increases the risk of death and illness due to heart disease and stroke⁹⁻¹² through both short term and long term exposures. While everyone faces increased health risks due to air pollution, the risk is greater for people with cardiovascular conditions such as angina, congestive heart failure, heart rhythm problems, those who have suffered a previous heart attack and also people with respiratory conditions, people with diabetes, the elderly, pregnant women and young children¹³.

In 2004, the American Heart Association published a scientific statement which summarized evidence of a significant relationship between air pollution and cardiovascular disease¹⁴. In 2008, the Canadian Medical Association, using national data, estimated that each year, air pollution is responsible for 21,000 deaths, 620,000 doctor visits, 30,000 emergency

- department visits, 11,000 hospital admissions, and has an economic impact of over \$8 billion¹⁵.
- Enhance other investments that facilitate active transportation and improved air quality, focusing on sidewalks, walking paths, and cycling lanes.
- Use fiscal incentives as part of the process of developing healthy community plans. Work with developers to create neighbourhoods that promote walking and cycling and decrease dependency on cars.
- Ensure that all wood burning stoves, fireplaces and fireplace inserts for sale in Canada conform to the best available technology standard for particulate emissions, which is, at present, the Washington Standard of less than 4.0 grams of PM_{2.5} per hour.

Researchers

- Continue to explore the health impacts of short term and long term exposure to air pollution.
- Evaluate how public policies and programs affect air pollution levels and the health of Canadians.

Industry

- Adopt pollution prevention measures and pollution control technology, improve energy efficiency, switch to renewable sources, and use cleaner fuels⁸.

Public health and health care providers

- Help raise awareness of the health effects of air pollution and the need for action to reduce pollution levels.
- Learn more about the AQHI and how to help patients with known risk conditions manage the impact of air pollution on their health.

Most of the studies on the cardiovascular impacts of air pollution have focused on fine particles or particulate matter 2.5 (PM_{2.5}). PM_{2.5} is made up of tiny particles or droplets in the air that are two and one half microns or less in diameter. These particles come from many different sources and large amounts also form in the atmosphere from gaseous air pollutants interacting with each other in the presence of sunlight and water.

Researchers are working to better understand the mechanisms by which particulate matter can cause heart and stroke events. Evidence suggests that air pollution causes cardiovascular events by:



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1. Causing an inflammatory process in the lungs that also affects circulation, leading to impaired blood vessel function and an increased likelihood of blood clots.
2. Leading to changes to the body's nervous system that might result in heart rhythm disturbances.
3. Through components of PM entering the blood stream and directly harming the cardiovascular system. Studies show that PM exposure can lead to atherosclerosis, or plaque build-up, in the arteries, increasing the risk of heart disease and stroke.

The Air Quality Health Index (AQHI)

The AQHI was designed by Environment Canada and Health Canada in collaboration with provinces, NGOs and other stakeholders. It is meant to improve on the existing air quality indexes by more accurately reflecting actual health risks and providing information to help Canadians manage their own level of risk during times of poor air quality. The scale of the AQHI is based on research on mortality and air pollution in twelve urban areas in Canada¹⁶. The AQHI also takes into account the health risks from all the

pollutants in the index, while traditional indices are limited to the single worst pollutant at a given time¹⁷.

Because it is health-based and includes health and risk reduction messages, the AQHI is a tool for Canadians to make decisions about how to deal with air pollution. As the table below shows, there are two categories of advice. One is for the general population and one is for those with known risk conditions ("at-risk"), including cardiovascular and respiratory conditions and diabetes. To give an example, an AQHI level of 5 (moderate risk) would encourage an individual with a heart condition to reduce or reschedule strenuous activities outdoors, while an individual in the general population would not need to modify outdoor activities. Alternatively, when the AQHI is high or very high, even those in the general population may need to adjust their activities.

It should be emphasized that risk categories are only provided as a guide and that sensitivities to air pollution vary considerably from person to person. Individuals (especially those who are most vulnerable) are encouraged to pay attention to variations in their own symptoms relative to the AQHI values in order to develop familiarity with when adjustments to activities are personally required.

Air Quality Health Index Categories and Messages

Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population*	General Population
Low	1 - 3	Enjoy your usual outdoor activities.	Ideal air quality for outdoor activities.
Moderate	4 - 6	Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.	No need to modify your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High	7 - 10	Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High	Above 10	Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

* People with heart or breathing problems are at greater risk. Follow your doctor's usual advice about exercising and managing your condition.

At the time of this Position Statement, the AQHI is not available in all parts of Canada. To find out where the AQHI is available, visit www.airhealth.ca.

The AQHI and its recommendations are focused on short term changes in exposure to air pollution. Reducing long term exposure to air pollution is an extremely important public health goal which can best be addressed by other approaches. Examples include broad strategies to reduce emissions and improve air quality, and tools such as "pollution maps" which can be used to determine ideal locations for buildings which house large numbers of "at risk" individuals such as schools and long term care facilities.

Air Pollution in Canada

Based on the *Government of Canada Five-year Progress Report-Canada-wide Standards for Particulate Matter and Ozone*¹⁸, in 2002, the transportation sector accounted for 30% of the total emissions for the smog producing compounds of PM_{2.5}, sulphur dioxide, nitrogen oxide, and volatile organic compounds in Canada. Together, the industrial sector and electricity generation contributed 58% of total emissions. According to the US Environmental Protection Agency, in 1999, "on road mobile sources of air pollution" (cars, trucks, etc.) made up 29% of US hydrocarbon emissions, and 34% of nitrogen oxide emissions, with "non road mobile sources of air pollution" (diesel equipment, boats, railroads, etc.) contributing a further 18% of hydrocarbon emissions and 22% of nitrogen oxides^{19 20}.



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The Heart and Stroke Foundation of Canada recognizes that the life-long heart health of Canadians is affected by both individual and social factors. Individual factors include genetic make-up, personal health choices and actions, and social support. Social factors include the social, economic and environmental conditions in which Canadians live, work, learn and play. The Foundation encourages Canadians to make heart-healthy choices and encourages governments and the private sector to develop policies and programs that support healthy communities and reduce inequalities that negatively affect health and well-being.

The evidence contained in this scientific statement is current as of: JUNE 2009

Environment Canada's Canada-wide standard for acceptable air quality sets a particulate matter limit of 30 micrograms per cubic metre of air (30 µg/m³). However, it has been demonstrated that health effects begin to occur at much lower levels, such as 10 µg/m³, which is the level of the World Health Organization air quality guideline. As some degree of health effects can be anticipated at virtually all levels of pollution, governments and individuals should take action to limit exposure.

In February, 2008, the Heart and Stroke Foundation analyzed reports of particulate matter in Canada and issued a national report card on air pollution and heart health²¹. The report card gave several of the most populous provinces (in total accounting for where the majority of the population of Canada lives) grades of D or lower.

Given current pollution levels, Canadians need to be aware of air quality issues and take precautions when appropriate. The AQHI is a new tool to help support Canadians in this effort. At the same time, it is very important that Canadians continue to be encouraged to participate in outdoor physical activity to promote overall health. Avoiding/reducing exposure on poor air quality days is ultimately a short term solution. For the health of Canadians, it is very important that Canada reduce overall air pollution levels over the long term.

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