



DEVELOPMENT OF A  
HEALTH-BASED AIR QUALITY INDEX  
FOR CANADA

---

PUBLIC OPINION RESEARCH  
2004-05

**FINAL REPORT**

Prepared for:

**Health Canada**

POR#04-12

Call-up #H1011-040011/001CY

Prepared by:

Environics Research Group

May 2005

pn5545

## EXECUTIVE SUMMARY



## EXECUTIVE SUMMARY

---

### Background

Air pollutants such as ozone, particulate matter, nitrogen dioxide, sulphur dioxide and carbon monoxide have been clearly linked to a variety of health effects, including premature mortality, asthma, bronchitis, increased respiratory distress symptoms and other adverse end points. Certain populations are especially vulnerable to adverse health effects, including children, the elderly, and those with pre-existing cardio-respiratory disease. Individuals who exercise or do strenuous activities outdoors are also susceptible to the negative effects of air pollution.

Canadians currently rely on an air quality index (AQI) to inform them on a daily basis about air pollution conditions in their community. At this point in time, there is no common AQI used across the country: Provinces and some municipalities have developed and implemented their own versions, supported by the federal government providing scientific, monitoring and other technical assistance in the form of air quality forecasts. While these different AQIs share common features (e.g. colour and word scales), there is a notable lack of consistency in the way in which air quality is calculated and reported, as well as in the use of health-based messages.

A process was initiated in June 2001 to improve the state of Canadian AQIs, with the principal objective of making them more reflective of human health concerns. The federal government has a long history of involvement in the AQI and is currently facilitating the process to develop a national health risk-based AQI in partnership with provinces and other jurisdictions who issue an air quality index across Canada, as well as other stakeholders. Health Canada's Air Health Effects Division in the Healthy Environments and Consumer Safety Branch, in partnership with Environment Canada's Meteorological Service, is undertaking outreach

and health promotion activities to support the AQI stakeholder process.

To support this initiative, Health Canada identified the need to better understand Canadians' attitudes and experiences with respect to a number of central issues related to the AQI, including Canadians' level of familiarity with, and use of, the index; preferences with respect to the format of air quality messages; and how the public does or does not respond when confronted with an air quality warning. Improved understanding of these issues is intended to guide Health Canada and its partners and stakeholders in developing the most effective communications on air quality possible, as well as provide insights into how to frame a social marketing campaign designed to get Canadians to change their behaviours during smog events so that adverse health effects are minimized.

### The research

To address this information requirement, Health Canada commissioned the Environics Research Group to conduct public opinion research to gauge Canadians' awareness, perceptions and behavioural responses to air quality, air pollution and the AQI. The findings from this research will be used to guide the development of health messages to effectively communicate the AQI to Canadians with respect to the health risks associated with poor air quality, as well as promote actions that will protect their health and the environment. This current work builds on previous studies conducted by Health Canada and Environment Canada over the past decade.

The study consists of quantitative and qualitative research that was conducted in three phases between July 2004 and March 2005:

i. **Post-Air Quality Event Surveys.** Telephone surveys were conducted with residents of three urban areas (Greater Toronto Area, Montreal Island, Lower Fraser Valley, B.C.), in each case immediately following a poor air quality episode. This research measured the public's awareness and response to such events, as well as residents' general awareness and use of AQIs.

Following the post-event surveys in B.C. and Toronto, a separate "mental models" research project was undertaken by the Decisionanalysis Risk Consultants, Inc. to more fully map out the general public's perceptions and misperceptions around air quality and health. This work consisted of in-depth qualitative interviews with 28 individuals recruited from the general population, including some who are "at risk" in terms of health problems linked to poor air quality. The results of this analysis guided the development of the subsequent phase (Autumn 2004 National Survey), through which the findings of the mental model work were validated across the full population.

ii. **Autumn 2004 National Survey.** A comprehensive national telephone survey was conducted following the summer 2004 "smog season" with a representative sample of Canadians in areas currently served by AQIs. This research focused broadly on the public's awareness, perceptions and behaviours as they relate to air quality, air pollution and the AQI, with a particular focus on the relationship between air quality and health.

The results from the first two phases of this research were presented at a Health Canada-sponsored workshop on December 2-3, 2004, which brought together a wide range of professionals from the public and promotional health and environmental communities specializing in air issues in Canada. The purpose of this workshop was to use the new findings, as well as participants' recent research and experience, to guide the development of new health messages for testing in the phase 3 research.

iii. **Qualitative Assessment of new AQI communications concepts.** Focus groups were held with residents in six communities across the country to test public reaction to new AQI communications concepts (e.g. messages, graphics, category labels) that were developed according to the findings from the previous phases of this initiative.

## Conclusions

The first two phases of this research reveal that Canadians widely identify air pollution as a significant environmental problem in their communities today, and recognize that it represents a clear hazard to human health. At the same time, there is a strong tendency for individuals to dissociate these risks from themselves, either by underestimating their own exposure or assuming the risks apply primarily to other types of people who they believe are most at risk (e.g. the elderly). Most Canadians know that AQIs or advisories are provided in their area, but this information is having a limited impact in terms of attracting attention and prompting actions to reduce personal exposure, even during significant poor air quality events.

The results of the third phase of research clearly demonstrate the potential for a new type of national Air Quality Index in Canada that effectively conveys important information to the general public on air quality conditions and their significance, and specifically health-related messaging on impacts and what people can do to reduce their exposure. The key features of this new concept include a "0" to "10" point unbounded scale (including both a colour gradient from blue to grey and word labels) showing current air quality conditions, a forecast of future conditions, and standardized information at each level covering health risks, targeted information for groups most at risk, and recommended activities (e.g. when it is safer to engage in strenuous outdoor exercise).

The new AQI communications concepts tested received a strong positive response from all groups with which they were tested, regardless of individuals' own degree of involvement with air quality issues and its impact on their health. Canadians who are sensitized to this issue were most likely to see the new AQI information as valuable for their own use, while those less concerned see this as something important for other people who they think might be at risk. The degree of interest expressed in this new index provides evidence that it would be more effective than the current versions in attracting public attention and prompting health-protective behaviour.

This positive assessment stems from design innovations built into the new AQI concepts based on the previous phases of the research. For instance, the new 10-point scale for overall air quality proved to be intuitively obvious to almost everyone, suggesting it may be more accurately interpreted than what appears to be the case with the current AQIs (based on the results from the first two phases of this study). This was also the case in terms of the colour gradient, which is based on environmental conditions (sky blue to gritty grey) rather than the spotlight imagery (green-yellow-red) of the current index. Additional information provided, such as forecasted conditions and groups at risk, were widely viewed as relevant and useful in a practical way. For instance, some individuals volunteered that knowing the air quality forecast would prompt them to reschedule activities that might result in heightened exposure to poor air quality conditions.

The AQI concepts tested are clearly promising, but will require further development and testing before being launched on a full-scale basis. Pilot tests are scheduled to take place in New Brunswick and British Columbia in the summer of 2005, which will provide an opportunity to confirm the positive public reception found in the qualitative research, and most importantly, to gauge whether the new index proves more effective than the current ones in attracting attention and prompting appropriate self-protective actions.

Implementation of a new nationally-consistent AQI based on the concepts tested through this research will support Health Canada's goal of better informing Canadians about the health risks associated with poor air quality and prompting health-protective actions. But it would be unrealistic to expect substantial progress over the short term, because the issues around public perceptions and response to poor air quality are embedded in firmly entrenched patterns of human cognition.

The research reveals that the principal challenge to Health Canada's objective involves the dynamics around how individuals perceive air quality, air pollution, and its relation to their own health. The primary reason why Canadians are not more responsive to air quality warnings is less about a poorly-designed AQI, and more about individuals' dissociating the reality of air pollution hazards from their own personal circumstances, except in those cases where people are con-

fronted with compelling evidence of health symptoms or problems they can clearly link to poor air quality.

This pattern can be explained in part by the tendency for individuals to rely on their own senses (primarily visual) rather than public advisories to detect poor air quality, a tendency which allows people to determine that conditions are better than they are in reality. If they cannot see pollution in the sky or feel any noticeable health symptoms that they can tie directly to air quality, it is then easy to conclude that conditions do not warrant further attention; air quality advisories become of secondary importance as something that applies to other types of people who they believe may be more at risk. When Montreal experienced its worst-ever air quality episode in February (a rare winter event that prompted major media attention), 60 percent of the population noticed, but only one-quarter of this group reported that anyone in their household did anything different as a result.

Another way in which people may respond to the knowledge about air pollution and health is to conclude that there is nothing they can do about it. This response is most evident among Canadians who are informed enough to know that air pollution is hazardous but at the same time are not experiencing any clear symptoms that link to their own health and well-being. Air pollution becomes one of many lamentable but ultimately accepted risks that are part of life in the 21st century.

These patterns of human perception and behaviour are deeply ingrained, which means that getting Canadians to pay more attention to air quality from a health perspective will require more than the introduction of a new Air Quality Index. What is required is a more comprehensive initiative of social change similar to what has taken place with the public's orientation around the use of tobacco products. Making progress will require both a more effective air quality information system and a sustained program of social marketing/education to reframe how people think about and respond to air quality issues.

The focus of such efforts might be directed in such areas as more firmly establishing a public understanding that: a) external reports (e.g. advisories) provide the only accurate way to know when the air is bad;

and b) air pollution affects everyone's health, even at low levels. The successful introduction of weather-related indices and messaging around UV radiation and wind chill conditions provide hopeful examples of how progress is possible in building a more health-oriented public response to air quality.

## Key research highlights

The following provides key highlights from each of the three phases of this study.

**I. Post-Air Quality Event Surveys.** The results of this research reveal that advisories issued during poor air quality events in the Fraser Valley B.C., Greater Toronto Area, and Montreal Island over the past year, have had a modest impact on local residents, in terms of attracting attention and prompting actions to reduce personal exposure. The reality of poor air quality and its impact on health is widely acknowledged, but not sufficiently salient to motivate a majority of the population in these communities (and likely others across Canada) to take it seriously.

- Recall of the air quality advisory issued over the previous few days was not particularly high, although residents in Montreal (60%) and the Fraser Valley (54%) were more than twice as likely to notice it as were those living in the Greater Toronto Area (25%). This difference may be due to the fact that air quality is generally poorer in the GTA, making advisories there more common and so less noticeable when they are issued. In contrast, the Montreal air quality episode was highly unusual for the winter season and as a result generated a tremendous amount of local media coverage that would have contributed to public awareness of the advisory.
- Why more residents did not notice these advisories may be due in part to the fact that Canadians generally rely on their own senses (primarily visual) rather than media forecasts or announcements to determine local air quality conditions. And reliance on sensory cues appears to have been of limited value during these episodes, as most residents did not perceive local air quality conditions at the time to be substantially different than what they consider to be normal conditions. This finding is particularly striking in the case of the Montreal episode, during

which AQI readings of 100 plus were the highest ever recorded in winter.

- The research indicates that most residents absorbed little more from the advisory than the fact that air quality in their area was not good. Few could recall without prompting anything about potential health risks, the types of people most at risk, ways to reduce exposure or the specific AQI reading for the day. This may be because such messages are not being effectively broadcast, people are not paying enough attention to hear them, or what was heard was not successfully retained in a meaningful way.
- An appropriate behavioural response to the identified air quality advisory was limited to only a portion of the area population. Among those who could recall hearing or seeing something about the recent advisory, well below half of GTA (42%) and Fraser Valley (30%) residents say they or someone in their household did anything differently because of it; this figure was lowest of all in Montreal (23%) where conditions were actually the worst. Moreover, such efforts were largely limited to one type of action, most commonly to spend less time outdoors or to close windows.
- In all three communities, people give two principal reasons for not doing anything differently in response to the recent poor air quality episode in their area. Some denied the need to act because they themselves were not at risk from the ambient air quality at the time, either because it was not affecting their health or because they did not believe the current air quality level constituted any hazard. Others were more fatalistic, expressing the view that it was not possible to do anything about the poor air quality episode, either because they were not able to alter their routine at the time, or because they felt there is simply no way to avoid breathing bad air.
- Majorities of residents in the Fraser Valley and GTA communities have some familiarity with the local AQI, with such awareness noticeably lower in Montreal. But this information does not appear to be closely followed by most in any of these communities, as no more than one in four residents say they look for AQI information during summer months on a regular basis. Across AQI formats, residents



are most likely to rely on the word scale, possibly because it may offer the most intuitively obvious way for most people to make sense of differing levels of air quality. Terms like “good” or “poor” fit more easily into people’s current “mental model” of air quality, than a “stoplight” colour or number.

II. Autumn 2004 National Survey. The results of this study confirm that most Canadians understand at a general level that air pollution is a major environmental and health issue, and a majority have a basic awareness of air quality information provided in their area, in the form of an AQI or advisories. At the same time, the public has a limited and somewhat inaccurate understanding of air pollution and its impact on health, and tend to rely much more on what they can see and smell rather than published air quality information to determine when local conditions are bad and require protective actions.

- At a general level, air pollution is widely recognized as a major environmental hazard, and one that evokes concern. Two-thirds of Canadians say they are very concerned about the quality of air, comparable to the level of concern about water quality and toxic chemicals in the environment, and above that expressed for such issues as climate change and depletion of the ozone layer. At the same time, the public is no more concerned about air quality than they were in 2001, and this issue appears to be one to which people have become acclimatized as a fact of life in the 21st century.
- Most Canadians think of air pollution in relatively narrow terms, as being largely localized and coming chiefly from vehicle and factory/industry emissions. This conception of air pollution as being localized around specific sources leads many to assume that air quality is invariably better in the suburbs than in the downtown core, and that it is better still in the country. Moreover, there appears to be confusion between the pollutant ground level ozone and the ozone layer in the stratosphere.
- Canadians rely primarily on their own sensory cues (what they can see, smell or tell from their own health symptoms) rather than media advisories, to detect air pollution conditions. This pattern is further confirmed by the finding that most Canadians say they can identify poor air quality as soon as they step outdoors. This reliance on sensory cues appears to be a significant factor in the lack of greater reliance on published AQI and advisories.
- Most Canadians acknowledge that air pollution has a significant impact on human health, largely seen in terms of asthma and other forms of respiratory illness. At the same time, people tend to think about air pollution as having longer term rather than acute impacts on health, in large part because this is how respiratory illness tends to be viewed, and also in the absence of having knowledge of direct evidence of significant acute impacts (e.g. deaths, heart attacks).
- Despite acknowledging the health risks of air pollution, Canadians tend to downplay the extent to which it affects them directly, a pattern that is evident even among those living in major urban centres. Although almost three in ten report that they or someone in their household has experienced some type of health impact from air pollution in the past two years (mostly in the form of asthma or other respiratory problem), few in this group consider local air pollution to represent a serious hazard. This suggests that people view air pollution more as an aggravating factor to preexisting problems than a major cause of illness. Few believe that healthy people (like themselves) are at risk from air pollution because of where they live or through strenuous activity during air quality episodes.
- The limited assessment of personal risk from local air pollution may be due in part to the fact that Canadians do not believe there is much they can easily do to reduce such risks. At present, there is no widespread understanding of the appropriate protective actions to be taken when poor air pollution hits. Perceptions about the localized nature of air pollution leads many to believe that getting away from urban areas or avoiding high traffic areas will be effective in reducing personal exposure. Relatively few seem to understand that the most effective actions most people can take involve staying indoors or avoiding strenuous exercise.



- Canadians tend to assume that air pollution starts to affect health once their local AQI drops below the most positive point on the scale (e.g. from “good” to “fair”). This suggests that people may either be drawing a threshold for health impacts, or assuming that the highest level on the scale indicates the absence of any pollutants. When the focus is placed on when they should take action to protect their own health, there is a decided shift down at least one point on the scale (e.g. from “fair” to “poor”). This pattern is evident across jurisdictions and scale formats, but less pronounced with the colour scales, suggesting that the middle points on these scales (ie. orange, yellow) connote something more negative in comparison to the middle points on the word and numeric scales.
- Canadians say they would like to receive more information about local air quality and pollution, but this appears to be a somewhat unfocused type of interest, as no specific type of information emerges as a clear priority. People may simply have not had enough experience with such information, nor given sufficient thought to what might be of greatest value to them, to allow them to understand their own needs in a meaningful way.

III. Qualitative Assessment of new AQI communications concepts. The communications concepts for a new AQI were very favourably received by all of the focus group participants with whom it was tested, and the health-based messaging was broadly seen as valuable and useful information. A new index based on these concepts has the potential to be as effective in influencing people’s daily behaviour as other published environmental advisories that include health messaging, such as the current indices for UV radiation and wind chill.

- The communications concepts were favourably received regardless of participants’ degree of sensitization to air quality issues. However, the level of interest and acceptance was more positive among those more sensitized, who perceived the index as a useful tool and guide for their own use. Those less sensitized to air quality were more inclined to see the proposed information as particularly useful for other people with related health problems such as asthma.
- Each of the elements in the content and design of the new AQI met with positive reactions in general. Although a few participants took issue with individual elements, words or phrases in the materials presented, such criticism was minor in the context of the overall positive endorsement of the new concepts.
- Participants readily understood the air quality scale as an index depicting the level of air quality or air pollution. This was apparent even in the greyscale version, although the colour version was particularly effective in communicating a spectrum of air quality ranging from low health risk (characterized by a pale blue sky) to high health risk (from brown to grey). Participants also easily made sense of the scale going beyond 10 in extreme circumstances (signifying a very high health risk), and found it appropriate that the colour changes to red (for warning) at this point.
- The forecast information contained in the index (depicted as graphic arrows and additional text) was generally understood and considered to be valuable. Sensitized participants were more likely than others to indicate that they would use this information to plan their day.
- Simple, unambiguous and non-alarmist words and phrases were strongly preferred for the Category Labels (e.g., to describe the ranges 0-3, 4-6, 7-10 and 10+). The most effective and popular terms were those such as “low,” “moderate,” “high,” and “very high health risk.”
- The health risk messages that resonated best with participants were those addressing specific target groups, such as children, the elderly, and those with asthma and other ailments, as well as those providing cautionary advice and which were concise. There was a broad acceptance of having separate health risk messages for the general population and those with health risks, as well as for inclusion of the recommendations to seek a doctor’s advice.
- The inclusion of general information about air quality and health was also valued by most participants, although some expressed scepticism about a possible political agenda to this part of the index. At the

same time, it is clear that many do not understand technical terms such as “ozone” and “atmospheric transport,” suggesting such terms should be avoided where possible.

- Through both unaided (brainstorming) and aided (a list of possible names) techniques, participants were encouraged to suggest the most appropriate name for the new Air Quality Index. Overall, the clear preference was for the currently-used term “Air Quality Index” in the English focus group sessions, and the French equivalent “L’indice de la qualité de

l’air” in the French sessions. The terms “Air Health Index” and “Air and Health Index” were also viewed as acceptable choices.

- Apart from the content of the concepts tested, the design and layout of the new AQI also worked very effectively. Participants gave positive reviews to the various design elements, including the air quality scale (e.g., intuitively simple to grasp), large numerals that make it easy to find the day’s air quality reading, and the effective presentation of considerable information in a compact space.