



The physical environment

This brief section provides a glimpse of aspects of the physical environment that are known to affect health — namely, second-hand smoke and common air pollutants. There are other indicators of the state of Canada's environment, but either they are very general, such as trends in sales of consumer goods with ozone-damaging constituents, or their health implications are not clear, such as the proportion of the population with access to municipally treated water. On the other hand, good data are not readily available for the wide range of environmental hazards known to affect human health.^{1,2}

Overview

Although there were some new municipal bylaws regulating public smoking between 1991 and 1995, restrictions are still modest overall and highly variable between provinces (Topic 12). Further, only a quarter of smokers face any restrictions on

smoking at home, meaning that a minimum of 1.4 million children are exposed to cigarette smoke on a daily basis (Topic 13). When smoking during pregnancy (Topic 40) and breast-feeding (Topic 48) are also considered, it becomes clear that many young Canadians are not able to begin life with the assurance of clean air. Meanwhile, these children, along with most other Canadians, even in rural areas, are exposed to increasing amounts of the major components of smog (Topic 14).

On data sources and gaps

As noted above, there are few indicators of environmental quality that are clearly relevant to health, and those that do exist (e.g., Topic 14) are too old to be of real value. Indeed, the data on

environmental indicators are the oldest in this *Report* and are an exception to the general rule that “current” statistics would be no older than 1994–95. The lack of up-to-date, comprehensive, and regionally relevant environmental indicators represents a major gap in an otherwise reasonably comprehensive view of the factors affecting Canadians’ health.

References

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Restrictions on public smoking

Introduction

Both smoking and environmental tobacco smoke (ETS) are important and preventable causes of illness and death (Topic 79). Most governments attempt to discourage smoking, while many municipalities have restrictions on smoking in public settings in an attempt to protect the health of non-smokers. Bylaws against smoking in public are almost as effective as tobacco taxes in discouraging the use of cigarettes.¹

This topic presents the results of two independent national surveys of smoking restrictions affecting public places.

Prevalence of smoking restrictions, 1995

In 1995, smoking was at least partially restricted in a wide variety of public settings. According to an analysis of 269 bylaws received from most of the major municipalities in Canada, restrictions covered 17.9 million individuals, or 63% of the total Canadian population. Anti-smoking bylaws were most likely to specify municipal facilities, places of public assembly, service counters, and reception areas.² Of the municipalities with bylaws, 68% made an explicit provision for enforcement, but only 12% both identified the responsibility for enforcement and specified escalating fines for repeat offences. Again, of municipalities with bylaws, only 29% required that visible signs be posted to inform the public of the existence of restrictions.

A separate study of a large sample of public institutions across Canada in the same year revealed that smoking was completely restricted indoors and out in 65% of schools and 51% of daycare centres; only 29% of hospitals and other health care institutions such as long-term care facilities banned indoor smoking (Table 12).³

The nature of the smoking restrictions imposed by municipalities varied from setting to setting; however, in commercial settings (restaurants, shopping malls, bingo halls, etc.), the most common requirements were designated, unventilated indoor smoking areas. Restaurants had the highest overall proportion of designated indoor smoking areas (33%), whereas shopping malls had the highest percentage of ventilated smoking areas (6%).⁴

Differences among provinces

There are significant interprovincial differences in municipal smoking restrictions, but some consistent patterns emerge.

The population covered by bylaws in 1995 ranged from 3% in Newfoundland to 81% in Ontario (Fig. 12).^{2,5} For most provinces, the coverage was greater than in 1991,⁵ and there is the likelihood of some new bylaws since that time.² However, the additional population protected from ETS in public between 1991 and 1995 was very modest in all provinces except Quebec and New Brunswick, while there was actually a decrease in protection in Manitoba.

Reports of smoking restrictions obtained directly from schools, daycare centres, and health care institutions also reveal wide interprovincial variations in the extent of protection from ETS afforded employees, students, patients, and visitors to these locales (Table 12). There is a particularly wide range of school smoking bans, varying from 93% of Ontario schools (where total bans were a provincial requirement in 1995) to 15% of Quebec schools. There was less variation in the proportion of licensed daycare centres with total indoor and outdoor smoking bans, but it was still considerable, ranging from 55% in Newfoundland and Manitoba to 24% in the

territories. Indoor smoking bans in health care settings ranged from 81% in the territories to only 7% in Quebec. In all provinces except Newfoundland, Manitoba, and Saskatchewan, indoor vented smoking areas were more common than indoor smoking bans in health care settings.³

On definitions and methods

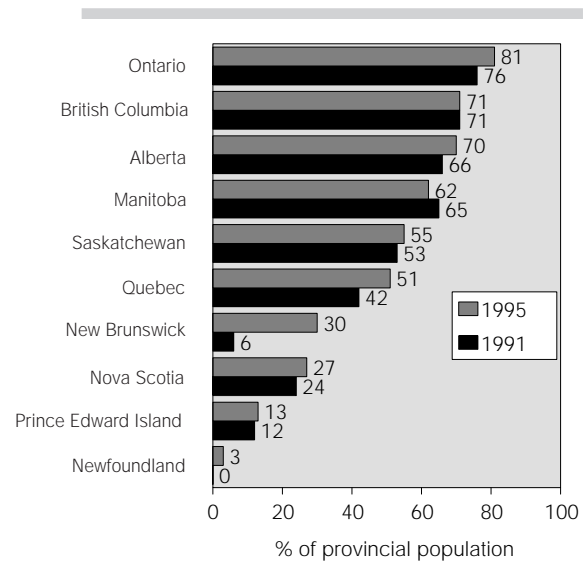
The survey of municipal bylaws contacted 698 municipalities and analysed 269 bylaws. Another 31 municipalities apparently had bylaws but did not provide them for analysis, and these municipalities are not included in the results presented here; 397 municipalities reported no bylaws.²

These results describe the existence of bylaws and could be seen as a reflection of official concern. Without data on enforcement activity, however, it is not possible to conclude how much protection from ETS residents actually experience. However, these bylaws describe minimum requirements; many organizations, including schools, daycare centres, hospitals, and residential health care settings, have stricter anti-smoking provisions than required by their municipalities.

References

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5. Health Canada. *Smoking Bylaws in Canada, 1991*. Ottawa: Health Canada, Environmental Health Directorate, 1992 (Cat. No. H46-1/26-1991E).

Figure 12. Population protected by bylaws restricting public smoking, by province, Canada, 1991 and 1995



Sources: Health Canada, *Smoking Bylaws in Canada, 1991*, Ottawa: Health Canada, Environmental Health Directorate, 1992 (Cat. No. H46-1/26-1991E); Health Canada, *Smoking Bylaws in Canada, 1995*, Office of Tobacco Control, Health Protection Branch.

Table 12. Extent of policies restricting smoking in schools and daycare centres (total ban indoors and out) and health care settings (indoor ban), by province/territory, Canada, 1995

	Schools (%)	Daycare (%)	Health care (%)
Canada, total	65	51	29
Newfoundland	66	55	44
Prince Edward Island	66	50	18
Nova Scotia	78	48	18
New Brunswick	59	47	31
Quebec	15	35	7
Ontario	93	53	30
Manitoba	72	55	47
Saskatchewan	65	49	44
Alberta	49	53	28
British Columbia	67	54	37
Yukon/Northwest Territories	57	24	81

Source: Thomas Stephens and Associates and Goss Gilroy Inc., *Study of Smoking Policies in Various Settings in Canada*, report prepared for Health Canada, August 1995.

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Exposure to environmental tobacco smoke

Introduction

Smoking has been widely regarded for many years as the major preventable cause of both illness and death, and, increasingly, the hazards of environmental tobacco smoke (ETS) are understood by the public (Topic 37). Young children are particularly susceptible to the effects of ETS, which include complications of pregnancy and low birth weight; increased risk of sudden infant death syndrome and middle ear infection; reduced lung development, with a possible impact on aerobic fitness; increased severity of childhood asthma and a possible role in the onset of asthma; and increased incidence of lower respiratory illness and frequency of chronic respiratory symptoms.¹ In addition to these consequences for the youthful non-smoker, there is the elevated risk of later smoking (Topic 40) and nicotine dependence (Topic 41) and all the disorders that these entail (Topics 73 and 79), not to mention the risks to the fetus of smoking during pregnancy (Topic 40). In 1991, Health Canada estimated that more than 300 Canadian non-smokers die each year from lung cancer caused by ETS.² U.S. researchers have estimated that at least 10 times the number of non-smokers die from ETS-linked heart disease as from lung cancer.³

This topic describes the degree of some form of restrictions on smokers from smoking at home, the potential ETS exposure of Canadian children at home, and ETS exposure of non-smokers at any location.

Prevalence of smoking restrictions at home and potential ETS exposure, 1995

In 1995, there were approximately 5.7 million daily smokers in Canada.⁴ Only 24% of these smokers faced any sort of restriction from smoking in the home —

whether a complete or just a partial ban, whether self-imposed, by family agreement, or by the landlord's requirement (Table 13a).⁴ There were about 5.1 million daily smokers who lived in homes where they were not subject to a total ban on smoking in the house. Over one-quarter (27%) of these 5.1 million smokers lived in households with at least one child age 14 and under, and 15% lived in a household with two or more children (Table 13b).⁴ This accounts for a minimum of 1.4 million children potentially exposed to ETS, an apparent decline from the 1.8 million children exposed in 1994,⁵ although the questions asked in the two surveys were not identical.

In 1995, 4.5 million non-smoking Canadians age 15 and older were exposed to cigarette smoke on a daily basis at any location.⁶ Although 20% of adult non-smokers lived with a smoker, only 11% of these non-smokers (1.8 million) encountered daily second-hand smoke at home, because not all smokers smoked in their presence every day.

Almost one-quarter (24%) of pregnant women smoked while pregnant in 1994–95, and 84% of them smoked during their entire pregnancy, consuming an average of 10.1 cigarettes daily.⁷

There are no international data with which to compare the 1995 situation.

Differences among groups

Overall, male daily smokers were slightly more likely than female daily smokers (26% vs. 23%) to face some form of restriction on smoking at home, which was also the case for most of the age groups (Table 13a).⁴ Daily smokers under the age of 45 were more restricted than those age 45 and older. Almost 30% of daily-smoking Canadians age 25–44 were restricted from smoking in the home, compared with about 15% of Canadians age 55 and older.

Almost one in three daily-smoking women with no total-house ban on smoking potentially exposed at least one child to ETS in the home, compared with just over one in five unrestricted daily-smoking men (Table 13b).⁴ This is at least partly attributable to more women staying at home to raise their children. Almost half of all daily smokers age 25–44 who were not subject to a total house ban on smoking were potentially exposing at least one child to ETS in the home. This is also the age group that smokes the greatest number of cigarettes daily (see Topic 40). This age group thus potentially exposes a minimum of 1.2 million children to ETS in the home. Younger and older daily smokers without a total house ban were least likely to potentially expose children to ETS.

Among non-smokers, 13% of women and 9% of men were exposed to second-hand smoke in the home. About 22% of non-smoking teens age 15–19 experienced daily exposure to second-hand smoke at home.⁶

The more educated daily smokers were, the greater the chance that they observed some form of smoking restriction in the home (Table 13a).⁴ Daily-smoking university graduates were twice as likely as daily smokers with less than a high school education to have a smoking restriction in the home. This is consistent with the awareness of health problems from ETS that increases with education (see Topic 37).

Daily-smoking high school and college graduates without a total house ban were the most likely to potentially expose at least one child to ETS, while daily smokers with either less or more education were less likely to do so (Table 13b).⁴ There were at least 340,000 children potentially exposed to ETS by daily-smoking female high school graduates, the largest single education–sex group that was allowed to smoke unrestricted in a home where there is at least one child.

On a provincial basis, about one-third of daily smokers in Nova Scotia, Prince Edward Island, and British Columbia faced some form of smoking restrictions in the home, compared with a low of 18% of daily smokers in Quebec and 20% in Manitoba (Table 13a).⁴ The Prairie provinces fell below the Canadian average for smoking restrictions at home, while the Atlantic provinces and Ontario were all above the average.

About one-third of daily smokers in Newfoundland, Nova Scotia, New Brunswick, and

Saskatchewan were potentially exposing at least one child to ETS (Table 13b).⁴ Smokers in the Prairie provinces and Quebec were slightly above the Canadian average for potentially exposing children to ETS in the home. Unrestricted daily smokers in Quebec potentially exposed a *minimum* of 491,000 children to ETS in the home, representing the largest group out of all the provinces (Fig. 13).⁴

On definitions and methods

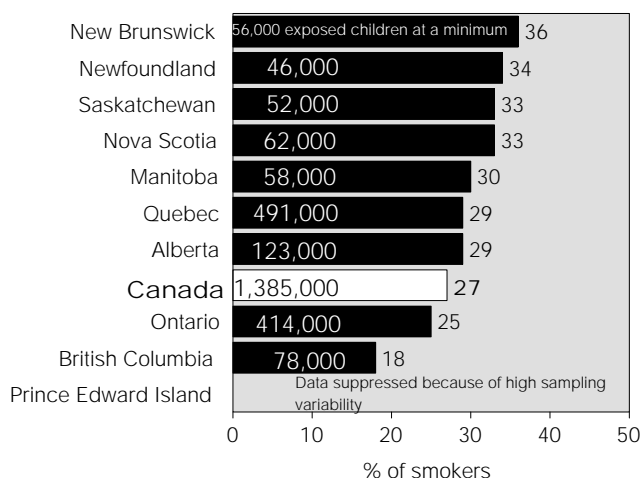
These data are from the 1995 *General Social Survey, Cycle 10*, conducted by Statistics Canada. The survey data were collected monthly from January 1995 to December 1995.⁴ Residents of Yukon and the Northwest Territories and full-time residents of institutions were excluded. Telephone interviews were conducted with a national sample of 10,749 persons age 15 and older. “Daily smoker” excludes occasional smokers, and “restrictions” could be from any source. The presence of children in the home of an unrestricted smoker does not necessarily mean that the children were those of the smoker, nor does it necessarily mean that the children were exposed to ETS.

References

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7. Connor SK, McIntyre L. *How Tobacco and Alcohol Affect Newborn Children*. Investing in Children, A National Research Conference, Ottawa, October 1998.

Figure 13. **Daily smokers not subject to a total house ban on smoking with at least one child under 15 years in the household, by province, age 15+, Canada, 1995**



Source: Statistics Canada, Housing, Family and Social Statistics Division, *General Social Survey, Cycle 10 (1995)*, special tabulations.

Table 13a. **Daily smokers with some degree of smoking restrictions in the home, by age and sex, by education,^a and by province, age 15+, Canada, 1995**

	Population estimate ('000)	Some smoking restriction at home (%)
Total, age 15+	5,730	24
Male	2,970	26
Female	2,760	23
Age 15-19, total	421	28
Male	229	33
Female	192	22
Age 20-24, total	603	25
Male	331	24
Female	272	27
Age 25-34, total	1,456	29
Male	752	28
Female	704	30
Age 35-44, total	1,429	28
Male	724	30
Female	705	26
Age 45-54, total	887	19
Male	476	24
Female	411	15
Age 55-64, total	568	15
Male	271	17
Female	297	13
Age 65+, total	366	13
Male	188	#
Female	178	#
Less than high school	1,810	18
High school	2,214	26
College	1,250	28
University	442	36
Newfoundland	148	29
Prince Edward Island	27	34
Nova Scotia	224	34
New Brunswick	165	28
Quebec	1,795	18
Ontario	1,921	27
Manitoba	218	20
Saskatchewan	181	23
Alberta	500	23
British Columbia	551	33

Data suppressed because of high sampling variability

^a Not age-standardized.

Source: Statistics Canada, Housing, Family and Social Statistics Division, *General Social Survey, Cycle 10 (1995)*, special tabulations.

Table 13b. **Daily smokers without a "total house ban" on smoking in the home, by number of children 14 years and under living in the household, by age and sex, by education, and by province, age 15+, Canada, 1995**

	Population estimate	Number of children age 0–14			
		0	1+	1	2+
	('000)	(%)	(%)	(%)	(%)
Total, age 15+	5,092	73	27	13	15
Male	2,575	78	22	11	11
Female	2,517	68	32	14	18
Age 15–19, total	338	96	#	#	#
Male	175	99	#	#	#
Female	164	93	#	#	#
Age 20–24, total	510	84	16	11	#
Male	292	95	#	#	#
Female	218	71	29	20	#
Age 25–34, total	1,259	54	46	17	29
Male	642	66	34	14	21
Female	616	42	58	21	37
Age 35–44, total	1,258	52	48	21	2
Male	611	55	45	21	24
Female	647	49	51	21	31
Age 45–54, total	834	88	12	10	#
Male	430	86	14	12	#
Female	404	90	10	9	#
Age 55–64, total	541	98	#	#	–
Male	246	97	#	#	–
Female	295	98	#	#	–
Age 65+, total	350	100	–	–	–
Male	177	100	–	–	–
Female	173	100	–	–	–
Less than high school	1,660	77	23	11	12
High school	1,963	71	29	13	17
College	1,074	69	31	14	17
University	380	76	24	13	11
Newfoundland	134	66	34	16	18
Prince Edward Island	22	77	#	#	#
Nova Scotia	190	67	33	15	17
New Brunswick	155	64	36	20	16
Quebec	1,691	71	29	14	15
Ontario	1,681	75	25	11	13
Manitoba	199	71	30	14	16
Saskatchewan	156	67	33	#	25
Alberta	431	72	29	14	15
British Columbia	433	82	18	#	13

Data suppressed because of high sampling variability

Source: Statistics Canada, Housing, Family and Social Statistics Division, *General Social Survey, Cycle 10 (1995)*, special tabulations.

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Air quality

Introduction

Environmental pollution is a significant and fairly consistent worry for a majority of Canadians, as between half and two-thirds reported each year between 1987 and 1996 that they were “very concerned” about air quality.¹ A quarter of adult Canadians think that their health is affected a “great deal” by pollution, and air is the path of greatest concern (37%), substantially higher than food (14%) or water (14%).¹ Recent studies bear out these concerns, showing that there is an increase in the death rate when smog is at its worst.² Perhaps as a consequence, substantial numbers of Canadians claim to be taking some action to benefit the environment (Topic 39).

This topic describes levels of air pollution in Canadian urban centres, as monitored by Environment Canada, how these have changed over time, and related indicators of air quality.

Air quality, 1993

In 1993 (the most recent year for which data are available), ground-level ozone and airborne particles, two important components of smog, were on the increase. In contrast, carbon monoxide, nitrogen dioxide, and sulphur dioxide all continued a long-term downward trend (Fig. 14a).³

Between 1979 and 1993, average levels of ground-level ozone climbed 29%. In contrast, airborne particles fell 38% during this period, a decline attributed to cleaner cars and industries and better control of open burning. However, this favourable trend was reversed in 1992, and, by 1993, levels were approaching those of 1989. Fine particles were again of concern.³

During this same period, sulphur dioxide levels fell as a result of reduced emissions from smelters and

power plants, under the Acid Rain Control Program.³ Carbon monoxide and nitrogen dioxide levels fell 56% and 28%, respectively, despite an estimated increase of 13% in passenger-vehicle miles.

Differences among regions

Ground-level ozone standards were most often exceeded in the Windsor–Quebec City corridor by a large margin among four regions of Canada. This was true of every year between 1979 and 1993 except two (Table 14).³ In the last four years for which data are available, British Columbia and the Prairies averaged less than one hour annually of excessive ozone levels, compared with approximately 12 hours in Central Canada. Rural areas were not exempt, as high levels of ground-level ozone are frequently recorded in the Fraser Valley in British Columbia, Fundy National Park in New Brunswick, and Kejimikujik National Park in Nova Scotia.³

Sulphur levels in gasoline vary widely in Canada (Fig. 14b),⁴ which may explain some of the distribution of smog: Ontario has by far the highest levels of sulphur, as well as the highest concentration of vehicles. Ontario’s levels of sulphur are roughly double those of Europe and the U.S. average and are almost *20 times* the California limits. On average, Canadian sulphur levels are higher than those of Europe, the United States, and Japan, but this is slated to change: in October 1998, the federal environment minister announced that Canadian levels would have to be reduced to an average of 150 parts per million (ppm) by 2002 and to an average of 30 ppm — the current California level — by 2005.⁵ This would make Canadian gasoline sulphur levels among the lowest in the world.

Increased death rates related to smog range widely, from 11% in Quebec City — representing 0.9

additional deaths — to 3.6% in Windsor and Edmonton (Fig. 14c).²

On definitions and methods

The National Air Pollution Surveillance Network (NAPS) monitors and assesses the quality of ambient air in Canadian cities and towns. Most NAPS stations monitor all five common air pollutants. Sulphur dioxide, nitrogen dioxide, and ground-level ozone readings are one-hour averages taken every hour throughout the year. Carbon monoxide readings are averages of an eight-hour running mean, taken every hour throughout the year. Total suspended particulate readings are from 24-hour samplings carried out every six days at each station.³

National Ambient Air Quality Objectives for the five common air pollutants have been cooperatively developed by federal, provincial, and municipal agencies. Three levels of objective exist for pollutant concentrations: desirable, acceptable, and tolerable. Figure 14a shows the percentage of the maximum acceptable level reached by the five common pollutants.

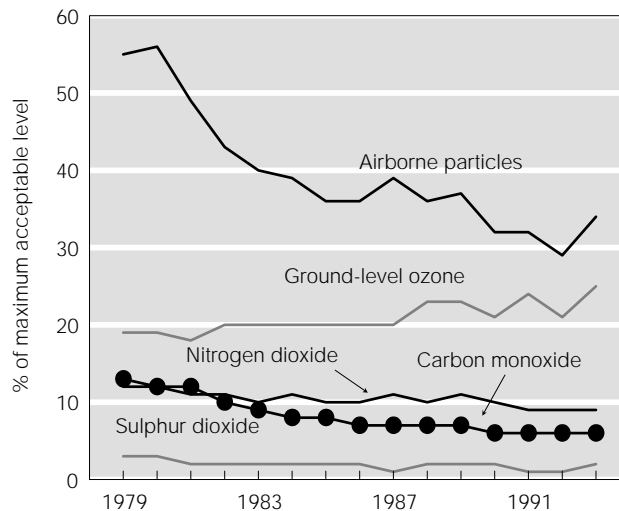
How representative a particular sampling site is of city air is a further consideration. It may not be possible to characterize the air quality in a given city solely on the basis of data from a single station — hence the caveat in comparing pollution levels in different cities. Caution should be exercised in this regard. The data represent the condition of the air in the vicinity of the individual sampling stations but may not necessarily represent community-wide air quality. However, a consistent time series can give a good representation of change.

References

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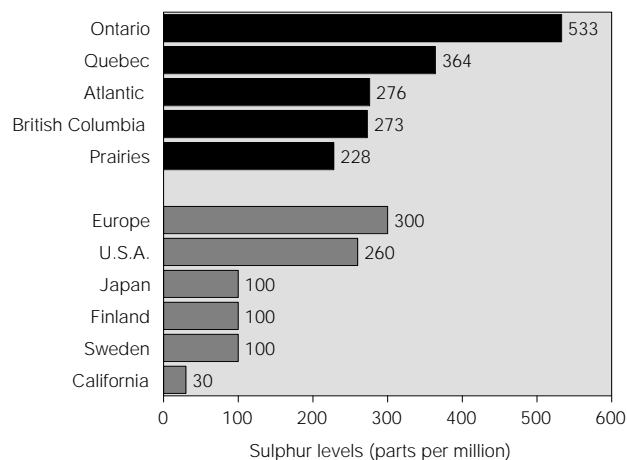
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5. Sulphur level in gas to be cut. *The Globe and Mail*, October 23, 1998.

Figure 14a. Levels of five common air pollutants, Canada, 1979–1993



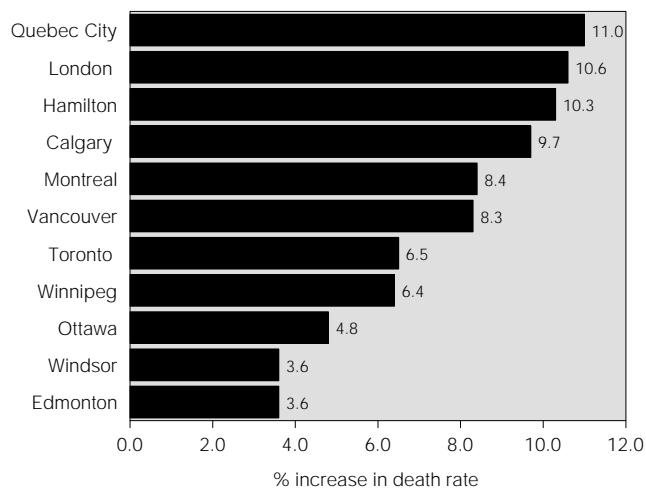
Source: Environment Canada, *Canada's National Environmental Indicator Series* as of August 1998.

Figure 14b. Sulphur levels in gasoline, various jurisdictions, 1995–96



Source: Mittlestaedt M, Canadian gasoline found to fuel smog, *The Globe and Mail*, March 7, 1998 (based on data from Environment Canada).

Figure 14c. **Increased death rate with high air pollution, by city, Canada, 1980–1991**



Source: Burnett R, Cakmak S, Brook JR, The effect of urban ambient air pollution mix on daily mortality rates in 11 Canadian cities, *Canadian Journal of Public Health* 1998; 89: 152–156.

Table 14. **Number of hours the ozone standard was exceeded, by region, Canada, 1979–1994**

	Canada	Atlantic Canada	Central Canada ^a	Prairies	British Columbia
1979	25.2		28.2	9.0	39.0
1980	21.1	12.6	30.1	1.4	16.5
1981	20.5	5.9	25.7	5.4	25.4
1982	10.4	4.0	14.5	3.6	6.5
1983	26.3	0.0	42.4	0.7	8.1
1984	14.4	47.8	16.3	7.5	2.8
1985	8.9	1.3	12.5	0.2	8.8
1986	8.3	0.0	12.6	0.4	2.9
1987	12.0	9.0	19.5	0.9	0.2
1988	51.0	8.2	83.0	0.9	10.2
1989	13.9	9.5	22.5	1.5	1.0
1990	8.8	7.1	12.8	0.6	4.3
1991	14.8	8.5	25.0	0.4	0.0
1992	4.9	0.5	8.5	0.0	0.0
1993	3.1	0.3	5.5	0.3	0.0
1994	6.5	2.5	10.5	0.7	1.0

^a Windsor–Quebec City corridor.

Source: Environment Canada, *Canada's National Environmental Indicator Series* as of August 1998.