

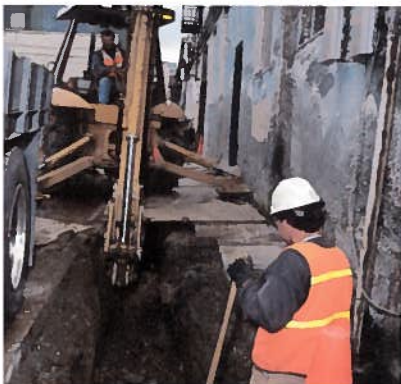
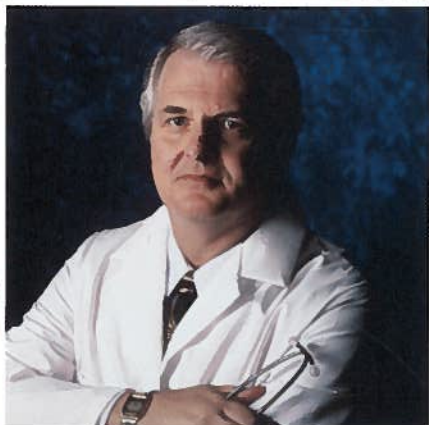


RÉGIE RÉGIONALE
DE LA SANTÉ ET DES
SERVICES SOCIAUX
DE MONTRÉAL-CENTRE

Direction de santé publique

*Risk Management
and Health*

A Modern-Day Safety Net



**LA PRÉVENTION
EN ACTIONS**

*Garder notre
monde en santé*

2003 Annual Report on the Health of the Population

*Risk Management
and Health*

A Modern-Day Safety Net

As of 30 January 2004, the legal title of the Régie régionale de la santé et des services sociaux de Montréal-Centre was changed to l'Agence de développement de réseaux locaux de services de santé et de services sociaux de Montréal.

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Foreword

In recent years, both in the public health field and among our principal partners, there has been a gradual awareness that the effectiveness of our initiatives to protect public health depends increasingly on the quality of our collaboration. Gone are the days when each intervener could assume its responsibilities with complete autonomy. However, the relentless demands of our everyday activities lead us all too often to manage crises sporadically, when they arise, by trying at best each time to repeat our successes and avoid our failures. It has become obvious that the multiplicity of interveners, the complexity of jurisdictions and health risks, not to mention the public's high expectations of us, will increasingly compel us to better pool our efforts to protect health.

This sixth annual report on the health of the population is intended to stimulate partnership based on shared risk management and, indeed, to foster the adoption of an initial integrated risk-management strategy for Montréal. Chapter 1 shows

***Stimulate
partnership based on
shared risk management and
foster the adoption of an initial
integrated risk-management
strategy for Montréal.***

to what extent health protection is inextricably linked to the city's history. Chapter 2 indicates our principal sources of information and work tools and describes the diseases and risks inherent in urban life. In Chapter 3, we examine 17 case histories centred in Montréal in recent years, and illustrate what we have collectively learned from these events. To conclude, in Chapter 4 we present the major observations stemming from these situations and explore what we deem to be the most promising avenues for improvement and the conditions for success necessary for their implementation.

Each significant crisis, such as the ice storm that struck Québec in 1998, is subject to analyses, recommendations and, indeed, amendments to legislation and regulations and changes in our practices. This time, we have instead sought to take advantage of the relative serenity prevailing beyond the agitation inherent in periods of crisis to propose a different approach, a comprehensive assessment based on various events. To our knowledge, this undertaking is the first of its kind in our region. We are seeking to determine how to improve, overall, our ability to jointly manage the entire range of situations rather than individual situations in an isolated manner. To this end, we have resorted to a qualitative analysis based on our experience over the years.

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While we assume full responsibility, as a an organization, for this report's analysis and conclusions, we felt it was essential, bearing in mind its content, to submit to our key regional partners the state of our reflection even before we drafted the final report. The round-table discussion held on September 4, 2003 has largely reinforced our perception of the relevance and usefulness of both this report and its proposals such as the adoption of an integrated management of health risks or the implementation of ongoing multijurisdictional monitoring that is, as much as possible, in real time. The participants' comments had a remarkable mobilizing effect on the project team. We would like to warmly thank all of them.

We hope that this report will mobilize and prove useful to our fellow Quebecers and political decision-makers and managers at the local, regional and provincial levels, that it will stimulate our collective management

of health protection and contribute to consolidating human, information, physical and financial resources. Our ability to manage health risks, despite its shortcomings and need for improvement, has created high

expectations among Montrealers. All of us who are striving to protect health have a duty to do everything possible to continue to warrant this trust each day.



Richard Lessard
Director of Public Health

Participants in the round-table discussion involving public health partners September 4, 2003		
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	<i>Planning</i>	<i>Jean-Nicolas Landry</i>

Acronyms

AQI	<i>Air quality index</i>
BTI	<i>Larvicide, Bacillus thurigiensis israelensis</i>
CAAM	<i>Comité aviseur antiterrorisme de Montréal</i>
CHSLD	<i>Residential and long-term care centre</i>
CLSC	<i>Local community service centre</i>
CMMI	<i>Comité mixte municipal-industrie</i>
CQSAS	<i>Centre québécois sur la santé des animaux sauvages</i>
CSST	<i>Commission de la santé et de la sécurité du travail du Québec</i>
DSP	<i>Direction de santé publique</i>
HIV	<i>Human immunodeficiency virus</i>
IDU	<i>Injection drug user</i>
INRS	<i>Institut national de recherche scientifique du Québec</i>
INSPQ	<i>Institut national de santé publique du Québec</i>
IRSST	<i>Institut de recherche Robert-Sauvé en santé et sécurité du travail</i>
LSPQ	<i>Laboratoire de santé publique du Québec</i>
MADO	<i>Reportable diseases</i>
MRSA	<i>Methicillin-resistant Staphylococcus aureus</i>
MSSS	<i>Ministère de la Santé et des Services sociaux du Québec</i>
MUC	<i>Montréal Urban Community</i>
PCB	<i>Polychlorinated biphenyls</i>
RRSSS	<i>Régie régionale de la santé et des services sociaux</i>
SARS	<i>Severe acute respiratory syndrome</i>
SOPFIM	<i>Société de protection des forêts contre les insectes et maladies</i>
SPIM	<i>Acronym of the Service de sécurité des incendies de Montréal in 1998</i>
SPVM	<i>Service de police de la ville de Montréal</i>
SSIM	<i>Service de sécurité des incendies de Montréal</i>
STI	<i>Sexually transmitted infection</i>

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Building a broader and richer interdependance to protect health

Over the past 30 years, health in the industrialized nations has shifted from being traditionally dominated by communicable diseases to the unprecedented appearance of new epidemics such as obesity, smoking, suicide, chronic diseases and mental health problems. These new trends are affecting the key causes of mortality and disease in the entire population and, more markedly, among specific social groups. At present, these trends alone account for nearly 60% of deaths in the world and will define the health profile for decades to come.

The 2002 annual report on the health of the population clearly illustrated these health trends by describing major health problems, along with risk factors and their evolution. It noted the need for population based action focusing on health objectives shared by the entire range of partners. The Montréal Public Health Action Plan 2003-2006, *Action for Prevention*, reflects these objectives by identifying explicit targets for the Montréal area.

Certain events have shaken our certainty about the nature of the challenges that the future holds in store for us.

However, certain events have shaken our certainty about the nature of the challenges that the future holds in store for us, e.g. mad cow disease, contaminated drinking water in Ontario, the appearance of West Nile virus or, more recently, the SARS epidemic. Their impact, not only on health but also on the social and economic life of our communities, reminds us of the precariousness of past achievements and the upsurge in the vigour and complexity of communicable diseases.

Despite remarkable advances in recent decades, such diseases, even when fairly well contained, are maintaining their full potential. Moreover, diseases are resurfacing

that had become rare and banal because of a reassuring feeling that science had overcome them or that they had been dealt with by the routine application of simple control measures such as vaccination and hand-washing. It must be acknowledged that both situations, to which must be added recourse to various agents to terrorize civil society, surprise and destabilize us and, on a global scale, make us more vulnerable.

This new health situation raises a number of scientific and ethical dilemmas. We must occasionally intervene without full scientific certainty when the public deems threats to its health to be unacceptable. Moreover, we must frequently invest considerable resources in emergencies that cause limited real harm in the area of mortality and disease, compared with the harm stemming daily from chronic diseases. Clearly, the question will continue to be topical and call upon the knowledge and know-how of all players in the health protection field in Montréal.

Under the circumstances, the role of the Direction de santé publique is well known: to prevent health and well-being problems. What is less well known is that, from the standpoint of health protection, the new *Public Health Act* gives the Director of Public Health broader powers in case of "a threat to the health of the population [...] of a biological, chemical or physical agent that may cause an epidemic if it is not controlled." The Director of Public Health now has at his disposal exceptional means to conduct investigations and involve public agencies in the region to confirm an epidemiological situation, apply control measures that fall under his jurisdiction and obtain confidential data in the course of pursuing

The question will continue to be topical and call upon the knowledge and know-how of all players in the health protection field in Montréal.

his initiatives. Moreover, in performing his duties, the Director of Public Health may call upon other agencies that have jurisdiction over public health and safety.

However, long before these stronger legislative measures were adopted, public health teams and their regular partners had already made a considerable effort to forge closer ties, usually centred on action. In-

creasingly, we all share the opinion that our interventions and risk management can no longer

We all share the opinion that our initiatives and risk management can no longer be unilateral, with each partner working independently within its specific jurisdiction and organization.

be unilateral, with each partner working independently within its specific jurisdiction and organization. An optimum response to the entire range of crises affecting health requires a multidisciplinary, pluri-jurisdictional approach.

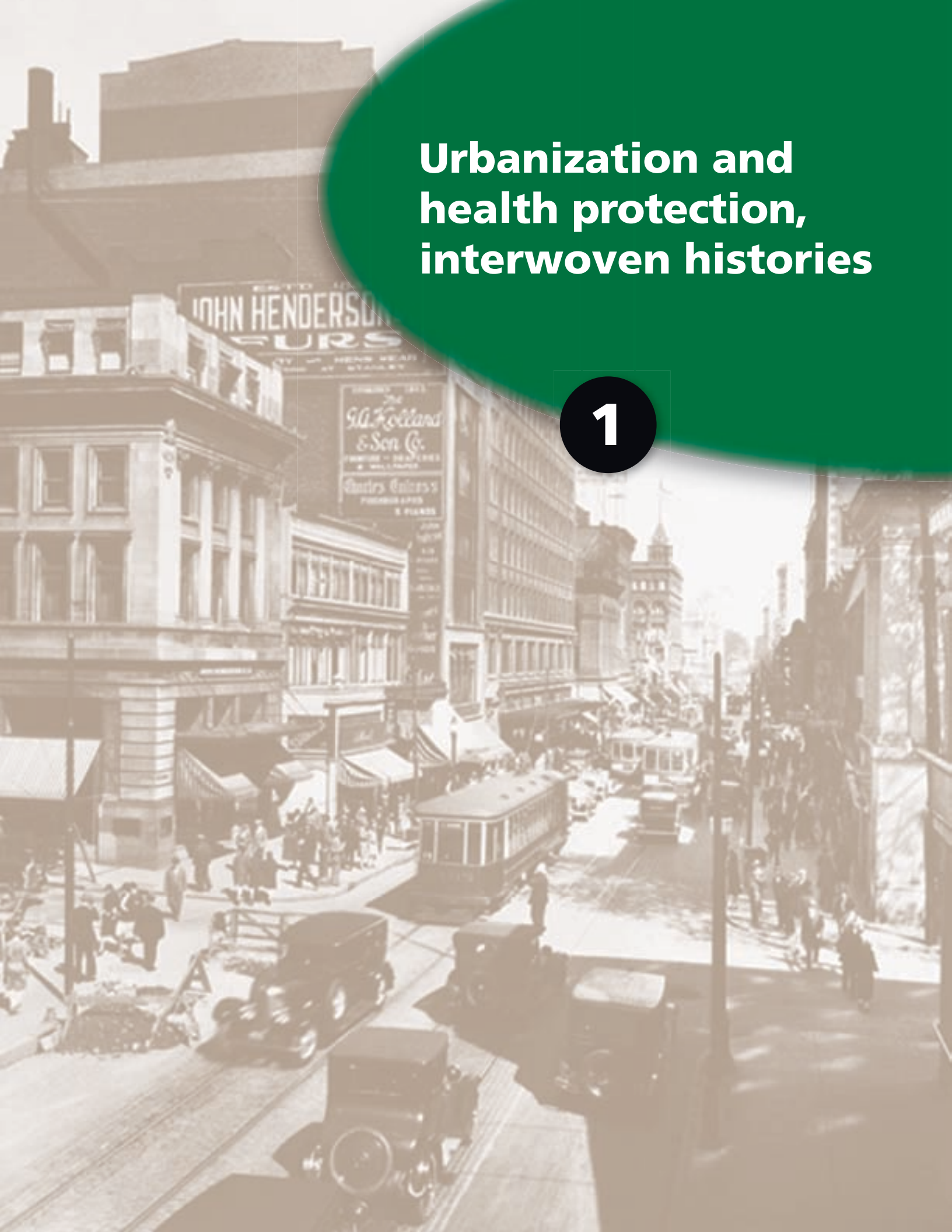
Moreover, such planning must take into account not only emergencies but also situations that foster the spread of disease.

Since the events of September 11, 2001, a determination has been noted the world over to modernize planning and create new networks of experts who are able to respond quickly to crises. It is a matter of establishing a firmer footing for intervention, especially by drawing up guidelines that will shape our decisions.

Are we collectively well informed? Are we vigilant enough? Do we act promptly to protect in a timely fashion individuals and groups whose health is or appears to be threatened? Are we prepared to act in an increasingly concerted manner to improve our plans and practices? These are some of the questions on which this report attempts to shed light. It questions our practices in public health and in other fields with the avowed intention of building a broader and richer interdependence in order to protect Montrealers' health.

Urbanization and health protection, interwoven histories

1





1 Urbanization and health protection, interwoven histories

M

MONTRÉAL ENJOYS a fairly high level of health that ranks it in the middle of the most industrialized nations. It is Canada's second largest city and had 1.8 million inhabitants according to the last Census; population growth has resumed and now stands at 15 000 people a year. Montréal's economic situation has also improved in recent years, following a period of stagnation. The proportion of social aid beneficiaries fell from 18% to 13% between 1996 and 2002 and unemployment decreased from 14% to 10%. However, this renewed prosperity must not mask the striking discrepancies that persist in the socio-economic status of the residents of various districts, which inevitably reflect certain health inequalities.

Montrealers can hope to live in a general state of well-being that has improved over time and that many other communities in the world would envy. While many risks of infection have been overcome and while we seem better equipped to face technological risks or natural catastrophes, news reports regularly remind us that vigilance is still necessary and that our safety net, i.e. our health and safety protection systems, must be constantly improved.

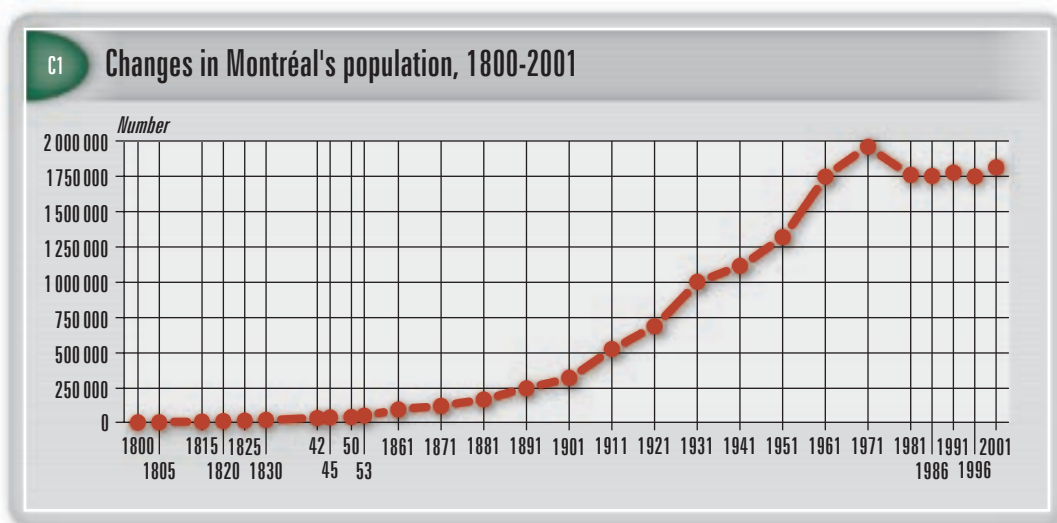
Indeed, public health can never be taken for granted. It is part of a community's history and changes with the progress and problems that mark our passage through time. In the specific case of Montréal, health risks and protection strategies are closely tied to the evolution of urban life.

From a mercantile town to an industrial metropolis

Montréal became a metropolis in the mid-19th century. Industrialization and a population explosion spawned a markedly different world in all respects. Chart 1 illustrates the spectacular population growth that began around 1850 and only stabilized in the last two decades of the 20th century: Montréal's population rose from 9 000 in 1800 to 100 000 in 1861 and now stands at 1.8 million.

This population explosion stems, above all, from international immigration and the rural exodus. Montréal spearheaded the industrial revolution in Canada and was the country's rail hub and cultural capital. Already, in the second half of the 19th century, Montréal had the status of a big, multi-ethnic city assembling, as its coat-of-arms reveals, residents of French, English, Irish and Scottish descent. A new change occurred at the end of the 20th century when Montréal fully entered the post-industrial era marked by the knowledge-based economy and the expansion of the services sector. Within one century, the proportion of workers in the manufacturing sector rose from roughly 30% in 1900, to a peak of 38% in 1941, then fell to 16.8% in 1996.

Current demographic development displays three trends. Montréal's population is ageing and the number of residents 65 years of age has risen steadily, to 15% in 2001, and family structure is changing in that over one-third of households (38% in 2001) comprised only one person. Immigration is also noteworthy in that it has shaped Montréal, although this profile is changing considerably: in 1901, Montrealers of other than French or British origin accounted for only 5.4% of the population, compared with 24% in 1971. According to the 2001 Census, most new arrivals come from 15 countries, only one of which, France, is in Western Europe.



Montréal in a nutshell

Geography

Area: 483 km² (50 x 16 km)

Length of shoreline: 267 km

One city, 75 islands

Sociodemographic data

Total population: 1 812 723

16% under 15 years of age

15% over 65 years of age

Number of one-person households: 38%

Average number of children per family: 1.1

Immigrant population: 28%

Rental housing: 64%

Socio-sanitary data

Life expectancy at birth:

75.3 years for men, 81.4 years for women

Economic data

Labour force: 62.8%

Employed population: 57.0%

Unemployment rate (July 2003): 12%

Transportation

Rail lines: 883 km

Total port traffic (2002): 18.72 million tons

Airport passenger traffic (2002): 8 806 990

Passenger vehicles (1999): 619 056

Other vehicles (1999): 146 982

Bus and metro trips (2001): 354 900 000

Length of traffic arteries: 5 617 km

Number of visitors: 10 451 000

Living conditions in a constantly evolving industrial city entail risks that, if not entirely new and specific, are at least exacerbated by urbanization. Greater population density creates an ideal breeding ground for infectious diseases while the relative anonymity that prevails along with an openness to the world foster the adoption of risk behaviours. Water supply and wastewater and household refuse disposal systems need time to adapt. The growing remoteness of farmland complicates access to safe food, especially meat and milk. Economic activity, centred on big industry, considerably increases technological, occupational and environmental risks in relation to the pre-industrial economy. Over the years, Montrealers have had to adapt to an environment that urbanization has been changing constantly.

Risk is not confined solely to occupational activities and living conditions in a big city. However it must be acknowledged that the sheer number of risks can cause much more devastating consequences.

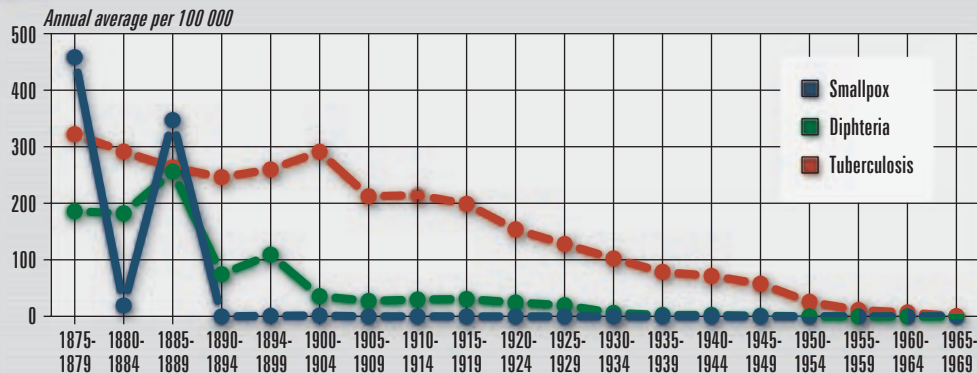
Over time, the profile of biological, technological and even natural threats changes. Major epidemics seem to be a thing of the past, e.g. the typhoid epidemic of 1927 that killed 500 people out of a population of 900 000, the Spanish influenza epidemic that killed 2 000 people out of a population of 650 000 in 1918, or worse still, the smallpox outbreak that cut down over 3 000 people out of a population of 200 000 in 1885. In other words, in the latter instance, a single disease killed, relatively speaking, twice as many people as all causes of death today. Considerable headway has been made and mortality is much less prevalent than it once was. However, recent events such as the ice storm and the SARS epidemic periodically remind us of our vulnerability.

In Montréal, as in the developed nations, the historic reduction in infectious diseases marks the key change in mortality. The following chart illustrates changes in the three most destructive diseases in Montréal barely a century ago: smallpox, diphtheria and tuberculosis.

Constantly changing risks

While the new city that developed during the industrial revolution was a formidable means of creating wealth and generating well-being, it faced new challenges that imposed a heavy burden, especially among the working class.

C2 Smallpox, diphtheria and tuberculosis death rates, 1875-1969



Through improved vaccines and vaccination coverage, smallpox deaths were virtually eliminated starting in 1890. Diphtheria continued to be a cause of death beyond that time but has been negligible since 1925. Tuberculosis proved to be more tenacious and it was almost the 1960s before it disappeared as a cause of death. It is once again rife and strikes roughly 200 people a year.

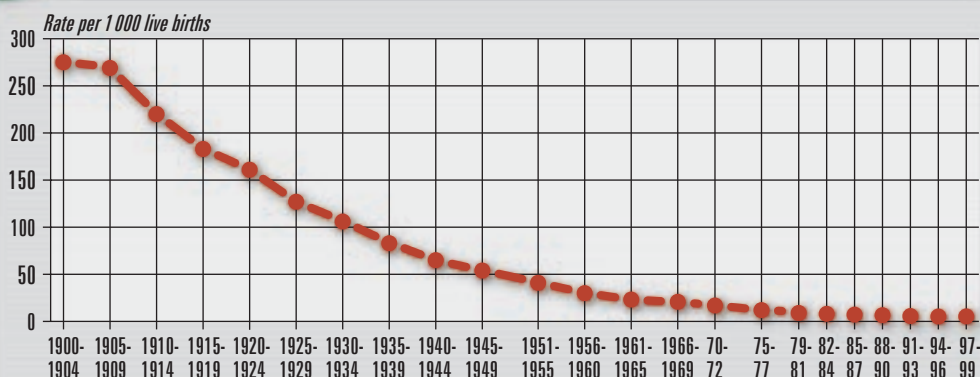
Infant mortality declined throughout the century. Very high rates until 1930 stemmed, by and large, from the poor quality of water and milk (barely 45% of milk was pasteurized at the time of World War I).

Between 1997 and 1999, infectious diseases accounted for less than 2% of total mortality, as against one-third a century

earlier. Today, chronic diseases are the leading causes of death: diseases of the circulatory system, tumours and diseases of the respiratory system account for 75% of all deaths in Montréal. The price of our successes also implies a risk that must not be underestimated, i.e. reduced vigilance of infectious diseases.

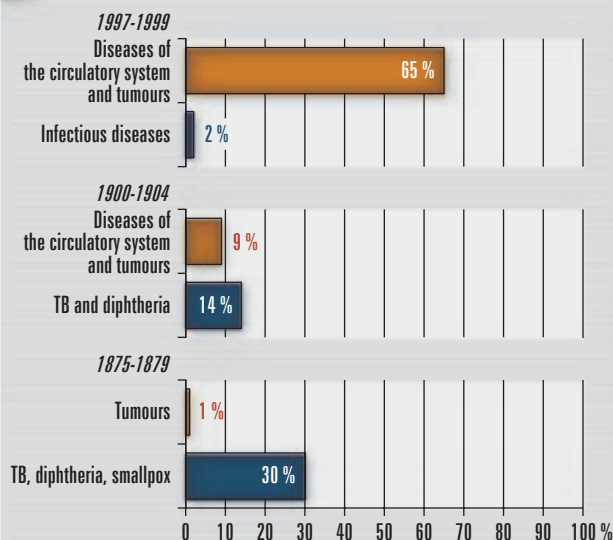
Like all big cities, Montréal must also contend with other types of risks associated, for example, with higher population density. Fire continues to be a source of tragedy although, fortunately, it would be hard to imagine a disaster such as the great fire of 1852 that killed 10 000 of the city's 60 000 inhabitants. The event occurred prior to the adoption of a by-law prohibiting new wood buildings and the establishment of a

C3 Infant mortality, 1900-1999



C4

Deaths in Montréal by major causes, 1875-1879, 1900-1904 and 1997-1999



professional fire department. Historically, the industrial development of a city such as Montréal has generated extensive economic and social spinoff. However, industry has come to rely increasingly on hazardous materials and, even though this danger is declining overall in the current service-based economy, it still implies risks, first and foremost for workers but also for the population at large. Fortunately, we have not experienced industrial catastrophes such as those that have occurred over the past 20 years in Ukraine, Italy or India. Such tragedies are nonetheless a vivid reminder of technological risks.

Two new types of risks that few of us anticipated appeared recently, i.e. climatic disruptions and terrorism. While Montréal has been spared in this respect, a number of its characteristics such as its status as an international hub and the high percentage of elderly people who are more vulnerable to heatwaves, among other things, exacerbate the potential consequences of such risks.

Change conditioned by knowledge, power and will

If risks stem from or are exacerbated by the very development of urban life, social protection measures and the individuals responsible for them are inextricably linked. Urbanization does not only engender problems but also creates conditions leading to solutions. Overall, mortality indicators confirm that health protection measures have improved steadily, despite the devastating impact of the epidemics that have occurred periodically in Montréal. However, the protection of public health is a long-term, collective initiative that relies

Knowledge

The discovery of infectious agents, the understanding of their mode of action and the development of vaccines have played a key role in the reduction of infectious diseases through enhanced hygiene and living conditions. Montréal continues to play a leading role in the development of such knowledge. The city's researchers and institutions have for a long time distinguished themselves in the realm of microbiology and consequently, in the medicopharmaceutical sector, thus making it a leading-edge sector in our economy.

Information systems, another strategic knowledge sector, continue to be crucial in allowing us to prepare adequately for emergencies and counteract the spread of infectious diseases. Advances in the information and communications technologies should, in principle, produce increasingly efficient information systems in the health protection field. However, their sound functioning does not depend solely on technological considerations but often on users' attitudes. In the early 20th century, only a tiny proportion of tuberculosis, polio and smallpox cases were reported since many physicians were afraid of violating professional secrecy. Key interveners can thus hamper the communication of knowledge that is essential to the implementation of a protection strategy. Even today, data on certain reportable diseases is highly fragmented.

on complex interaction between the state of knowledge, the availability of financial, human and organizational resources to implement solutions (power) and the decision-making processes in which public opinion also plays a significant role (will).

Professionals devoted to health protection in the city rely on knowledge to the extent that such knowledge is disseminated and

Will

In an increasingly complex, diverse society, decision-making processes in the health protection field as in other areas of community life are taking root within the framework of social debate and struggles. In the second half of the 19th century, public health problems were glaring in Montréal, which made a poor showing among big North American cities. Demands were made for public hygiene measures, which were slow in coming. Until 1865, the authorities failed to see the need to pay health personnel outside times of crisis. The establishment in 1866 of a permanent health office marked a turning point, the new expression of a clear political determination. Throughout the subsequent century and a half, variations were noted in the sensitivity of decision-makers to the challenges posed by health, challenges which could never be settled once and for all. In each era, the situation required a reminder by health officials of the importance of prevention and an effort on the part of decision-makers to fix priorities and allocate resources.

While political decision-makers have occasionally resisted pressing demands from interveners in the field, resistance has, paradoxically, also come from the very individuals who would benefit from protection measures. At the turn of the century, the public greeted with hostility the inspectors sent to ensure compliance with by-laws governing the elimination of cesspools and the connection of sewers. At the height of the 1885 smallpox epidemic, a strong anti-vaccination movement sparked riots. Less than a century later, times had changed and the vaccination campaign launched during the last major poliomyelitis epidemic in 1959 was greeted enthusiastically.

Power

When a public health problem arises, it is not enough to know what has to be done, we must also have the means to act. As we know all too well, protection can be costly.

The spectacular urbanization that occurred in the late 19th century needed heavy investments in essential modern infrastructure, especially wastewater disposal and drinking-water supply. Between 1885 and 1913, the wastewater system was completed, especially in the suburban towns, and cesspools virtually disappeared at the beginning of World War I. As for the water works system, in light of recurring typhoid epidemics, health authorities pressed for chlorination, which began in 1910, and filtration, completed in 1918.

Intervention does not depend solely on financial resources. The legislative and regulatory provisions that a society adopts are also key components that figure prominently in a society's history, enlightened by scientific progress but also by experience, especially painful experience, such as the impact of a major fire, which demands new ways of doing things.

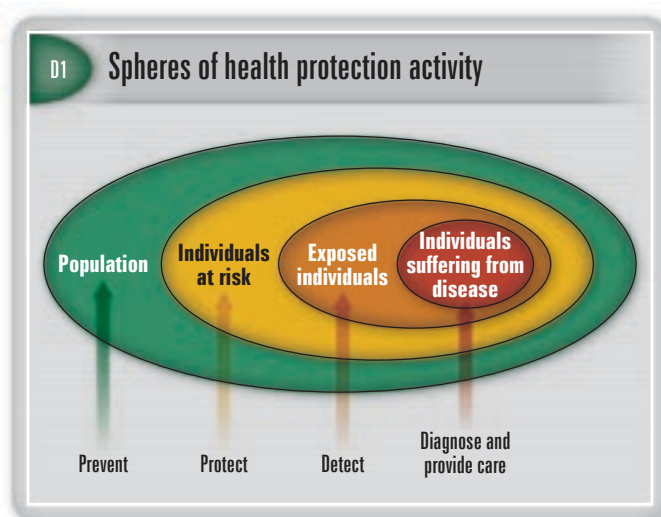
*Finally, and above all, the power to act finds concrete expression in the organization of protection services, which have largely been established in Montréal under the aegis of the municipal government. The city had to establish a police force (the first in Canada, in 1840) and a permanent fire department (1863). The City of Montréal's health service, whose history Gaumer *et al.* have brilliantly recounted, became permanent in 1866. In this way, Montréal adopted the measures to deal with health challenges in a big city.*

In the 1970s, public health services were reorganized in the network of CLSCs and sub-regional community health departments, amalgamated in 1994 within the Direction de santé publique (DSP) integrated into the regional health and social services board. The city nonetheless maintained key responsibilities in such vital sectors as the monitoring and management of the quality of air, water and food.

pooled, enlightens political decision-makers and shapes public opinion. The resources earmarked for protection depend on the community's general level of economic development and the priority given by decision-makers to various competing objectives. Will obviously refers to the complexities of political life but also to the attitudes, aspirations and resistance of various groups of citizens.

An increasingly complex safety net

The protection of the health of individuals, groups at risk and the general public encompasses four major spheres of activity. The first sphere, which covers the public at large, focuses on promotional and educational initiatives to bolster individuals' abilities and encourage them to adopt behaviour conducive to health and safety. The second sphere concerns individuals at risk and encompasses measures aimed at preventing infection, disease or accidents or reducing exposure to them. The third sphere pertains to individuals who have



been exposed and comprises disease detection and control measures. The fourth sphere is aimed at affected individuals and includes care and rehabilitation measures when accidents, diseases, poisoning and infections occur. The specific nature of health protection stems from its own mission and the biological, chemical and physical risks threatening the population, whether exposure to a common source or the transmission of an infectious agent from one person to another.

C5 Key players in health protection

International

World Health Organization

Centers for Disease Control and Prevention

Environmental Protection Agency

National

Canadian Food Inspection Agency
Ministère de l'Environnement

Food inspection, Mtl
Air quality, Mtl
Drinking water quality, Mtl

Environment Canada

Communications Québec

Ministère de la Santé et des Services sociaux

Health Canada

Community groups

Corporate communications, Mtl

Fire department, Mtl

Transportation corporation, Mtl
Boroughs, Mtl
City residents
Physicians' offices

Regional

Direction de santé publique

Régie régionale de la santé et des services sociaux

Housing service, Mtl

Commission de la santé et de la sécurité du travail

CSST, Regional office
Urgences-santé

Environment, regional office

Police department, Mtl

Emergency preparedness, regional office

CLSC

Emergency preparedness, Mtl

Institut national de santé publique du Québec

Ministère de la Sécurité publique

Conseil du Montréal métropolitain

Red Cross

Ministère de l'Agriculture, des Pêcheries et de l'Alimentation

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Issues related to protection, both from the standpoint of problems and solutions, bear the stamp of urban life. Montréal's specific nature is apparent in the size and structure of its population, its economic activity and infrastructure, political stature and, of course, the city's institutions or those that operate throughout its territory. Nevertheless, the factors that contribute to the protection of Montrealers' health depend on a number of authorities that extend beyond the city limits.

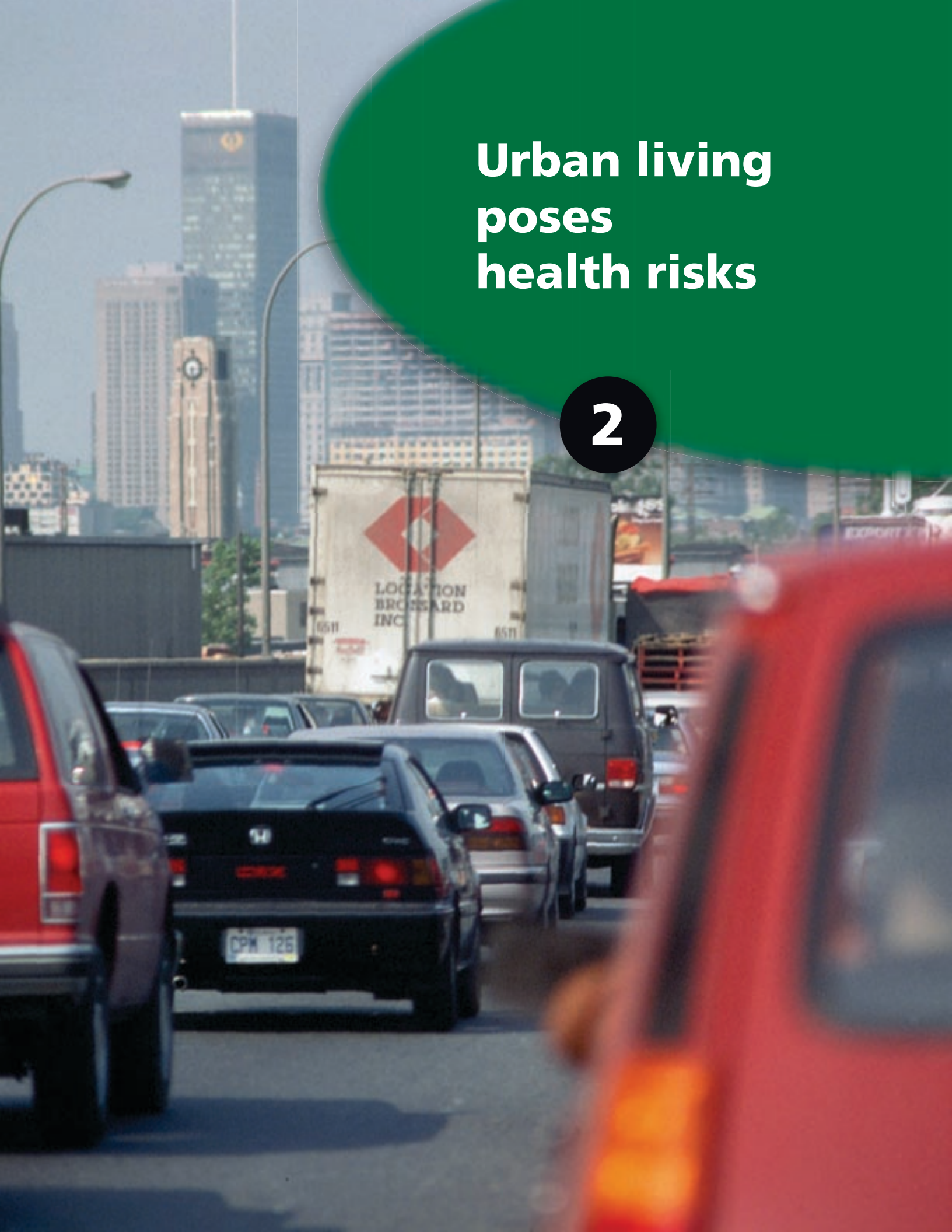
A number of partners from different jurisdictions contribute to the protection of health and safety. What takes the place of a safety net is underpinned by the federal, provincial and municipal governments with, at each level, numerous government departments, agencies and services, each one of them acting according to its own mission and regulatory framework and covering sectors of varying scope in the public health field.

Chart 5 groups together the key agencies with which the DSP collaborates on an almost daily basis in the protection field. Each agency in its field must intervene to prevent, engage in preparation, react to known risks or face the unknown. To this end, a number of these agencies exercise, pursuant to the legislation that governs

them, powers of investigation and inspection and the legitimate authority to oversee the administration of the control measures stipulated in legislation and regulations. In addition to these usual partners, the DSP works with a number of other specialized agencies at all levels of government.

The presence of all of these players, to whom the community has assigned increasingly formalized roles, indeed reflects a broad determination to elaborate legislative, administrative and scientific tools and refine them as new crises reveal their shortcomings. However, the need to link interveners is, increasingly, being recognized, as revealed in amendments to important statutes, such as the *Public Health Act* (December 2001) and the *Regulation respecting the quality of drinking water* (May 2001) of the ministère de l'Environnement, not to mention the *Civil Protection Act* (December 2001). These legislative measures clearly indicate the course that the management of health risks must follow in our society.

The quality and strength of the safety net develops based on advances in knowledge, the enrichment of society and changes in ways of doing things. In each era, we must update public health protection measures, which always stem from the combination of knowledge, power and will.



Urban living poses health risks

2

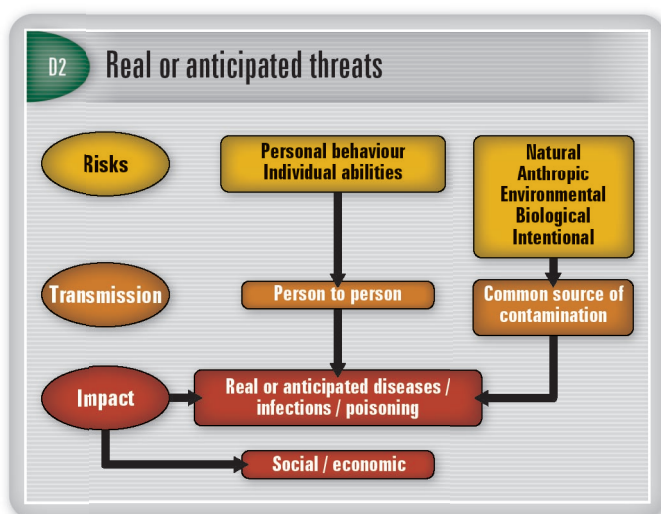


2 Urban living poses health risks



Communicable diseases caused by various pathogens no longer represent anything more than a limited burden in terms of disease or mortality. At the very time that we might believe the enemy to be vanquished, a number of phenomena are appearing that call into question our past achievements. The interdependence of nations, massive migrations, the speed of transportation and the globalization of trade are exposing populations to new and different risks but also, to our great surprise, to old risks that we thought had been eliminated.

Our previous annual report extensively described the ways in which, based on its characteristics, such as its infrastructure, population, social networks and health problems, Montréal is distinct in terms of urban health. In this year's report, we examine the risks likely to affect Montrealers' health, and the diseases, infections and poisonings that are still active, though avoidable. Overall, such risks can be of any nature, e.g., individual behaviour, natural sources of exposure related to human activity or of environmental or biological origin, or of an intentional nature.



Varied information sources

To pinpoint diseases associated with biological, chemical and physical agents, health authorities already have at their disposal several sources of information. First, the reportable diseases information system which encompasses reporting on diseases, infections and poisonings. The *Public Health Act* obliges physicians and laboratory directors to notify the Director of Public Health of all cases of reportable diseases. These 78 diseases have been selected because of their incidence, potential contagiousity and seriousness.

Another source of information is reporting by interveners in schools, day care centres, businesses, health care establishments, government departments, fire and police departments and Urgences-santé to the public health 24-hour emergency on-call service of all other situations likely to cause epidemics. Numerous other sources also make it possible to monitor diseases, detect sources of outbreaks,¹ pinpoint risk factors and populations at risk, and plan appropriate measures. Such sources are found either in the health sector, e.g., hospitalization records, death records and the Centre Anti-poison, or in other agencies such as the CSST, federal and provincial government departments, and the City of Montréal.

Each report is subject to epidemiological investigation by a public health professional to validate or invalidate outbreaks or poisonings through the collection of information from individuals suffering from the disease or who are at risk. Some investigations prove to be more complex depending on the situation's epidemic potential, the difficulty in reaching the people affected or their contacts, or the availability of front-line services to administer control measures such as prophylaxis, vaccination or patient management. Epidemiological investigations are another source of information.

All partners engage in real time monitoring at provincial, Canadian and international sites in search of information that may affect Montréal and could require protection measures.

The Public Health Act obliges physicians and laboratory directors to notify the Director of Public Health of all cases of reportable diseases

¹ An outbreak is the appearance of a small number of cases of a communicable disease or an increase in the number of cases in a region or community, while an epidemic is a large number of cases.

Persistent health problems

Communicable diseases

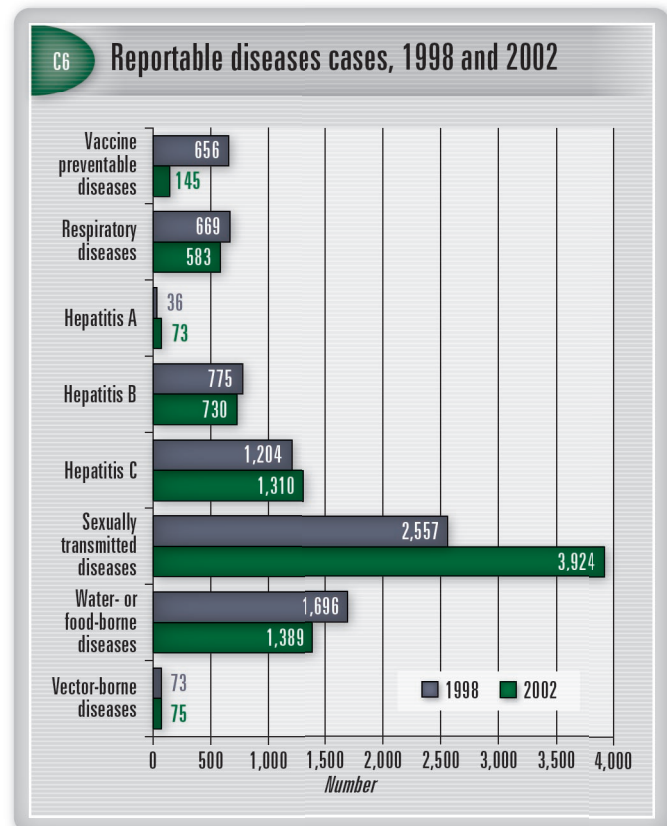
Aside from epidemic situations, the DSP receives, on average, 15 000 reports of all kinds. In 2002, it recorded 3 924 cases of sexually transmitted infections, 2 113 cases of hepatitis A, B and C, 171 cases of tuberculosis and 1 325 cases of bowel disease. The total number of HIV-infected individuals in the territory appears to be around 11 000 and the number of people with AIDS, 4 400. Despite prevention measures, since 1998 all sexually transmitted infections have been recrudescing after remaining stable for several years, especially among men

Behavioural studies, corroborated by the recrudescence of infections such as rectal gonorrhoea and syphilis, raise fears of a resurgence of the HIV epidemic in Montréal.

who have sex with men. Chlamydiosis continues to be a major health problem among young women between the ages of 15 and 25, given its impact on fertility in the absence of proper patient management.

It is disturbing to note that behavioural studies, corroborated by the recrudescence of infections such as rectal gonorrhoea and syphilis, raise fears of a resurgence of the HIV epidemic in Montréal. Moreover, over 600 injection drug users contract HIV each year and, after three years of the practice, half of street kids who inject drugs become hepatitis C carriers.

Montréal differs from the rest of Québec from the standpoint of infections that pose a threat to public health. This situation stems, in part, from the city's multiethnic population: tuberculosis, hepatitis B, parasitic enteric disease and typhoid fever are endemic in most immigrants' countries of origin. While the incidence of tuberculosis is stable, the complexity of cases is growing. The failure by individuals to take medication makes it difficult to pursue antibiotic treatment that lasts several months or even years. Moreover, some cases occur in environments where hundreds of people may have



been exposed. Fortunately, the percentage of antibiotic-resistant strains remains small in Montréal.

Acute hepatitis B infections affect, above all, individuals who engage in unprotected sex, and drug users. Enteric disease is transmitted mainly from person to person or through contaminated food. These infections produced the biggest number of outbreaks for which collective control measures had to be implemented. In 2002, 49 outbreaks of epidemic diarrhoea affecting roughly 1 200 people were reported, 40 in hospitals, 5 in schools, 2 in day care centres and 2 in restaurants. Chronic under-reporting of enteric diseases has been suspected for a long time.

The most striking gain in the realm of infectious diseases is the reduction of vaccine-preventable diseases and vaccination against hepatitis A and hepatitis B. The incidence of all of these vaccine-preventable diseases is under control, except for pertussis, as the vaccine is less effective. West

Nile virus is an emerging infection on the Island of Montréal. In 2002, it affected 329 people in Canada, 19 of them in Québec, including 13 in Montréal, with 2 deaths. As of November 2003, 14 cases were confirmed for Québec, including 5 in Montréal. In the absence of a specific treatment and vaccine, protection from mosquitoes is the best way to combat the virus.

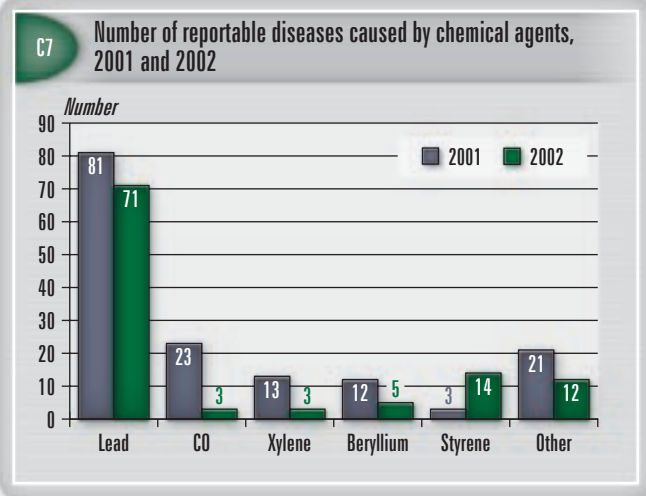
The interpenetration of social networks produces more extensive contacts in major urban centres. Several groups in Montréal are especially vulnerable to infectious diseases because of high-risk behaviour and the relaxation of prevention measures since HIV triple therapy appeared. A higher incidence of disease has been noted in the territories of CLSCs where groups at risk live, e.g., men who have sex with men, prostitutes, injection drug users, or street youth. Similarly, certain diseases continue to be more prevalent among immigrants and socioeconomically disadvantaged individuals.

Poisonings

The DSP receives notification of chemical poisonings through the reportable diseases information system (MADO) as well as through other reports, which clearly indicate that the true picture of poisoning is incomplete. In 2001-2002, the DSP received 361 reports from the reportable diseases information system, the most frequent dealing with lead and carbon monoxide poisoning, especially occupational exposure cases.

Occupational overexposure to lead is reported each year by business, industry and specialized firms. Poisoning of environmental origin affects children above all, mainly through ingestion of flakes of old paint. It should be noted that some immigrant children had already been exposed to lead before arriving in Montréal.

Carbon monoxide poisoning is frequent in the workplace and stems from poorly maintained propane lift trucks, vehicle engines that are left idling inside buildings, or defective industrial boilers and ovens. Poisoning of environmental origin also often stems from defective boilers and water heaters.



Among reports of significant events, the evacuation of 2 200 workers in a city textile plant following a gas leak comes to mind, as well as two incidents in a public swimming pool where over 100 children suffered irritation of the skin and respiratory tract. In all three cases, the agent could not be identified, which clearly reveals the difficulty of detecting certain chemical agents.

Ever present risks

As residents of a big city, Montrealers may face an array of health risks but, aside from intervention by public authorities however effective it is, the public has a major role to play to ensure its own safety and adopt preventive behaviours. Inevitably, city residents will always have to react and prepare themselves. It is essential for all individuals to be thoroughly familiar with the risks that surround them and the effective responses to such risks.

***The Public
has a major role to play
to ensure its own safety and
adopt preventive behaviours.***

Natural risks

It has become apparent in recent years that the Montréal area is not shielded from natural hazards. Serious climatic disorders

such as floods, the violent storms on July 14, 1987, the ice storm, and heatwaves are not without consequences. Environment Canada issues an extreme heat warning when the air temperature reaches 30°C and the Humidex (which takes into account the relative humidity of ambient air), 40°C. Between 1996 and 2003, the number of weather warnings varied between none and five per year and lasted anywhere from several hours to just over two days.

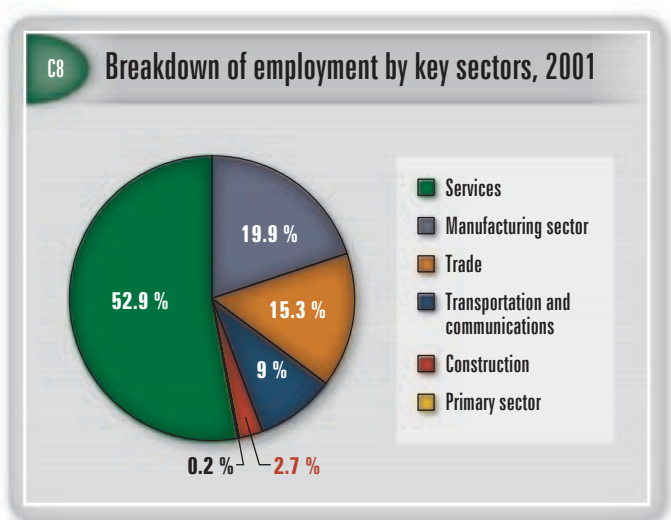
Air pollution, greenhouse gases and, in particular, CO₂, are causing significant health problems. For 15 years, meteorologists have relied on modeling to anticipate the possible effect of the growing presence of greenhouse gases. An Environment Canada report produced in 1997 presents a scenario in which the concentration of atmospheric CO₂ doubles in southern Québec, which leads to a general warming trend of between 1° to 4°C, and from 2° to 6°C in the winter, along with an increase in winter precipitation of as much as 20%. According to these climatic change scenarios, we would likely witness an increase in the frequency, duration and intensity of extreme climatic events such as drought, floods, cold snaps and heatwaves, snowstorms and violent storms.

Risks stemming from human activity

Workplace

Just over 1 million people work in the Montréal area and one-third of them live off the Island of Montréal. The workforce is fairly equally divided between the sexes. Workers under 30 years of age account for nearly 25% of the employed labour force and workers 60 or over, less than 5%.

Most workers are employed in the service and manufacturing sectors. In the service sector, wholesale and retail trade employ 22% of workers; women predominate in the health and social services and education fields. The key segments of the manufacturing sector are clothing, electrical and electronic products, printing and publishing, and food and beverages. Men generally outnumber women in the manufacturing sector, except for clothing.



The workplace engenders many risks. In Montréal, between 1996 and 2000, the CSST compensated approximately 40 000 new employment injuries, i.e. approximately 40 per 1 000 workers. Relatively speaking, 2.5 times more men than women are injured. According to the 1998 *Québec Health and Social Survey*, young workers are more extensively exposed than older ones to conditions that may be detrimental to their health. Nearly 80% of CSST compensation covers injuries and trauma. Three sectors – construction, manufacturing and health and social services – are noteworthy for their high level of risk.

Major technological accidents

A major technological accident is defined as an unexpected, sudden event stemming from a major spill or discharge, fire or explosion due to an abnormal industrial operation that engenders a serious, immediate risk for the population living outside the boundaries of the facility; and involves one or more hazardous materials. In light of this definition, it might be thought that a technological accident is totally unforeseeable. Experience has shown that planning and preparation can completely reverse a situation.

Nonetheless, even though Montréal has been spared, certain characteristics mean that a major industrial catastrophe could have serious consequences. Here are some examples: several heavy industry hubs, the proximity of industrial and residential sec-

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tors, autoroutes used to transport hazardous materials, the absence of bypass routes, a rail transport centre and rail switching yards through which hazardous materials pass in transit, an international airport, port operations, sensitive infrastructure such as the metro, the density of housing, rush-hour traffic jams, numerous highrise buildings, bridges, and so on.

Environmental risks

Air pollution

The environment of a big city such as Montréal can also affect health. For instance, smog is a mixture of airborne pollutants (gases and particulate matter) and two of its principal components are ozone (O₃) and fine particles. The increase in carbon dioxide (CO₂) and greenhouse gases is no longer in doubt in the scientific community, above all because of fossil fuels such as natural gas, gasoline, oil, coal and wood. Young children, asthma sufferers and elderly people suffering from chronic cardiopulmonary diseases are more vulnerable to air pollution. Indeed, when pollution peaks, disease and mortality rates rise.

The air quality monitoring network (RSQA) calculates the air quality index (AQI) in light of the recommended thresholds established according to current knowledge. In 2002, the AQI was poor on 31 days between May and September in respect of at least one pollutant at one sampling station. During the rest of the year, the AQI was poor on 17 days because of fine particles, since ozone is not a factor in the winter. Fine particles are the most frequent cause of poor air quality, although ozone was also a factor on one-third of the days. Criteria for summer smog warnings are slightly more stringent and, since 1999, 10 or so days of summer smog have been recorded, although none was noted in 2000. In October 2003, Montréal

experienced smog stemming from fine particles engendered by fossil fuels and a thermal inversion, a weather condition that hampers the dispersal of pollution.

Aside from industrial sources, road transportation accounts for nearly half of greenhouse gas and ozone precursor emissions, especially nitrogen oxides. Heating in general and wood-fired home heating, in particular, also play an appreciable role.

Ragweed pollen is the leading cause of seasonal allergic rhinitis or hay fever. Vacant and industrial lots, highways and rail lines and airport sites promote the proliferation of ragweed. Pollen counts dropped steadily between 1977 and 1991 but have been rising over the past 12 years. The most recent data indicate that the western portion of the Island of Montréal appears to be at greater risk than the central and eastern portions. It is hard to interpret these findings since several factors come into play, e.g., climatic variations and human activities that contribute to increasing the area of bare ground. Moreover, since the Montréal Urban Community abrogated the ragweed by-law in 1996, there is no longer a systematic monitoring and eradication program.

Pollution of interior air in living environments

Interior air is not free of agents that can affect health. For the past 20 years, epidemiological studies have established a link between dampness in housing, the presence of mould and mites and the development and exacerbation of asthma and the development of respiratory symptoms such as coughs or irritations. Chemical contaminants such as tobacco smoke and nitrogen oxides from poorly adjusted gas stoves, or solvents used during renovations, also cause problems.

We have only cursory knowledge of the scope of the problem of substandard housing. According to a study conducted by the INRS-Urbanisation in 1991, 50 000 of the 320 000 housing units in the former City of Montréal appeared to be located in buildings where maintenance is apparently

inadequate and might be the source of damage and water leakage that promotes the growth of mould. In 1998, 11 municipalities in the MUC received 1 352 complaints concerning insalubrity pertaining to vermin, moulds, damp, heating problems and water seepage. The DSP and the City of Montréal housing service are seeking to better pinpoint zones in which problem housing is concentrated.

Various other salubrity problems are known, including an emerging problem concerning the quality of air and salubrity in schools and day care centres. Requests for information and intervention increased markedly between 2000-2001 and 2002-2003.

Contaminated soil

Many lots in Montréal are contaminated because of former industrial operations, improper waste management and the lack of environmental controls that prevailed in the past. Some lots have been put to other uses for a long time. Others are undergoing residential development in response to rising demand for new housing. The ministère de l'Environnement directory lists roughly a thousand contaminated lots on the Island of Montréal, mostly in formerly heavily industrialized sectors.

Health risks stem from direct, frequent contact with contaminated soil, i.e., ingestion, inhalation of vapour that infiltrates buildings or consumption of garden vegetables. Effects vary by type of contaminant (metals such as lead or organic substances such as petroleum products) and level of contamination. Although potential health risks are relatively limited, only efficient management of contaminated lots makes it possible to ensure the ongoing protection of residents.

Since the *Politique de protection et de réhabilitation des terrains contaminés* has been adopted and, above all, since the regulation has come into force, new rules have applied to the reuse of such lots for residential purposes. It is a question of ascertaining the level of decontamination necessary and, bearing in mind the health and environmental risks that the

soil poses, the scope of the contaminated soil management measures that remain in effect. Moreover, provision is made for information intended for the public and the inclusion of such information in the land register to keep track of the situation and avoid re-releasing the contaminants.

Water management

Montréal is served by seven drinking water treatment plants and three private distribution networks that draw water from the St. Lawrence River and the Rivière des Prairies, in addition to 650 private wells in the western portion of Montréal Island. The drinking water distribution network comprises approximately 680 km of trunk water mains and 4 560 km of lateral mains and is suffering serious problems of obsolescence and disrepair. Leaks are frequent and losses are estimated at between 40% and 50% of the water treated.

Daily monitoring of drinking water ensures its quality for city residents. However, in the wake of the Walkerton accident, the government has tightened up, since June 2001, standards governing the absence of pathogenic organisms and physical and chemical quality criteria, turbidity and the design of treatment plants. The City of Montréal is examining various scenarios to ensure compliance with the standards in the coming years.

During the 1970s, the MUC built infrastructure to collect and treat wastewater. Since August 1995, the water treatment plant, which receives all wastewater in dry weather, has served the entire population of the Island of Montréal. However, when it rains, some wastewater is discharged without treatment around the island, which is deteriorating the quality of shore water. The quality of water at the Island of Montréal's four public beaches was checked in 2003 and ranged from good to excellent.

The drinking water distribution network comprises approximately 680 km of trunk water mains and 4 560 km of lateral mains and is suffering serious problems of obsolescence and disrepair.

Biological risks

In addition to the usual diseases, food poisoning and sexually transmitted or blood-borne infections, health officials are now facing emerging infections that are crossing borders, such as encephalitis stemming from West Nile virus or SARS, and threats such as bioterrorism. Certain conventional infectious agents are changing and becoming resistant to antibiotics, such as tuberculosis or enterococci in health care establishments, also called nosocomial infections. Others are altering their genetic makeup and becoming more virulent, such as group C meningococci. Individuals suffering from chronic diseases are at the greatest risk.

Since the health care system is intervening more extensively, for longer periods and differently than it did in the past, it occasionally becomes the source of infection for its most vulnerable patients. Biotechnological advances in the realm of instrumentation, care techniques and drugs have made it possible to save lives. However, failure to fully comply with the rules of asepsis creates a source of infection. In the food sector, mass food processing and packaging methods are also sometimes a source of new infectious agents and epidemics, the most obvious case being bovine spongiform encephalopathy or mad cow disease.

Influenza is another infection that engenders avoidable mortality and morbidity. Annual epidemics affect roughly 10% to 20% of the population. Hospitalizations and deaths occur, above all, in high-risk groups such as the elderly and individuals suffering from chronic diseases. Despite the gains made from year to year regarding the vaccination of vulnerable groups, coverage is still not optimal. In 2002-2003, approximately 48% of the groups targeted in the Montréal area were vaccinated. Vaccination coverage stood at 56% among individuals 65 years of age or over, 47% among people in the 60-

64 age group, 30% among those under 60 suffering from a chronic disease, and 25% among workers in residential facilities (residential and long-term care and other centres).

The importance of vaccination, especially among nursing staff, was highlighted once again this year, with the appearance of SARS. The constant circulation of several genotypes of the H5N1 virus, which are combining with other viruses responsible for avian flu, are reviving concerns about a new emerging pandemic strain. Human populations enjoy little or no protection from these viruses. Moreover, WHO has recommended more robust monitoring among human beings and susceptible animals such as chickens, turkeys and pigs in the affected countries.

Intentional risks

In 1995, the world became aware of a new phenomenon, recourse to weapons of mass destruction to terrorize civilian populations. For example, the Aum Shinrikyo sect, showed how relatively easy it is to manufacture and use chemical weapons, when it attacked the Tokyo subway system. In March 1998, in response to the threat of chemical or biological weapons being used in the Montréal metro, the CAAM² was created. The obligation to maintain intense vigilance was strengthened in December 1999 with the arrest in customs of an illegal immigrant residing in Montréal who was apparently planning an attack on Los Angeles airport with the advent of the year 2000. A tear gas grenade set off in the Berri-UQAM metro station on September 2, 2001 illustrated this type of threat with a weapon that was, fortunately, hardly

Despite the gains made from year to year regarding the vaccination of vulnerable groups, coverage is still not optimal.

² CAAM, established in 1998, brings together representatives of the SPVM, the Service de sécurité des incendies de Montréal (SSIM), the Société de transport de Montréal (STM), the Centre de sécurité civile de Montréal, the Régie régionale de la santé et des services sociaux de Montréal-Centre, the Corporation d'Urgences-santé, the ministère de la Sécurité publique, the Sûreté du Québec, the Armed Forces of Canada, and the Direction de santé publique.

toxic. The following week, North America learned that terrorism is not a fiction but a cruel reality for which we must prepare ourselves.

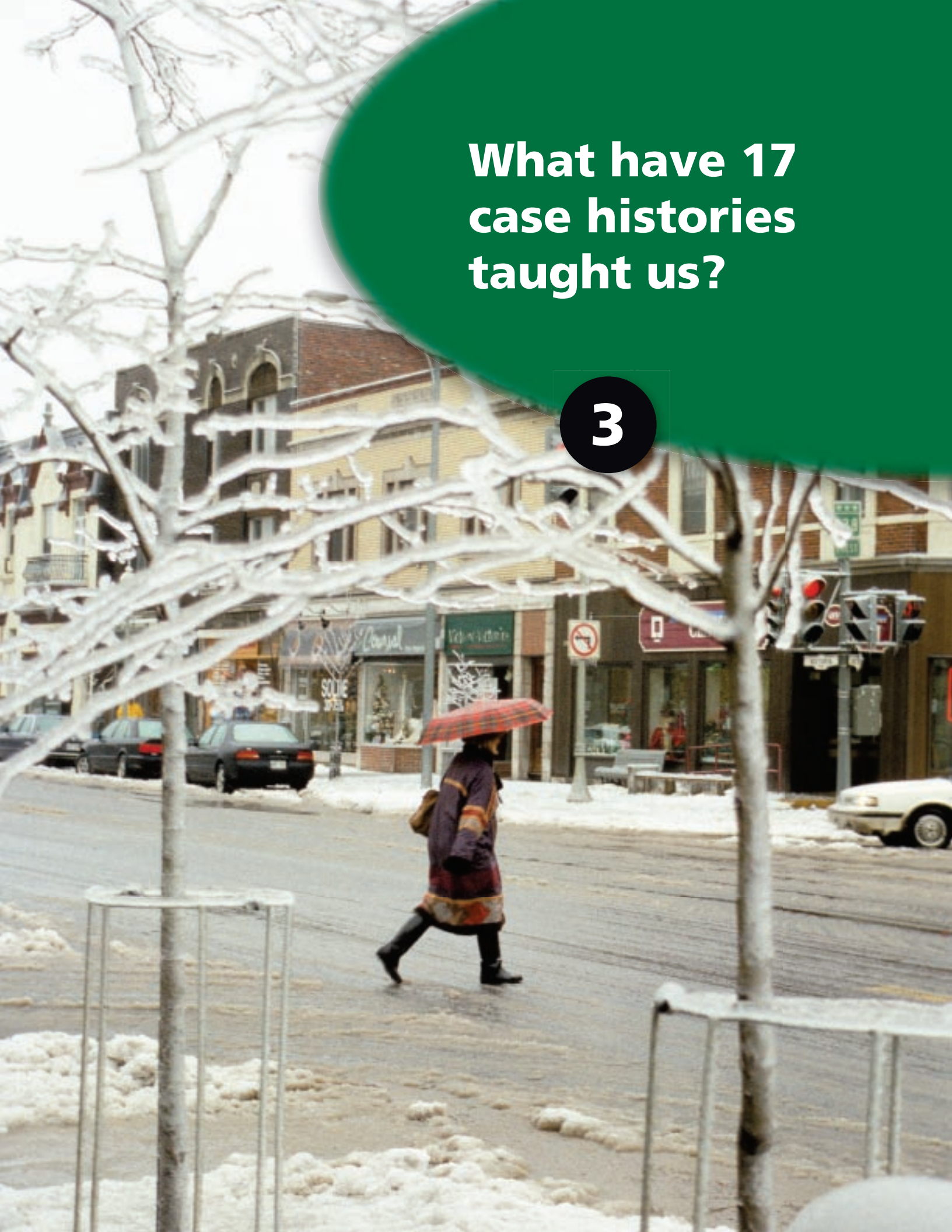
Mailings of letters or packages containing a pathogenic agent also demanded specific preparation. In the United States, letters purporting to contain the *Bacillus anthracis*, which transmits anthrax, were sent, to abortion clinics. In October 2001 in the United States, letters that actually contained the bacillus resulted in a number

of victims. The phenomenon crossed the border and in Montréal alone the police received over 2 000 calls in this respect.

This broad overview of the health risks inherent in a big international city clearly shows that, while Montréal may be less at risk than other big cities in the world, it is nonetheless essential to implement effective prevention and protection systems. For this reason, we will now examine 17 case histories that focus concretely on many of the risks we have just described.

**What have 17
case histories
taught us?**

3





3 What have 17 case histories taught us?



I*N PRACTICE*, when outbreaks, disasters or environmental emergencies arise, various interveners set in motion a series of measures; and their combined efforts usually provide an adequate response to public health and safety concerns.

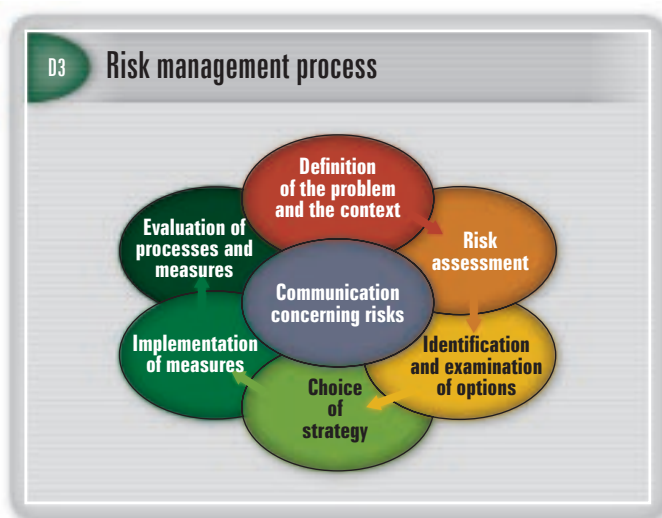
However, one question constantly resurfaces: is our collective management of emergencies, epidemics and risks adequate and is it possible to improve it? To shed light on the question, we have decided to examine more closely a number of case histories that reflect specific conditions in Montréal, from a health protection standpoint. We have chosen 17 events of all types that have occurred within the past seven years and that involved, in one way or another, health protection in Montréal.

These case histories reflect the variety of situations that we face regularly. They are certainly not exhaustive although they do fully illustrate the responses to the situations. They are presented in chronological order to illustrate, beyond their specific nature, what we learn collectively from one event to the next and what we could also learn by improving our procedures.

In each case, we used the risk-management model proposed by the INSPQ and asked ourselves a series of questions. How did the events occur? Were we thoroughly familiar with the problem in question? Were we sufficiently prepared to deal with it? Did we adopt the right strategy? How was collaboration forged between the partners? Was the response properly coordinated? Did we adequately communicate health risks to victims, partners and the general public? Did we take the time to evaluate our response so that collectively we could improve risk management in our region?

In practical terms, we attempted to assess the risk management process from the standpoint of prevention, preparation, detection, coordination, communication and feedback. For each factor, we indicated our assessment of the need for improvement using of a three-tiered scale.

- Red: improvement necessary
- Yellow: improvement desirable
- Green: improvement still possible



Case 1 Free vaccination to halt hepatitis A

In November 1994, the DSP receives four times more reports of hepatitis A cases than the preceding month, most affecting men between 20 and 39 years of age. The epidemiological investigation reveals that the principal risk factor is sexual relations between men. A new vaccine is available and the DSP envisages a comprehensive free vaccination campaign in the gay community.

The natural history of the disease leads us to expect epidemics that follow variable cycles. In 1991, an initial epidemic affects 500 people and causes one death. In 1994, the DSP contemplates vaccination since a vaccine against hepatitis A has been officially licensed, and traditional approaches such as individual follow-up, awareness campaigns and the administration of immunoglobulin had not had any discernible effect on the course of the 1991 epidemic.

Montréal's gay community numbers roughly 40 000 and there is a genuine risk of hepatitis A spreading outside the community and to other DSP territories since the disease is transmitted by the faecal-oral route and through contaminated food. Hepatitis usually leaves no after-effects although it can be debilitating and last for several weeks. On average, 25% of affected adults are hospitalized and 1 victim in 1 000 dies, especially among individuals suffering from chronic hepatic diseases.

In 1994, Québec did not have a free vaccination program, but the vaccine's effectiveness had been proven in institutions and small communities and it was thought likely to curb or halt the epidemic. Risk management demands extreme vigilance and it is suggested that the cases be investigated quickly to offer post-exposure prophylaxis to close contacts, vaccinate

homosexuals and bisexuals likely to contract hepatitis A, and disseminate promotional messages.

The time it took to convince decision-makers to provide funding meant that it is only in August 1996 that the DSP launches a major free vaccination campaign, in agreement with community leaders, clinics and specialized newspapers. The Gay Pride Festival in August is deemed the ideal time at which to launch the campaign. The DSP has a clinic and information stands on the festival site and takes advantage of the opportunity to also administer the hepatitis B vaccine. The communications strategy targets the entire community: postcards in specialized newspapers on the eve of Gay Pride Week, a leaflet and posters distributed in bars and saunas, and promotional material distributed by community organizations to their members.

During the first phase of the campaign (summer and winter of 1996), negotiations with the MSSS result in the DSP obtaining between 10 000 and 15 000 doses of vaccine. Vaccination is offered with



30 % of Québec children die before the age of 5 years

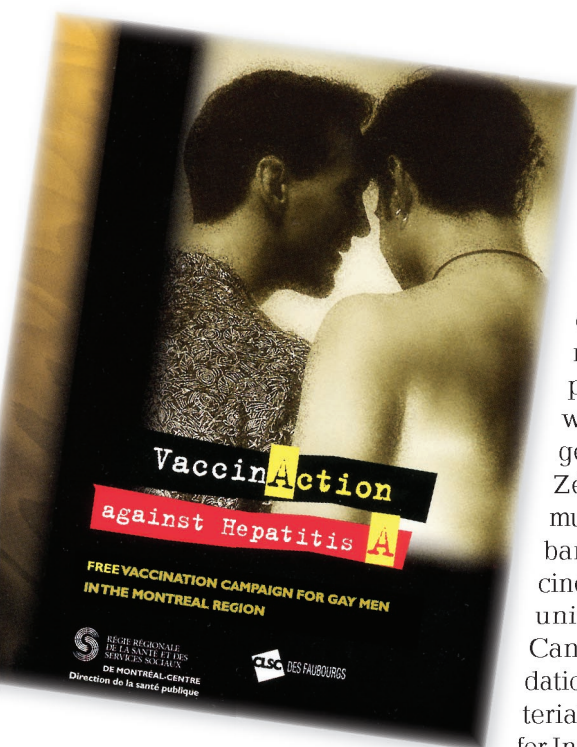
1851

Union government wants to cut funding for hospitals that do not vaccinate

1853

1852

July 8: fire devastates the Saint-Louis, Saint-Jacques and Sainte-Marie districts and part of the eastern district



the assistance of partners such as specialized clinics and the CLSC des Faubourgs, and the campaign reaches nearly 10 000 people. In collaboration with community agencies such as Séro-Zéro and Aids Community Care Montréal, bars, restaurants and cinemas in the village, universities and the Canadian Liver Foundation, promotional material and information for Info-Santé CLSC and

reviewed and advertising in the gay media is stepped up in collaboration with the MSSS, community agencies and vaccinators.

All told, the three phases of the vaccination campaign spread over five years made it possible to vaccinate approximately 49% of gay men likely to contract hepatitis A. Moreover, the incidence of viral hepatitis A and B has fallen markedly in the community and this observation continues to hold in 2003.

physicians is disseminated, and a press conference is held. During the second phase of the campaign in the fall of 1996, vaccination clinics are reactivated at Halloween and an intensified awareness campaign is conducted in collaboration with the CLSC des Faubourgs.

In 2001, five years later, we note a drop in vigilance. Interest in vaccination wanes and the proportion of individuals vaccinated falls, as revealed during meetings with community representatives. Phase 3 is launched during the winter of 2002. Promotional material is

What did we learn?



The outbreak was contained fairly rapidly despite the delay in convincing decision-makers of the urgency of releasing the funds required for the free vaccination campaign. The local campaign centred on the availability of an effective vaccine and fruitful collaboration with the communities affected was successful. However, the need for a second dose to obtain complete protection against the virus was not fully understood, especially since the dose was not free of charge. The DSP broadened its knowledge on how to control the sources of hepatitis A, although under-reporting persists and vigilance tends to wane once the outbreak has passed.

Case 2 Ammonia leak: the coroner asks whose fault it is

On March 21, 1997 one worker was killed and 24 workers were poisoned at the Montpak meat processing plant in the east end of Montréal when an ammonia pipe supplying huge refrigerators burst. Since the pipe was located in a stairwell, workers fleeing from the building were exposed to heavy fumes. This accident, which revealed a flaw in emergency measures, led to a Quebec-wide prevention program.

Ammonia reacts very quickly with water in the mucous membranes and the skin to form a caustic alkali. Depending on the concentration and length of exposure, irritation of the eyes, nose, throat and windpipe are noted and, in more serious cases, acute pulmonary oedema and even death may occur. Effects on the skin range from mild erythema to serious burns.

The first firefighters on the scene rush into the building to save a trapped worker. Since they do not don protective equipment, they are exposed to ammonia and are evacuated by ambulance.

The City of Montréal fire safety service chemical intervention unit measures a concentration of ammonia exceeding 30 ppm and firefighters don maximum protective equipment while ambulance attendants provide first aid outside the building.

Given ammonia's dreaded effects, the Direction de santé publique disseminates information for the public through the media, and on site among ambulance attendants, firefighters and the police. Journalists are

interested in the immediate effects and anticipate after-effects while ambulance attendants and firefighters fear delayed effects and seek information on current norms.

The accident is a veritable tragedy for the workers, and the CLSC has to offer them psychosocial support. Most of the workers are of Portuguese origin and are very close to their deceased colleague and injured coworkers. Moreover, the workers who attempted by every possible means to remove the bars from the window to free their colleague witness his death.

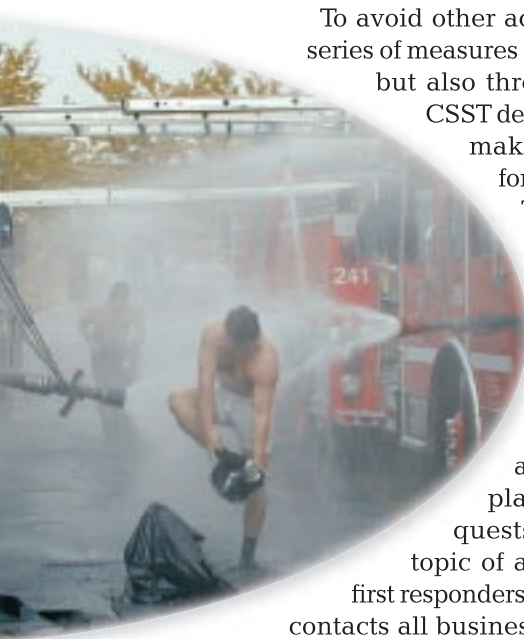
The coroner's report notes six causes of the accident: prohibited storage on the landing where the container is located; an unshielded, badly rusted ammonia pipe; the absence of evacuation procedures; bars blocking the windows; the absence of an alarm system; and poorly marked exits. He also criticizes organizations that have a prevention mandate. The CSST lacked vigilance with regard to the absence of an evacuation plan and an emergency lighting system. Moreover, the Régie du bâtiment relied on inspections conducted by insurers, not to mention that intervention by the agencies that regulate the refrigeration industry is not always clear and is often lacking.



▼ 1862

Montréal hires three physician vaccinators

▲ 1865

Montréal establishes
a permanent health office

To avoid other accidents of this type, a series of measures are adopted at the plant but also throughout Québec. The CSST demands that the company make several changes before it resumes operations. The Régie du bâtiment demands numerous remedial measures and a committee of experts studies the management of refrigeration equipment and establishes an inter-agency response plan. The committee requests that training on the topic of ammonia be offered to first responders and workers. The CSST contacts all businesses that use ammonia and develop FRIGO, an on-site training program on the preventive management of ammonia. Based on the Montpak plant case, the City of Montréal fire safety service produces a training video for interveners handling hazardous materials that is sent to all fire departments in the province.

What did we learn?

Prevention
preparationDetection
and alert

Strategy

Coordination
Communication

Feedback

Ignorance of risks related to ammonia and the absence of an appropriate emergency measures plan meant that responders' initial intervention was disorganized. Simple preventive measures would have made it possible to avoid this fatal accident, but in order for the measures to be applied, organizations and their employees must be accountable. Officials responsible for emergency measures and the development of such measures and, consequently, prevention, must be identified and their mandates clearly defined. Feedback concerning the event and the coroner's inquest and report made it possible to adopt risk control measures to be applied by all establishments that use ammonia.

Case 3 Air quality in arenas: a two-stage strategy

Hockey players are poisoned twice in 1994 by gas emitted by ice resurfacers. Two awareness campaigns are conducted among arena officials throughout the Island of Montréal, in collaboration with the agencies concerned. Given the measures' failure, the DSP resorts to a risk communication strategy targeting organisations at fault. This was to be conclusive.

On October 20, 1994 two days after a game, a hockey player notifies the DSP that 9 of his 11 team mates display respiratory symptoms i.e. coughing, breathlessness, blood-stained sputum, and so on. The public health professional on duty detects exposure to nitrogen oxides emitted by an ice surfacer and two responses are immediately organized: an epidemiological investigation of all of the players who were in the arena on October 18 and referral, if need be, to the appropriate medical services; and an evaluation of the contamination to identify and remedy the problem.

When they arrive on site, experts from the DSP note that the most recent preventive maintenance of the ice resurfacer had been performed six months earlier and that the carbon monoxide (CO) and nitrogen oxides (NO_x) measuring program had been interrupted following a change of management. They measure a concentration of 6 to 7 ppm of NO_x, while the limit is 0.5 ppm, but observe a low level of CO. Two measures bring the situation back to normal: use of the defective ice resurfacer is halted and restoration of the ventilation. Moreover, a specialized mechanic is asked to perform emergency maintenance on the ice resurfacer. The epidemiological investigation targets 125 players who may have been exposed, nearly half of whom display symptoms; 11 are referred to a pneumologist.

The second incident occurs two months later, in December 1994, in another arena. The Centre Anti-poison du Québec informs the DSP that three players display symptoms. In the wake of the two incidents, all arena officials on the Island of Montréal are sent a letter informing them of the situation and a manuel on air quality.

The situation calls for a broader intervention. In 1995, the Association des arénas du Québec, the Conférence des régies régionales de la santé et des services sociaux du Québec and the Régie de la sécurité dans les sports du Québec launch a strategy to promote air quality, aimed at arena officials. At the same time, a survey is undertaken to assess their knowledge of the problem and control measures. Big surprise: officials are unaware of the manuel on air quality in arenas; only one-quarter of officials implement control measures; half fail to see the point of doing so; and a high percentage of them are unaware of the symptoms of poisoning by contaminants emitted by ice resurfacers. For this reason, in January 1996, a vast



awareness campaign is launched among officials throughout Québec and the general public, which is to be repeated in 1997.

To ascertain the impact of these campaigns and exposure among workers and the public (players, referees and spectators), an air quality measurement project is carried out in the fall and winter of 1996-1997 in arenas on the Island of Montréal in collaboration with CLSC occupational health teams. Results indicate that the problem is far from being solved: the concentration of CO exceeds 20 ppm in nearly 40% of the arenas, and that of NO₂ exceeds the limit in nearly half of them. Indeed, problems are found in over 70% of the arenas.

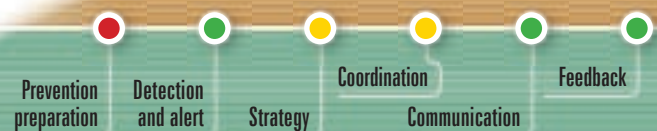
All efforts failed. The DSP informs its partners (CLSCs, Association des arénas du Québec, Régie de la sécurité dans les sports du Québec) and arena owners (mayors, directors general and officials) that it is going public with the findings but will not identify specific arenas. The media hype exerts strong pressure that forces municipal officials to take the necessary remedial measures. The DSP commits itself to reassessing the situation the following season.

The 1998-1999 study, which focused on all known municipal, school, community and private arenas on the Island of Montréal, reveals a clear improvement: 71% of the arenas comply with the criteria stipulated. The findings

are eagerly awaited and the DSP decides to publish them in a press release, this time specifying names. This action is in accordance with the Director of Public Health's duty to inform. The message underlines the overall improvement and the control measures to be taken in arenas, and confirms that sampling will continue for one year.

Improvement is gradual. During the winter of 2000, 80% of arenas comply with the criteria, compared with 82% in 2001 and 86% in 2003. This year, three of the eight arenas with problems informed the DSP of the remedial measures they intend to adopt before next season. To protect arena users, workers and the public, the DSP has set up a monitoring and follow-up program to assess the situation.

What did we learn?



In light of the difficulty of controlling the situation at the source, various partners opted for a promotional strategy. However, genuine improvements stemmed from disclosure of the findings to the media, the disclosure of the names of problematic arenas, and the monitoring program. The Director of Public Health's use of his legal mandate to inform the public led to the implementation of an effective control strategy.

Case 4 Ice storm crisis overcome despite lack of preparation

Between January 5 and 10, 1998 an ice storm strikes the northeastern portion of North America. Some 10.6 cm of freezing rain falls and destroys power transmission lines, demolishes buildings, causes flooding and wrecks thousands of trees. An array of public health problems arise in the wake of this freak storm. The Nicolet Commission concludes that a genuine emergency preparedness culture must be developed in Québec.

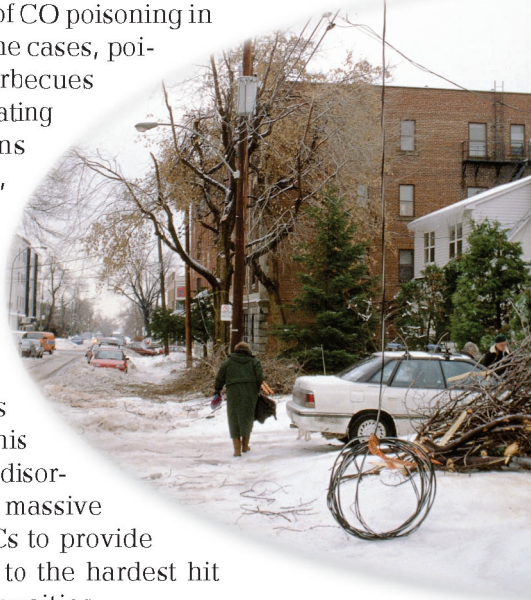
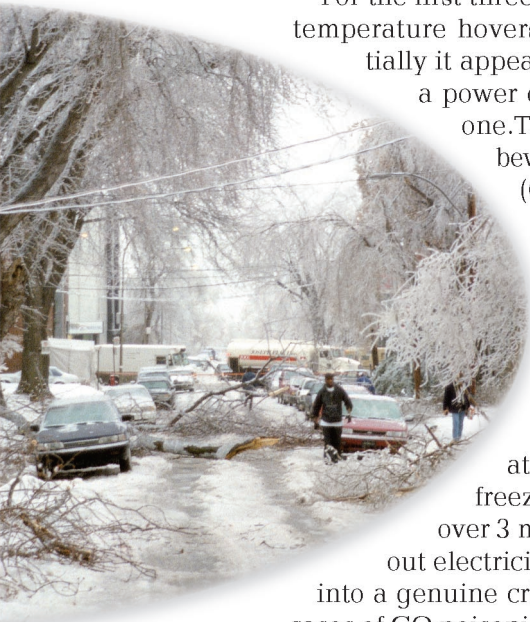
For the first three days of the storm the temperature hovers around 0°C and initially it appears that the problem is a power outage, albeit a major one. The public is warned to beware of carbon monoxide (CO) poisoning: when equipment that burns propane or hydrocarbons is used, CO is released when ventilation and maintenance are inadequate.

Day 4: the temperature drops and heavy freezing rain falls. By now, over 3 million people are without electricity. The blackout turns into a genuine crisis, with hundreds of cases of CO poisoning, hypothermia, falls on the ice, and food poisoning. In addition, there are water shortages, gasoline rationing, thousands of evacuees, and hundreds of patients to be moved.

The situation worsens: at 12:38 p.m. on January 9, the Atwater and Charles-J.-des-Baillets water filtration plants, which serve 1.5 million city residents, are without power for two hours. Only the Québec Premier, the Mayor of Montréal and senior executives at Hydro-Québec are notified. The

mayors of cities that obtain drinking from Montréal, the Director of Public Health and city residents are only informed at the end of the day. It is not until around 8 p.m. that the Director of Public Health advises hospitals that they must use their reserves of bottled water, and at 9 p.m. that a warning is broadcast for city residents to boil their drinking water. Fortunately, city water is not contaminated and no major fire occurs.

The ice storm causes 30 deaths in Québec. There are 177 victims of CO poisoning in Montréal. In 90% of the cases, poisoning stems from barbecues and other makeshift heating equipment that burns kerosene, propane, briquettes or wood and are installed in the home. Once the storm was over, the removal of ice from roofs alone causes four deaths and numerous fractures in Québec. This rare situation of social disorganization requires a massive intervention by CLSCs to provide psychosocial support to the hardest hit individuals and communities.

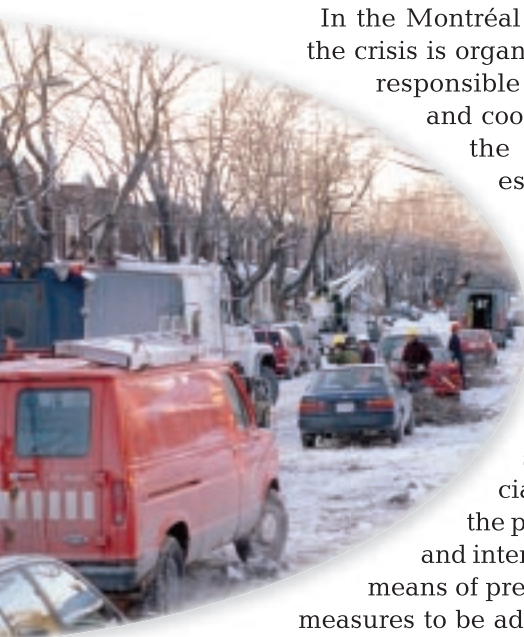


1883

Annexations begin
Montréal absorbs Hochelaga

1885

Smallpox epidemic
3 164 deaths



In the Montréal area, management of the crisis is organized with all agencies responsible for health and safety, and coordination centres rally the partners, including establishments in the health care network, the Montréal Urban Community, the City of Montréal and the regional emergency preparedness unit.

Throughout the crisis, public health officials are asked to inform the public, decision-makers and interveners about risks, the means of preventing them, and the measures to be adopted. The fire department's information campaign on CO poisoning carried out the previous year proves to be highly useful as staff are aware of the risks and the appropriate measures. The crisis receives extensive media coverage and as a result public messages are widely broadcast. An appeal is launched to encourage people to visit relatives, friends and acquaintances, as many victims had neither radio nor television.

In the wake of the crisis, the government set up the Nicolet Commission so that the province would be better prepared to deal with

such events. Its mandate calls for: analysis of the ice storm, a study of the security of energy supplies, and an assessment of the organization, state of preparation and measures carried out. In addition to recommending a sweeping review at all levels of crisis management, the Commission advocates heightening public awareness of the measures to be taken to ensure one's autonomy in an emergency.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

In Montréal, despite crushing demand, organizations that were poorly prepared and compelled to improvise generally maintained access to quality services. Health care establishments and most of their employees were victims of the ice storm but responded to a considerable increase in demand. Nonetheless the crisis revealed that the role played by public health branches in protecting health goes beyond the control of infectious diseases and chemical threats to the environment. The partners and core interveners knew little about regional emergency measures plans. The health care establishments' plans were often outmoded and poorly aligned with municipal plans, which in turn were inadequate. Feedback highlighted the very weak emergency preparedness culture among Quebecers.

Case 5 Fire in a former paint factory: contamination in neighbourhood avoided

The fire in an abandoned paint factory in south central Montréal confirms the relevance of properly organized prevention: despite the presence of lead dust, neither firefighters nor area residents suffer lead poisoning.

In January 1998, the Service de prévention des incendies de Montréal (SPIM) submits to the Direction de santé publique an inspection report concerning a building in the Hochelaga district following a bankruptcy. Since the early 20th century, a paint factory belonging to Carterchem had occupied the site and the building contained an unknown quantity of hazardous materials, including pigment residues with high proportions of lead and containers of hydrochloric and sulphuric acid. The acid containers are eliminated on the recommendation of the DSP which is verified by an on-site visit conducted by DSP professionals and staff from the Montréal fire safety service.

The owner is notified of his obligation to barricade the site and ensure permanent surveillance to prevent homeless people from entering the building. Moreover, he is informed that, to reuse the plant, he must comply with occupational health and environmental standards, depending on the anticipated use. In

the event of a fire, the DSP recommends that firefighters wear respiratory protection, then decontaminate their clothing by means of the usual dousing technique, and collect the decontamination water.

A year and a half later, in July 1999, a fire breaks out at 5 a.m. and 300 people are evacuated from the quadrangle exposed to smoke. Toxicological information available to the firefighters indicates the considerable dangerousness of lead without specifying what action is required or the conditions under which poisoning occurs. The first responders are therefore concerned, although the effects of lead poisoning occur only after chronic exposure to large quantities over several weeks. It is the accumulation of lead in the body that poses a threat by lodging itself in the blood, kidneys and nervous system. In the case of exposure for several hours, risks are very limited and would have to exceed by far the levels of lead present on the morning of the fire.

Public health officials thus had to reassure the firefighters, who were the first responders, while taking extraordinary measures to decontaminate the neighbourhood to avoid chronic exposure among children, who are more vulnerable. A notice to this effect is distributed in the neighbourhood.

At the congress of the Association des chefs des services d'incendie du Québec in 2000, the head of the Division santé et



▼ 1892

First electric tramway in Montréal

The City of Montréal hires
its first sanitary engineer

▲ 1895

sécurité, stratégies, tactiques et contrôle of the SPIM presents the intervention as a success, explaining that knowing the risk involved, it was able to transmit instructions on safe intervention to the units while they travelled to the site, and that no one was injured.

However, in the neighbourhood, soot samples taken after the fire confirms that contamination exceeded the threshold recommended for children. Flushing is entirely warranted in the neighbourhood. It is carried out first by the public works department and then by individual residents, who must wash their balconies and entrances. To contain the contamination, runoff water is collected and then channelled to wastewater drains, then controlled when it reaches the Montréal water purification plant.

What did we learn?

Prevention
preparationDetection
and alert

Strategy

Coordination
Communication

Feedback

The sound level of preparation among the partners made it possible to accelerate decision-making when the event occurred. Such preparation reduced the need to improvise during the intervention and risk communication activities. However, planning efforts did not make it possible to control the problem at the source. Since it is impossible to entirely eliminate threats posed by chemicals on the Island of Montréal, the identification, analysis and evaluation of risks is the basis for emergency measures plans.

Case 6 Distribution of syringes: public backlash

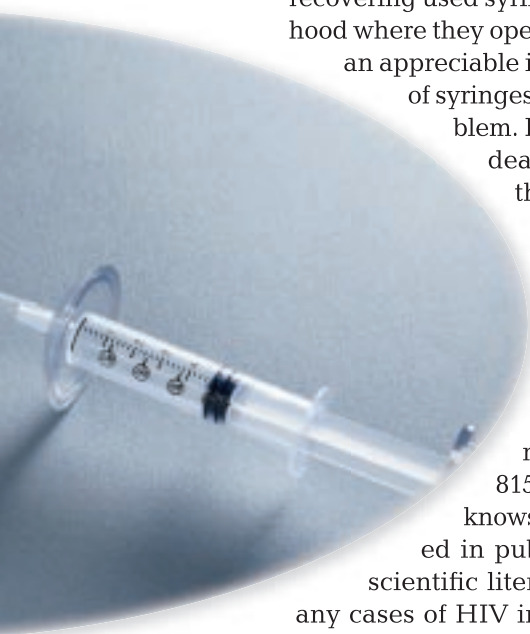
HIV and hepatitis C threaten injection drug users through the repeated use of syringes. To prevent transmission, the distribution of sterile syringes has proven to be effective. Ten years later, a public backlash occurs. City residents are concerned about syringes littering parks, alleyways and the entrances to buildings and call these services into question.

Since the late 1980s, two community organisations, Spectre de rue and Cactus, have been distributing sterile syringes and recovering used syringes. In the neighbourhood where they operate, residents observe an appreciable increase in the number of syringes and denounce the problem. Looking for solutions to deal with the complaints, the community groups turn to the DSP. The 13 distribution services participating in monitoring take stock of the syringes distributed and recovered, i.e. 630 000 syringes recovered of the 815 000 distributed. No one knows how many are discarded in public places. While the scientific literature does not report any cases of HIV infection through dirty syringes, theoretically there is a potential risk. Despite the public's negative perception, the Direction de santé publique and municipal authorities do not call into question the strategy of distributing syringes among injection drug users, as is the case in other big cities. However, other agencies are concerned by the problem since an even bigger volume of syringes used for therapeutic purposes in the home or the

workplace are found in the environment or in household refuse, in the absence of management and systematic recovery.

In the spring of 2000, a committee assembles to draw up a work plan. The committee starts by taking stock of the situation with recovery and collection partners, then works to develop solutions to be implemented in the districts concerned. A recovery and collection guide is prepared in collaboration with the city, the CLSCs and community agencies, especially prevention programs. Two sources are identified to offer residents assistance and information: the CLSC and the borough public works department. Residents are informed how to pick up a syringe safely, the public works department assumes responsibility for picking up syringes in public places and, if need be, residents are referred to other specialized services.

As for an information program, the committee identifies target populations, such as preschoolers and school children, and awareness and training resources focusing on the risks posed by discarded syringes. Over



▲ 1901

▼ 1903

Shawinigan Water & Power installs the world's biggest generator (5 000 watts)
Montréal is the site of the longest (136 km) and most powerful (50 kv)
transmission line

▲ 1905



the past two years, several districts and milieus have been targeted and the MSSS has joined the program.

As for drug users, officials assess the geographic accessibility of distribution and recovery services on the Island of Montréal and then promotes the use of recovery bins that the centres distribute. Officials also examine obstacles to preventive behaviours among IDUs, in particular the presence and behaviour of police forces. To avoid incidents among workers at risk, information is disseminated to employers and employees to familiarize them with preventive measures.

After three years, officials succeed in containing most of what the public perceived to be the undesirable consequences of a prevention program adapted to one segment of the population. In practical terms, through widespread collaboration, the number of discarded syringes is substantially reduced where collection bins are installed, although it was initially difficult to establish who was responsible for recovery in public places.

Given this outcome, the committee hopes to extend this approach throughout the Island of Montréal.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

The DSP initially underestimated the syringe distribution program's impact on the environment in certain central neighbourhoods and on public perception, to the extent that the program was called into question despite its recognized medical relevance. It was possible to quickly mobilize an array of partners to find solutions. These efforts must be pursued, especially as regards risk communication since, despite everything, a climate of anxiety persists in relation to these programs and the public deems the impact to be unacceptable. We must also envisage broadening the measure to include syringes for therapeutic use outside health care establishments, such as in the home.

1906

Medical inspection of schools begins,
a first in Canada

Industrial production of automobiles begins
(Model T Ford)

1908

First public bath opens year round

Case 7 Asbestos in school: taking precautions

On July 31, 1998, while the debate on the use of asbestos rages in Québec and abroad, the ministère de l'Éducation asks the DSP to ascertain the presence of sprayed asbestos insulation in the 536 elementary and secondary schools. Verification reveals that the ceilings and walls of many schools urgently need repairs. Surrounded by controversy, a 6-month operation is launched with a plan to provide follow-up, coordination and monitoring of all school buildings.

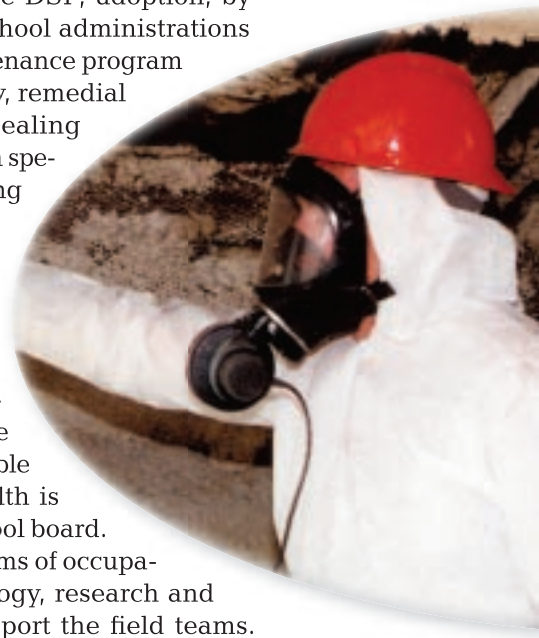
The process begins in 1997 when deteriorated sprayed asbestos insulation is found in several Québec schools. The MSSS requests an evaluation of public buildings, starting with schools. Between 1950 and 1980, sprayed asbestos was used as insulation, for fireproofing and as an acoustic insulant. However, during the 1970s, use of asbestos was halted and, in 1990, Québec prohibited amosite and crocidolite asbestos. The spraying of asbestos can pose a public health problem when fibres are released into the air, deteriorate or are handled. Moreover, it should be noted that young people could be more sensitive to carcinogens and that the latency period for asbestos-related cancers is especially long. The *Démarche de prévention relative au flochage d'amiante dans les écoles* is launched in February 1998.

The measure, which is supported by employer associations and labour organizations in the school system and the Fédération des comités de parents du Québec, mobilizes numerous interveners: Québec school boards, the Directions régionales de santé publique du Québec, the Commission de la santé et de la sécurité du travail, the CLSCs responsible for occupational health, and the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST). Day-long information sessions are organi-

zed in Québec City and Montréal to ensure uniform implementation and to present the entire operation to regional responders in the health care system.

The process comprises several steps: sampling of coverings containing asbestos or suspected of containing it in the schools targeted by each school board; analysis by the IRSST; reporting of problem schools to the DSP; qualitative assessment of the state of preservation of sprayed asbestos during an on-site visit by the DSP; adoption, by school boards and school administrations of a preventive maintenance program and, where necessary, remedial measures, such as sealing sprayed asbestos with a special covering, removing it or cribbing it.

An intervention team comprising a DSP physician, a hygienist, and an occupational health technician designated by one of the CLSCs responsible for occupational health is assigned to each school board. Specialists in the realms of occupational health, toxicology, research and communications support the field teams.



▼ 1911

Population of Montréal: 528 397
Opening of the first milk stations

▲ 1912

▲ 1914



Throughout the operation, which runs from November 1998 to June 1999, the situation is closely monitored: the teams participate in information meetings organized by the schools and the DSP ensures liaison with the media. In conjunction with the current debate concerning the safe use of asbestos, the DSP relies on openness and the disclosure of all information. Over 9 000 copies of a leaflet for parents are distributed and an audiovisual presentation is produced for school board directors, school administrators and the unions.

Of the 118 schools visited, sprayed asbestos is found in 108 of them, the equivalent of nearly 3 000 rooms, of which 13% contain amosite asbestos and 67% contain chrysotile asbestos. In nearly two-thirds of the schools, remedial measures are deemed to have priority, especially gyms and swimming pools (balls striking walls, dampness) and in rooms with low ceilings or where seepage has deteriorated or damaged coverings. Priority work begins in the summer of 1999 under a five-year action plan.

From a scientific standpoint, at the time the measure was carried out, the risks to most students and teachers are deemed to be limited. However, workers such as electricians, plumbers, pipefitters and insulators are exposed to higher concentrations. This work is therefore subject to the *Safety Code for the construction industry* to avoid releasing fibre dust in the work zone and contaminating the site.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

Faced with a known carcinogenic substance and uncertainty concerning the exposure of children in the schools, ministerial officials launched an operation to ensure the safe management of risk. Given the large number of organisations affected and the sensitive nature of the question, the risk-communication strategy was decisive and ensured the smooth operation of the regional initiative. The operation, which targeted sprayed asbestos, first and foremost, revealed serious salubrity problems in several schools, e.g. mould, leaking roofs, and so on, which raised fears of other health problems. It should be noted that in 2002, despite the opposition of public health officials, the Québec government adopted its policy governing broader, safe use of asbestos.

Case 8 Meningitis vaccination megacampaign

In the spring of 2001 in the Québec City area, a new outbreak of meningococcus infections among children and adolescents causes panic. The crisis does not affect Montréal, but the media mobilize and the public is worried. In the meantime, a new vaccine that is more effective than the previous one becomes available and the DSP decides to launch a meningitis vaccination megacampaign, at the instigation of MSSS officials.

In the early 1990s, Québec had already been struck by a similar meningococcus outbreak, which mainly affected people under 20 years of age. The consequences are serious: a 15% death rate and sequela such as amputations, kidney disease, scars and so on that affect 15% of victims. A sweeping vaccination campaign aimed at young people between 6 months and 20 years of age was thus undertaken in 1993. However, studies revealed that the vaccine used, polysaccharide vaccine, provides protection for only two years and that its true effectiveness varied depending on the age group.

As soon as a case of meningitis is reported, the DSP launches an epidemiological investigation to pinpoint the individuals exposed to the sick person's body secretions in the week preceding the outbreak of the disease. Officials contact the individuals concerned to ascertain their risk of exposure and, if need be, they are given antibiotics as a preventive measure. If the serogroup involved is one of the four for which there is a vaccine (A, C, Y, W-135), vaccination is offered.

In 2001, the DSP decides to opt for mass vaccination for three reasons. The vaccine administered in 1993 no longer provides protection. With the onset of winter, officials fear outbreaks of meningitis since infec-

tions peak during the flu season. The new conjugate vaccine used in England is safe, very effective from the age of 2 months on and has the potential to provide long-term protection. The MSSS works with Health Canada, which approves the vaccine.

The campaign is launched on 10 September and targets all young people between the ages of 2 months and 20 years, i.e. 420 000 young people, 80% of whom are of school age. To maximize access to the vaccine, the campaign takes place in the education system, i.e. elementary and secondary schools, Cegeps, universities and professional schools. Preschool children and individuals not in the school system are sent to the CLSCs or their usual vaccinators in private clinics, which obtain the vaccine from the DSP.

A campaign of this scope requires solid coordination and a committee is established comprising the DSP, the CLSCs, the school boards, associations of private schools, Cegeps, youth centres and the regional health and social services board. A preparatory meeting assembles all of CLSCs to inform them of the situation and of the organization of the campaign, and to answer their questions. CLSC nurses administer the vaccine and the education system provides student lists, space and infrastructure.

1922

CKAC, North America's first French-language radio station, goes on the air

1924



The information program on risks is carried out at all levels. Physicians and vaccinators are regularly sent letters and newsletters, the Info-méningo telephone service answers the CLSCs' questions, and the MSSS distributes leaflets intended for the public. The DSP uses its Web site to provide daily updates on vaccination coverage, and organizes press conferences, press releases and interviews, as needed.

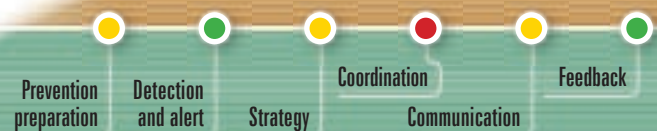
This sweeping campaign mobilized extensive human and material resources in front-line health services, already in short supply, and promotion and prevention activities suffered because of it. However, these efforts produced results: the

campaign reached 87% of the target population, i.e. over 365 500 people. The vaccination of preschool and school-age groups was a success, as the CLSCs are accustomed to mass campaigns. However, coverage varied, according to data from the CLSCs and the INSPQ: 80% of preschool children, 93% of elementary

school children, 91% of secondary school children, 63% of Cegep students, and 18% of university students. In addition to the two latter groups, it was hard to reach young adults not attending school and, in the case of preschool children, services were unable to meet demand.

Normally, nearly 70% of vaccination is performed in private clinics, but in such a short lapse of time this network was unable to accommodate additional children. Another problem was management of a new individual consent form needed to establish a vaccination registry. The new form irritated physicians, who were already overwhelmed by the campaign's rapid pace.

What did we learn?



Given past experience of vaccination in the schools, the regional health care network was thoroughly familiar with its roles, which facilitated coordination. However, the usual vaccination method could not satisfy demand because of a chronic lack of access to the network of physicians in private practice and the pressures already exerted on CLSCs. The technical infrastructure required to quickly computerize 420 000 vaccination consent forms and vaccination data was not completely in place. While the information strategy adopted was adequate, it did not succeed in allaying the public's anxiety sustained by certain media, and it was nonetheless very difficult to reach certain target groups.

Case 9 Factories, a breeding ground for tuberculosis

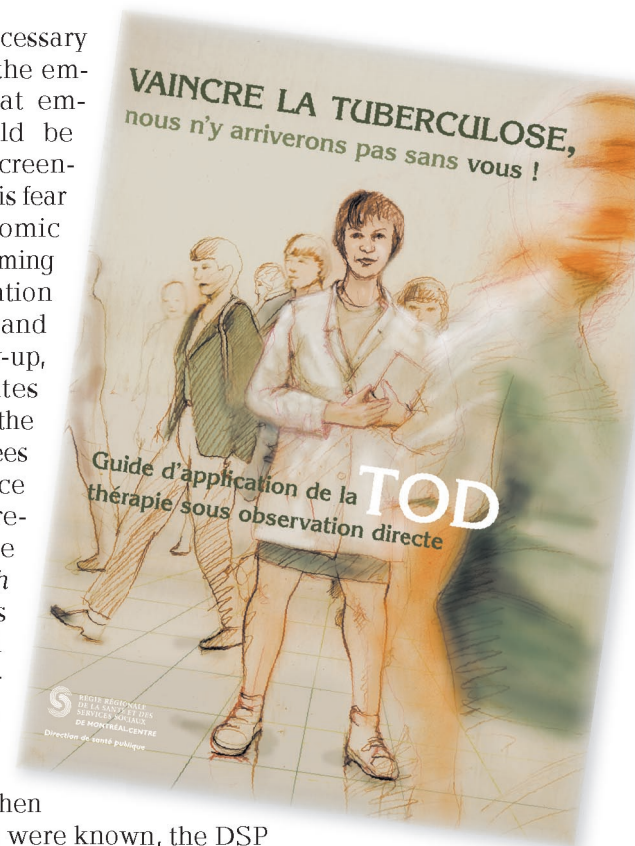
In December 2002, a case of contagious pulmonary tuberculosis in a textile worker is reported to the DSP. An epidemiological investigation is launched immediately. Given the disease's contagiousity, crowding in the plant and the fact that the workers come from countries where tuberculosis is endemic, a comprehensive on-site screening operation is conducted.

Since tuberculosis is a reportable disease, each of the roughly 200 cases reported each year is subject to an epidemiological investigation to ensure that treatment is carried out and to identify contacts, who are informed of the situation and undergo a tuberculin skin test and preventive treatment, if need be.

In this case, the risk of contagion is high since the plant employs over 2 500 workers, mostly immigrants from countries where tuberculosis is endemic, and working conditions such as crowding and inadequate ventilation appreciably increase risk. Numerous secondary cases are expected. Contrary to the usual procedure, DSP infectious disease and occupational health professionals intervene directly on site, aided by a local CLSC and specialized treatment centres. All organizations participate in the management of the crisis but, while they agree on the strategy adopted, they fail to reach a consensus on their respective roles. Who was responsible for screening, the local CLSC or the CLSC in charge of occupational health in the sector (five CLSCs share responsibility for occupational health on Montréal Island)? How was responsibility for the implementation of the operation to be apportioned between the CLSC and the DSP?

It is also necessary to deal with the employer so that employees could be released for screening. Despite his fear about economic shortfalls stemming from the duration of screening and medical follow-up, he collaborates and provides, the list of employees and their place of work, as required by the *Public Health Act*. Nurses from the local CLSC conducted screening, supported by the DSP. On the last day, when the outcomes were known, the DSP team goes to the plant to allay the workers' and employer's concerns.

During this four-day process, the DSP conducts screening in concentric circles, in keeping with the criteria adopted by the World Health Organization: the 264 workers deemed at highest risk because of their



proximity to the person affected are tested, including 45 who had left the company. The numerous positive cases (67%) are referred to four adult tuberculosis centres or their CLSC. The information transmitted to the DSP following medical evaluation is exemplary, although some patients waited nearly three months for an appointment because of limited access to clinics. Moreover, it was impossible to reach agreement with the employer to release the workers who had to go to follow-up appointments. The four cases diagnosed are treated.

Even today, the DSP is receiving new case reports and, each time, the investigation, treatment and follow-up process is set in motion. This event reveals to what extent the workplace, especially in the manufacturing sector, is a breeding ground for outbreaks. To improve detection of latent tuberculosis and halt the primary spread of the disease, the DSP would like immigration services to improve tuberculosis screening among new immigrants, in collaboration with the MSSS.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

The outbreak was contained through prompt, on-site intervention. However, the joint epidemiological investigation was punctuated by coordination problems that clearly stemmed from a lack of joint preparation by the partners. For this type of follow-up, the application of control measures requires access to front-line medical or nursing services, which is hard to obtain. Moreover, we must broaden the training of clinicians with regard to this disease. As for risk communication, it was, in our opinion, preferable to focus our efforts on the workplace affected.

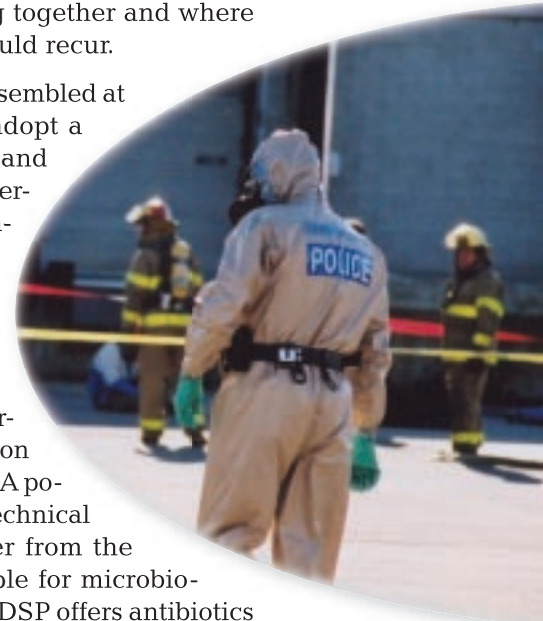
Case 10 Anthrax scare: a terrorist threat

At 10:55 a.m. one day in December 2001, in the mail room of a computer company, an employee opens an envelope, from which a white powder is released. Inside the envelope is a greeting card bearing the message "Our thoughts are with you in this time of sadness. We regret to inform you of the death of your business." The employee drops the letter and asks his colleagues to call 911. Everything transpires very quickly. The CAAM immediately intervenes on site and evacuates the building. No pathogens are found in the powder but the effectiveness of the intervention illustrates the importance of adequate preparation.

Fifteen minutes later, the two police patrol officers and the sergeant called to the scene conclude that they are dealing with an anthrax scare. They leave the room, close the door and wash their hands with soap and water. They then discover that the firm, which operates in a highly competitive sector, also has a New York address. Within minutes, the ventilation and heating system are shut down since 20 companies operate in the building. The Montréal antiterrorist advisory committee (CAAM) is subsequently alerted. A command post is established on site and three buses are requisitioned to evacuate the 100-odd workers. The police isolate and secure the site. Three days later, analysis reveals that the white powder does not contain any pathogenic agent and the six people exposed stop taking the antibiotic prescribed. It is worthwhile to examine how the intervention is coordinated in a

situation where the interveners are not accustomed to working together and where this type of threat could recur.

The interveners assembled at the command post adopt a strategy. The police and firefighters from the Service de sécurité des incendies de Montréal (SSIM) evacuate the building. The DSP asks that the individuals exposed to the powder and those sharing the same ventilation system be assembled. A police officer from the technical unit and a firefighter from the SSIM collect a sample for microbiological analysis. The DSP offers antibiotics to the individuals exposed to protect them from anthrax and other infectious diseases, even if the risk is limited. It also records the names of all evacuees in case a pathogenic agent is found and informs them of the situation. The firefighters decontaminate the site and rooms on the first and second floors are secured.



Penicillin production begins

1941

Inauguration of Dorval Airport

Drought in India kills 1.5 million people

1942

Discovery of streptomycin, the first drug
that is effective against tuberculosis

Loi de l'instruction publique obligatoire in Québec

1943

August 6: the atom bomb is dropped
on Hiroshima, killing 100 000 people

1945

Alas, today, terrorism is a genuine threat. To destabilize a country, terrorist groups could resort to biological agents such as bacteria, viruses or toxins that can cause disease or death. Since the sarin gas attacks in the Tokyo subway and the anthrax scare in the United States, biological, chemical, radiological and nuclear weapons pose a threat that cannot be overlooked. Although the threat is deemed to be limited in Montréal, the consequences could be so catastrophic that it is essential to prepare for it. Only rapid intervention can avert a disaster in the case of a toxic agent. Given the complexity of these situations, it is imperative to ensure the regional coordination of partners.

The CAAM already has a number of achievements to its credit. It has determined the roles, responsibilities and field of action of each intervener, and developed a concerted response to terrorism, whether to a confirmed threat or a hoax.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

The smooth operation of this intervention stems from lengthy, demanding preparation by the organizations concerned. Initiated prior to September 11, 2001, the elaboration of a protocol governing suspicious packages was accelerated and intensified as the threat became more real. In October 2001, in response to a surge of calls concerning suspect packages (up to 80 a day in Montréal), the proposed protocol was put into practice several times, with the result that in December 2001 it was designed, implemented and tested on several occasions in the field.

However, over time, reflexes wane when there is no regular demand made on them. It is a daunting challenge to maintain such a high level of preparation among the partners based on past achievements, and to develop other collaborations. The organizations concerned must allocate substantial resources to attain this goal.

Case 11 **Deadly heatwaves: support individuals most at risk**

In 1994, following the death by heatstroke of a worker in the Chaudière-Appalaches region, a coroner recommends that Environment Canada elaborate a heatwave warning program for Quebec. In 2001, given the frequency of heatwaves in Montréal and in Toronto, the media demand government action. The DSP launches a more vigorous program, "Hot days are a health risk," to prevent morbidity and mortality and also to heighten public awareness.

The heatwaves that are striking big cities in the temperate climate zones are deemed to be a cause of morbidity and mortality and Montréal is no exception. Heat not only has direct effects such as exhaustion and heatstroke but also more frequent indirect effects that affect individuals suffering from chronic diseases, which may prove fatal. Starting in 1995, the DSP issued public advisories designed to help Montrealers protect themselves from heatwaves. The midsummer heatwave in France that caused thousands of deaths reminds us of how far-reaching this problem can be.

The problem is indeed widespread. In the United States, the Centers for Disease Control and Prevention estimate that heatwaves cause, on average, 300 deaths per year. Since Quebec data are limited, studies must be undertaken. The key risk factors are urban living, especially in city centres, the condition of housing, age, chronic diseases, low socioeconomic status and social isolation.

In 2001, the DSP sets up a new program enabling it to carry its research further and broaden its knowledge base. The Occupational and Environmental Health Unit first updated the scientific documentation on the impact on public health, proposed a series of measures, and widely disseminated the

subsequent document among the partners. The DSP then collaborated with Environment Canada to gain access to its warning system centred on air temperature and the Humidex. The advisory is sent 24 hours in advance to the media and to Info-Santé, and informs the public that the temperature will exceed 30°C and the Humidex 40°C during the next 48 hours. Moreover, a preventive information campaign targets the most vulnerable groups: a leaflet distributed to over 2 500 establishments such as hospitals, CLSCs, clinics, municipalities and pharmacies explains how heat affects health and offers advice.

A series of epidemiological studies were also undertaken to document the impact of heatwaves on health. The first study is conducted in collaboration with the Toronto Public Health Department and Environment Canada, and will continue until 2004. It measures mortality attributable to the heatwaves that occurred in 1999 and 2000 in relation to meteorological parameters, pollen and smog. A second study seeks to refine the diagnosis by characterizing the most exposed sectors of the city. A survey on the percentage of air-conditioned dwellings will be highly useful since the most recent Statistics Canada data (1995), indicate that 20% of dwellings are air-conditioned in Montréal,

▼ 1951

Infant mortality:
41 per 1 000

▼ 1952

Television broadcasting begins
in Montréal and in Canada

End of the Korean War

Discovery of the structure of DNA

▲ 1953

Salk discovers polio vaccine

▲ 1954

▼ 1955

Life expectancy at birth:
71.2 years (women), 65 years (men)



compared with 60% in Toronto. To improve its programmes, the DSP is striving to better describe the effects of heatwaves, especially whether there is good reason to establish an alert threshold, and to ascertain the level of penetration of public messages disseminated by Info-Chaleur and Info-Smog.

In years to come, efforts will focus on two priorities: how to better advise the most vulnerable individuals to help them adopt preventive behaviours and how to implement protection measures in collaboration with the partners. For example, to target more vulnerable individuals, the CLSCs are in a position to act through their home-care services and their knowledge of the territory. Other

possible partners include the boroughs, emergency preparedness organizations, non-governmental agencies and chronic-care establishments.

In 2004, even before the research is completed, the Director of Public Health will ask the partners to participate in a mobilization

plan to determine as quickly as possible whether Montrealers' health is threatened because of a heatwave and to put forward an intervention program for individuals at risk.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

Faced with this anticipated threat, in 1995 the DSP implemented a number of initiatives to inform the city's most vulnerable residents how to protect themselves during heatwaves. Intuitively, in a northern city like Montréal, this problem did not seem to be a priority. However, global warming forecasts and the crisis in France last summer compel us to better assess this problem and the inherent risk factors so we can act more effectively. For want of more precise knowledge of health risks, the strategy is based on an advisory and alert program and an awareness campaign. The research program now underway to document the question from a scientific standpoint will make it possible to orient medium-term measures. However, initiatives must not be paralyzed and precautionary measures must be determined to protect the health of the most vulnerable groups.

Case 12 Return of syphilis: a disease that thrives on risky behaviour

The recent history of syphilis in Montréal is like a bad movie. After plummeting for several years (only 1 case in 1998), officials begin the new millennium confidently. The battle appears to have been won. Alas, there are 15 cases in 2001 and 35 in 2002. The upturn seems inexorable: 51 cases in the first half of 2003 and it is estimated that the 100-case mark could be crossed before the end of the year. Syphilis is creeping into the gay community because of a relaxation in safe sexual practices.

Syphilis has found new hosts: nearly all of the cases reported in 2003 are homosexual men and HIV offers the disease a fellow traveller. Significantly, 51% of the cases in 2002, whose average age was 38, were also carriers.

How can we not be pessimistic about controlling this epidemic? The epidemiological investigation reveals that, during the incubation phase, roughly 70% of the individuals had sexual relations in saunas and 36% with a partner living outside Montréal. Moreover, shortcomings are observed in the sustained application of control measures. The investigation also reveals an increase in risky sexual practices. Such laxness stems from the advent of treatments such as triple therapy (people are no longer afraid of AIDS) and an ignorance of the seriousness of syphilis and other sexually transmitted infections. The situation is all the more alarming since 24% of homosexual men who know that they are HIV carriers report having unprotected sex with a seronegative partner or a partner whose serologic status is unknown.

Moreover, syphilis is capricious: asymptomatic contagiousness can last for years. It is imperative to act since both the first stage (the chancre) and the second stage often

go unnoticed: 30% of untreated individuals in the second stage develop latent syphilis that leads to cardiovascular, neurological, ophthalmological or gummatous lesions. The epidemic could spread to women through bisexuals and spawn a wave of congenital syphilis.

Prevention and screening are the two principal means of combating the disease. In New York City, the alarm sounded late and the incidence of syphilis increased 400%. Despite an intervention plan, the increase remained steady at 100% between 2000 and 2001, and 150% in 2002. Other big cities have also reported outbreaks. The DSP's intervention plan is based on this perceived emergency.

In September 2003 in Montréal, with 118 cases reported since January 2000 compared to 29 in the province, it is not unreasonable to dwell on the city's specific situation. The DSP relies on the reporting of all cases by physicians and of all positive tests by confirming laboratories. In 2001 it established a five-tiered intervention plan.

First, the plan sought to strengthen detection and analyse the social networks concerned. Next, it endeavoured to more promptly confirm the case and stage of

Yuri Gagarin carries out
the first manned space flight

1961

Cuban missile crisis

1962

Construction of Place Ville-Marie,
the city's first true skyscraper

Electricity is nationalized in Québec

1963

The first FLQ bombs go off
November 29: a DC-8 crashes
in Sainte-Thérèse de Blainville,
killing 118 passengers

Establishment of the ministère de l'Éducation
du Québec

1964

the disease, analyse risk factors and propagation networks, ensure that sufferers faithfully comply with treatment, and offer support to inform the partners and ensure their treatment. Third, the plan encourages vigilance in the medical community through training sessions and by monitoring access to medication and to new tests. The fourth segment of the plan is aimed at organizations, leaders and interveners in the gay community such as staff in saunas and bars, travel agencies and event organizers, with particular emphasis on heightening awareness of the upsurge in sexually transmitted infections, the adoption of safe sexual practices, and the promotion of screening of partners and social contacts. The initiatives were launched in the summer of 2001 and the spring 2003 campaign was carried out in collaboration with the gay community under the slogan "When was your last screening test?" Leaflets, mini-posters and a videoclip jointly financed by the Montréal, Ottawa and Toronto public health departments were distributed. The fifth segment of the plan is designed to bolster screening in clinics used by members of the gay and bisexual community, at the CLSC des Faubourgs and in public saunas.

The information campaign was also stepped up, both in specialized clinics and through the AIDS-STI teams in the CLSCs, Info-Santé and the other public health departments

concerned. Specialized newsletters have been sent since August 2002 to GPs, microbiologist-infectious disease specialists and paediatricians. The campaigns have been favourably received by the communities and medical interveners, although their success depends on four factors: systematic reporting of cases by laboratories and physicians; intensification in all cases of the epidemiological investigation; characterization of social networks to better understand the dynamic of transmission; and linkage of screening to that for other diseases such as gonorrhoea and HIV and vaccination against hepatitis A and B among individuals at risk.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

The outbreak was foreseeable in light of the upsurge in risky sexual practices and other sexually transmitted and blood-borne infections. However, it took a long time to mobilize the prevention sector. Delays were noted among attending physicians in reporting and diagnosing the disease, indicating reduced vigilance regarding a fairly rare ailment. Based on past experience, some degree of complicity had already been established with community interveners during the campaign against hepatitis A, which also facilitated risk communication activities. Today, feedback with partners must be bolstered given the steadily rising incidence of the disease.

▼ 1966
Opening of the metro

▼ 1967
April 28: Expo 67 opens
50 million visitors

▲ May 68:
student uprisings

▲ 1968

▲ July 21:
the first moon walk

▲ 1969

Earthquake in
Peru kills
66 000 people

◆ 1970
The October Crisis

Case 13 Break in major water main: health impact warrants monitoring

At 2:30 a.m. on August 12, 2002 a water distribution main on boulevard Pie-IX in Montréal bursts and floods the neighbourhood. The City of Montréal's emergency preparedness plan is set in motion. A heatwave aggravates the situation and 50 000 residents must boil their water until August 21 when the water main will be put back into service.

Around 6 a.m., the coordinator of the Montréal Emergency Preparedness Centre calls the DSP to ascertain the measures to be implemented. Since the pipe is a 2-m in diameter feeder main, it is necessary to modify the water distribution network to continue supplying Rivière-des-Prairies and Montréal-Est. This reduces the water pressure of roughly 28 000 residents and cuts off supplies to 22 000 others. On the same day, because of restricted flow in the distribution network, the city sends a preventive boiling advisory to approximately 50 000 area residents.

The DSP notifies the Régie régionale de la santé et des services sociaux, which ensures water supplies in health care establishments, several of which indeed lack water. An appeal is launched for vigilance: a note describing the situation and the sector affected is sent to Info-Santé, hospital emergency departments and microbiologist-infectious disease specialists. Consequently, physicians and nurses are to report gastroenteritis cases linked to the situation to the DSP, which will conduct an epidemiological investigation.

Throughout the intervention the City of Montréal laboratory takes samples and ensures constant monitoring of the microbiological quality of the water. The city also organizes access to drinking water and sets up distribution points for residents of Rivière-des-Prairies. Once again, officials contact the DSP to determine the minimum daily volumes to be distributed at city service centres.

Given the situation, in addition to dealing with the water shortage it is necessary to manage the consequences of flooding, especially as regards the salubrity of dwellings. From the outset, professionals from the DSP assembled at the crisis management centre draw the attention of interveners to the ease with which mould proliferates in poorly cleaned dwellings. The borough then undertakes a systematic initiative to assess the extent of damage, in collaboration with the DSP, and explains to landlords and tenants how to proceed. Such information is also transmitted to firefighters and to Info-Santé in Saint-Michel and Saint-Léonard.

The DSP advises the technical group established by the city's Emergency Preparedness Centre to target tenants to be relocated until their dwellings are cleaned. Of the 250 homes flooded, 40 are declared uninhabitable and 1 300 families are without electricity or gas. On the night of August 12,



the emergency shelter accommodates 41 people. Furthermore, the CLSC Saint-Michel offers psychosocial support to disaster victims

Another problem arises: heatwave warnings are issued between August 12 and 15. Vulnerable individuals such as children, the elderly, sick people, and others who are at risk of suffering complications such as dehydration and electrolytic imbalance are supposed to drink plenty of water, which is lacking. To remedy this situation, the City of Montréal launches an appeal to residents in the centre of the Island of Montréal to reduce water consumption to maintain pressure in the drinking water distribution system and thus serve as many people as possible, especially in the Rivière-des-Prairies sector.

On August 21, 10 days later, the water main is put back into service once the city has disinfected the segment affected to eliminate pathogens that entered the main during the repair. The water main is then be tested.

The City of Montréal and the DSP collaborated in the management of this crisis, above all to communicate prevention measures. At the August 12 press conference held at the mayor's office, public health information is disseminated. However, during the first few days of the crisis,

the information transmitted by the media is somewhat confused: the accident occurred in the borough of Saint-Michel while the advisory to boil water and the water shortage affected instead the Rivière-des-Prairies and Montréal-Est sectors. In response to calls from residents, Info-Santé nurses call the DSP to confirm the information. Another problem is the potential for the development of mould. On August 14, the borough issues a press release explaining to all landlords concerned how to clean a dwelling as a preventive measure.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

This situation is not new given the poor state of repair of the water distribution system. In light of the obligations stipulated in the Regulation respecting the quality of drinking water, warning procedures were adopted. The collaborators quickly went into action to deal with the accident and coordination was sound despite the large number of interveners and the scope of the problem. However, the measures were stopgaps as the problem was not solved at the source and this situation continues to be worrisome given its growing frequency and the inherent health risks.

Case 14 West Nile virus: a new reason to protect oneself from mosquitoes

On June 13, 2002, a Montréal resident discovers several dead crows and calls the reporting service. SOS braconnage collects the crows and sends them to the Centre québécois sur la santé des animaux sauvages de Saint-Hyacinthe for autopsy. This initial case of West Nile virus in Montréal will be followed, three months later, by the death of a city resident. This major regional operation allowed us to face the subsequent mosquito season better prepared.

Staff at the centre is overwhelmed with work and it is several days before tissue samples from the crows are sent to the Health Canada National Microbiology Laboratory in Winnipeg, the only one in Canada at the time that could identify the West Nile virus. A technician conducts genomic amplification testing, which is positive. The laboratory contacts the Québec Director of Public Health: the crow tested is the first case of an infected bird in Québec. On July 9, the MSSS notifies the DSP of the case. In Montréal, it is necessary to monitor mosquitoes because of the risk of transmission of West Nile virus to human beings. Hospitals are kept abreast of developments and they are already reporting any suspected cases to the DSP. The public is made aware of prevention and personal protection methods. A leaflet recommends the use of insecticides, the installation of mosquito screens and the elimination of sites favourable to reproduction, such as stagnant water.

On August 26, an octogenarian is taken to an emergency room, where he is kept under observation. A blood sample is sent to the Laboratoire de santé publique du Québec (LSPQ). The patient's condition continues to deteriorate. The screening test is positive and on September 6, the DSP is notified and a specimen is sent to Winnipeg

to confirm the presence of West Nile virus. Despite the care provided, the patient dies on September 18. An epidemiological investigation is already underway. Since the man had no medical history and had not received blood, the transmission occurred through mosquitoes. The Winnipeg laboratory, overloaded with work, only obtains the result of the confirmatory test on October 10 and immediately notifies the MSSS and the Regional Director of Public Health. The Montréal case is the city's first confirmed case of human infection by West Nile virus.

The scope of events in 2002 took everyone by surprise. In 1999, cases were, by and large, confined to New York City. In 2002, there were over 4 000 cases and nearly 300 deaths in the United States, over 300 cases and 20-odd deaths in Ontario, and 16 cases and 2 deaths in Montréal. Moreover, other means of transmission are discovered: transfusions, transplants, breast milk, placenta and accidental inoculations of laboratory staff. Procedures are promptly established to detect the virus in donated blood. Throughout the summer of 2002, the DSP regularly sends information documents to physicians and to Info-Santé, distributes posters, leaflets and information on the Internet intended for the public, organizes press conferences and interviews, and issues press releases.

▼ 1981

First AIDS case in Montréal reported

Professor Montagner's team
at the Institut Pasteur isolates HIV

▲ 1983

December 3: 40 tons of methylisocyanate
accidentally released at the Union Carbide pesticide plant
in Bhopal, India, killing 7 000 people

▲ 1984

▼ 1985

December 1:
inauguration of the 911 service

Québec has been closely monitoring the situation since West Nile virus appeared in New York City. Numerous partners,³ who, until recently, were little inclined to work together, are collaborating on the matter. Measures to combat the problem in the coming summer are being prepared at the regional and provincial levels. One response is the preventive use of insecticides. Several strategies are possible. Most interveners advocate applications early in the spring in zones at risk and throughout the summer. It is believed that this approach will keep the mosquito populations very low throughout the mosquito season so that it is not necessary to resort in mid-summer to insecticides that pose health and environmental threats. The larvicides selected by the Institut national de santé publique, the *Bacillus thuringiensis israelensis* (BTI) and methoprene, pose no significant health or environmental threats.

This is the strategy that the MSSS advocates. In May it announces an ambitious larvicide treatment program in zones

³ Several government departments, CQSAS, the Faculté de médecine vétérinaire de l'Université de Montréal, SOPFIM, firms responsible for controlling mosquitos, entomologists, INSPQ, LSPQ, hospital physicians, Info-Santé, CLSCs and other DSPs.

deemed at risk. Laboratory analyses to detect the virus in dead birds and mosquitoes are being systematized.

The LSPQ is equipped with new means of accelerating the detection of the virus and the INSPQ is developing a province-wide epidemiological monitoring and information system. A scientific committee is keeping a close eye on the situation with a view to proposing remedial measures, should the epidemiological situation deteriorate.

Coordination is bolstered during the 2003 mosquito season. A joint City of Montréal-DSP committee is set up, which the Société de protection des forêts contre les insectes et maladies (SOPFIM) also joins.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

The initial delay in promptly establishing and confirming a positive diagnosis made early detection of the virus more difficult. The situation is now under control as a result of a more stringent process and the development of better adapted tools. At the regional and provincial levels, this public health intervention made it possible to establish a concerted strategy. As the 2003 West Nile virus season drew to a close, the partners noted that the measures would undoubtedly have a positive effect on the clinical situation. While the number of dead birds and infested mosquito ponds rose, few people developed the symptoms associated with West Nile virus in the Greater Montréal area and no deaths had been recorded by the end of October.



1986

1988

Fire breaks out in a PCB dump in
St-Basile-le-Grand



1989

December 6: 14 women
are slain at the
École Polytechnique



1990

Fire breaks out
in a tire dump
in St-Amable

Case 15 Mould in apartments: taking stock of the situation

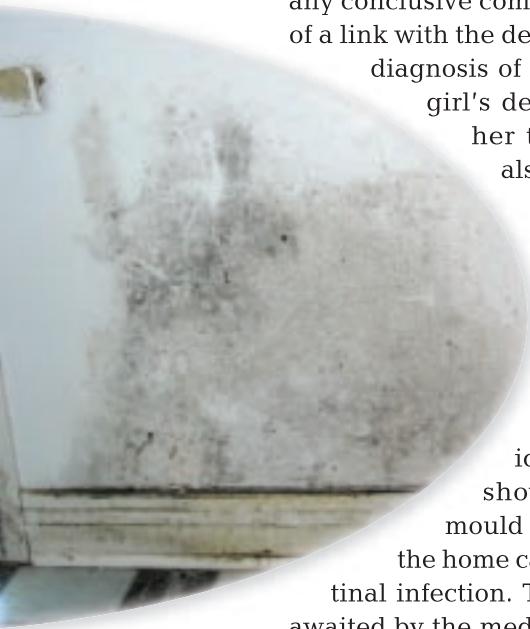
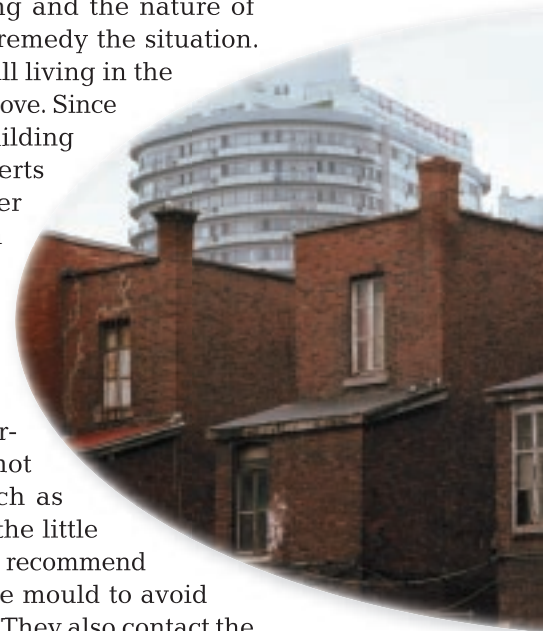
Christmas 2002: the media report the death of a two-year-old girl following a gastrointestinal infection. According to her father, the child's death stems from mould contamination in the apartment. On January 3, 2003, the media call the DSP, which then contacts the director of public works in the borough concerned and offers to send experts on site to assess public health risks. Following their analysis, the experts confirm that mould is not the cause of the death.

January 4, 2003: the Saturday edition of *La Presse* announces that an epidemiologist will visit the site on Monday, January 6. When he arrives, journalists are already there and follow the experts into the dwelling. Once the visit has ended, the experts explain that the contamination in the dwelling is moderate and that exposure to mould mainly affects the respiratory system. They avoid any conclusive comments on the absence of a link with the death, pending the final diagnosis of the cause of the little girl's death and the cases of her two sisters, who are also hospitalized.

That afternoon, during other interviews, they are more specific: mould is not involved. In the public health advisory, they are categorical: no scientific study shows that exposure to mould through inhalation in the home can cause a gastrointestinal infection. This advisory, eagerly awaited by the media, helps to allay public apprehension.

At the same time, professionals from the DSP inform the borough of the condition of the dwelling and the nature of the work needed to remedy the situation. The family, who is still living in the dwelling, decides to move. Since the tenants in the building are concerned, experts return two days later to inspect the seven other dwellings and meet with the tenants accompanied by representatives of the borough inspection service. They reiterate that mould cannot cause an illness such as the one from which the little girl was suffering, but recommend the elimination of the mould to avoid respiratory ailments. They also contact the building's owner concerning minor repairs to be undertaken.

While municipal inspection services are responsible for the salubrity of dwellings, the collaboration of the DSP was important as it provided support and heightened their awareness of the health risks stemming from insalubrity.



▼ 1993

Vaccination campaign against
meningococcal infection
June 9: Stanley Cup riot

▲ 1995



What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

In an extensively media-based situation where the perception of risk was a key issue, the DSP, out of concern for openness, worked constantly before the cameras. Since the cause of death was unknown, delays occurred in risk communication, which further dramatized the situation. Despite the scientific conclusion that there was no causal relationship, the residents of the building affected continued to be concerned. However, the coordination of all partners was effective.

▼ 1996

Hepatitis A vaccination campaign
in the gay communityKrever Commission report
on Canada's blood supply

▼ 1997

March 21: ammonia leak
at the Montpak plantLife expectancy at birth:
81.4 years (women), 75.3 years (men)
Cancer mortality rate: 246 per 100 000

▼ 1998

January: ice storm
in southern Québec

Case 16 SRAS: quarantine, an exceptional measure

On March 12, 2003, the World Health Organization issues a worldwide alert: sources of severe pneumonia have been reported in China and Vietnam. On March 15, new sources are reported in Singapore, Thailand and Canada (Toronto). Severe acute respiratory syndrome (SARS), an ailment of unknown cause and transmittable from one person to another, displays symptoms such as fever and respiratory problems and mainly affects health care staff. In Montréal, as everywhere in the country, health officials are on high alert. On April 16, several hundred people are quarantined, a rare event.

On April 15, 2003, a public health physician in Toronto calls the emergency on-call public health physician in Montréal to inform him that a Torontonian passing through Montréal appears likely to be suffering from SARS. The epidemiological investigation reveals that the man had participated in a half-day symposium held in a hotel in the western portion of the Island of Montréal and had attended a banquet in the evening. Most of the nearly 400 participants are Montrealers, although some participants are from other regions of Québec, Ontario and the northeastern United States. The man spent the night in a downtown hotel and ate in the hotel restaurant.

During his stay, the man had a heavy cough and is deemed to be at risk of transmitting SARS. The disease is spread through droplets from the respiratory tract and anyone who was within 1 m of him could have been exposed and, in turn, develop the disease, as the incubation period varies from 1 to 10 days.

The same evening, the on-call infectious diseases team discusses the case's management. A telephone conference call the next day with the MSSS validates the strategy, as several regions would participate in

the measure. Since the disease is serious, indeed fatal, it is decided to place any asymptomatic individuals who had direct contact with the Toronto man in preventive isolation for 10 days. Individuals who had had less direct contact with him are asked to monitor the appearance of fever, without restricting their activities, since it is believed that fever is a necessary condition for the disease's transmission.

Two measures are adopted that target the contacts. All symposium participants, the restaurant owner and the waiter are quarantined, i.e. compulsory isolation at home and daily monitoring of symptoms through telephone contact with a DSP professional. Staff in the two hotels engage in self-monitoring with no restriction on their activities: they take their own temperatures daily and call Info-Santé in the event of problems.

The operation involves several steps: pinpointing the contacts, reaching them inside and outside Québec, informing them of the measures to be taken, ensuring that the persons concerned comply with the quarantine, and informing our partners. The first step consists in obtaining the names and addresses of symposium participants

1999

January 31: fire breaks out
in a former paint factory

2000

911 service receives 1 262 862 calls

from the organizers and the names and addresses of employees from the hotels. In the case of non-residents, the MSSS is responsible for locating them in the regions, other provinces and the United States.

In Montréal, officials inform the contacts and provide them with masks, thermometers and fact sheets. Given their number (370), the very tight deadline and the need for daily telephone follow-up, the DSP mobilizes all available

internal resources. When quarantined individuals do not answer the telephone, the police are asked to intervene accompanied by the emergency on-call physician to locate these people and underline the importance of complying with the measure. The collaboration of the CLSCs and Sun Youth is also necessary to support several individuals who have difficulty complying with the requirements imposed by the quarantine.

During the second step, the DSP organizes a concerted response with partners in the health care network. When quarantined individuals experience health problems, they contact Info-Santé, which

in turn calls, if need be, the on-call public health physician, who organizes safe transport with Urgences-santé and consultation in a hospital.

Understandably, the media constantly demands information. The DSP spokesperson grants all requests for interviews and avoids creating needless public anxiety. He indicates that all of the necessary measures are in place and that the public will be informed immediately of any likely SARS case. The most clearly targeted groups, such as individuals of Chinese origin, fear that their communities will be affected. The SARS crisis gradually turns into a media event rather than a health question.

What did we learn?

Prevention
preparation

Detection
and alert

Strategy

Coordination
Communication

Feedback

This case study clearly reveals that the health care network and its partners succeeded in mobilizing very quickly. A preparation plan covering smallpox and discussions already under way with hospital emergency services accelerated this mobilization.

One question remains: would we have been ready to adequately deal with one or more probable SARS cases? The simple threat of a genuine case had already led in the preceding weeks to an acceleration of preparation in Montréal. It was noted that the health care network, already overwhelmed, was unable to respond to prolonged emergencies. The health care system would have experienced the same difficulties as the system in Toronto did. Indeed, Montréal benefited from Toronto's experience and the effectiveness of the prevention and control measures implemented there. In Montréal, given the anticipated threat, we had more time to prepare and we accelerated the implementation of measures, although much remains to be done.

Case 17 Multiple-resistant bacteria: preventive practices must be intensified

In Montréal, the spread of multiple-resistant bacteria has been growing in hospitals, probably since the late 1980s. These strains pose a daunting challenge because they are resistant to several antibiotics, which complicates treatment, and because of their potential for spreading in health care facilities. A new dynamic is developing in health care establishments, which requires a change of behaviour.

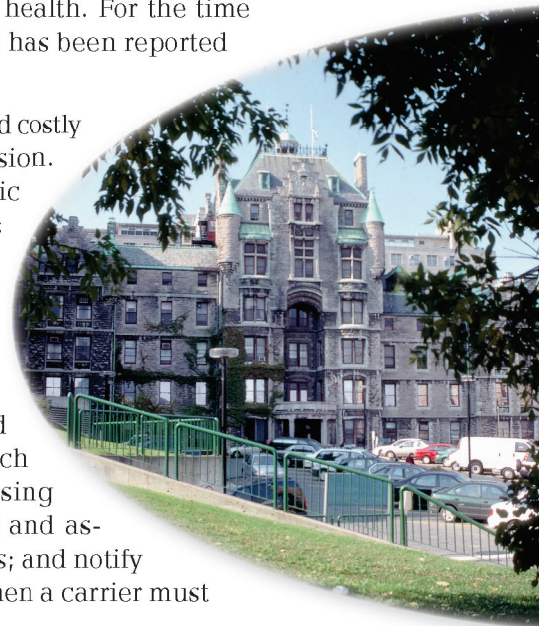
The *Staphylococcus aureus* bacterium is part of normal human flora and is found on the skin and in the nostrils of many people. This bacterium, which can cause numerous infections, occasionally very serious ones such as pneumonia and osteo-articular and bacterial infections, has gradually become resistant to penicillin and other common antibiotics. For over 10 years, multi-resistant strains that have been isolated in hospitals have developed resistance to semi-synthetic penicillin such as methicillin, hence the name methicillin-resistant *staphylococcus aureus* (MRSA).

There is a high risk of MRSA colonization or infection among vulnerable patients, especially in the case of organ transplants, immunosuppression, major surgery, prolonged hospitalization, dialysis, contact with a carrier, or the prolonged use of several antibiotics. MRSA is usually transmitted from one patient to another by medical employees who neglect to wash their hands and the patient can remain contaminated for months or even

years. While they do react to the antibiotic vancomycin, strains of MRSA nonetheless cause significant morbidity and mortality among high-risk patients.

Moreover, new strains have been reported recently in Japan, the United States and Europe that are partially resistant to vancomycin. If, as observers believe, this marks a preliminary stage in the development of fully vancomycin-resistant strains, it means that no antibiotic will be effective, a serious threat to public health. For the time being, no such strain has been reported in Québec.

It will be difficult and costly to halt this transmission. To do so, three basic measures are essential: screen patients who are carriers of multi-resistant bacteria as soon as they are admitted to the hospital; adopt prevention and control measures such as hand-washing, using gloves, coats, masks and assigning private rooms; and notify the establishment when a carrier must be hospitalized.





A month-long heatwave



Implementation of common real time health monitoring system



Four recommendations have been proposed. First, clear guidelines must be established that rally all establishments. Second, nosocomial infection⁴ prevention and control committees should be set up to bring together the partners of all types of establishments, the regional health and social services board, the DSP and the CLSCs. Third, more emphasis should be placed on the prevention and control of nosocomial infections and multi-resistant bacteria in health care establishments, i.e. greater numbers of nurses should devote themselves to doing so. Fourth, each establishment should broaden the application of basic preventive practices and additional precautions.

What did we learn?

Prevention
preparation

Detection
and alert

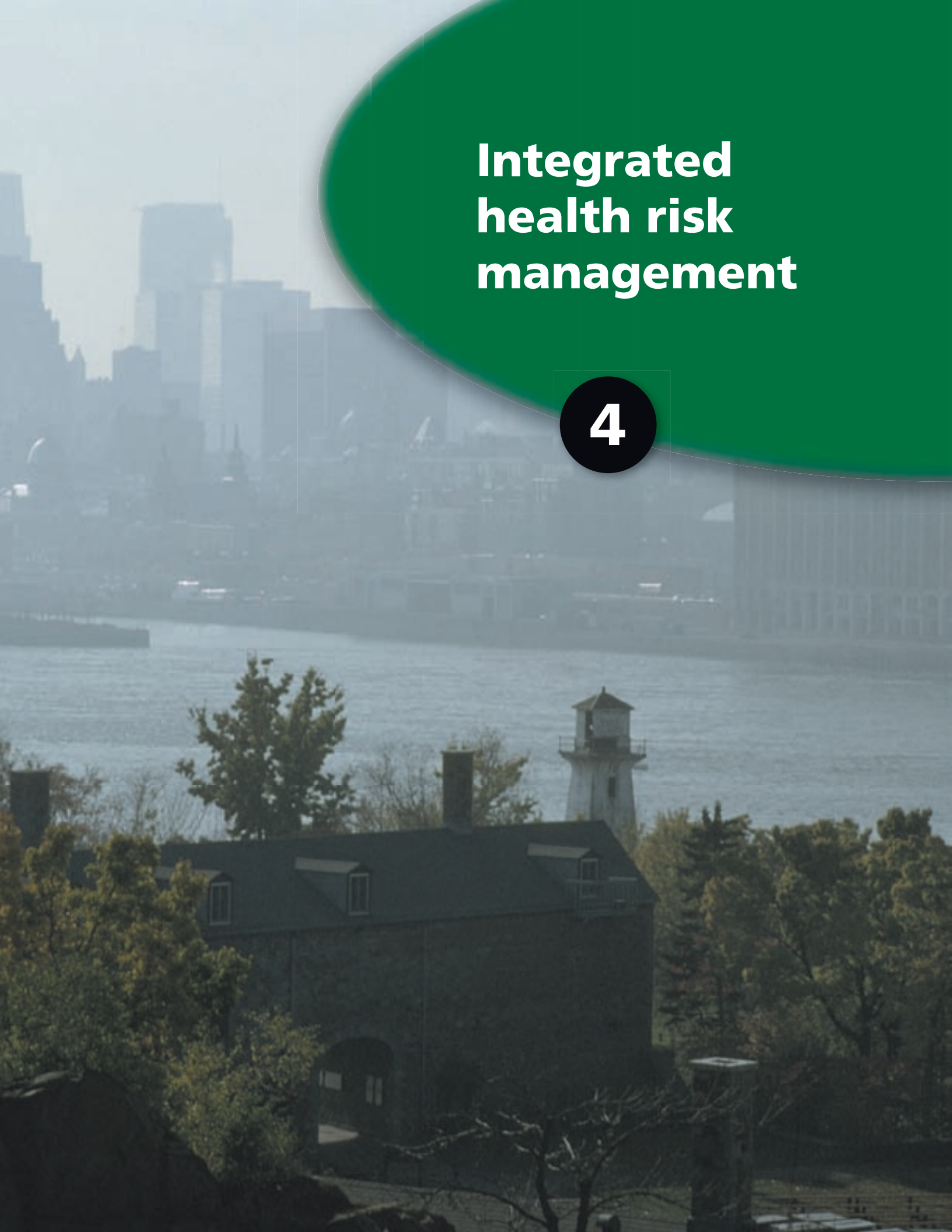
Strategy

Coordination
Communication

Feedback

Realistically speaking, prevention is carried out case by case in each establishment, which is less effective, and the number of persons affected is unquestionably underestimated. Moreover, the level of preparation and the effort invested are insufficient. The true solution to preventing and controlling MRSA is to harmonize intervention at the regional level in all establishments, which goes hand in hand with tighter coordination and the systematic application of a program. Mention should also be made of the relevance of acting since these infections have been deemed reportable since November 2003.

⁴ Infections due to multi-resistant bacteria that patients may contract in all types of establishments, especially hospitals.

The background of the slide features a composite image. The upper portion shows a hazy city skyline with several tall buildings, including one with a prominent antenna. Below the skyline is a body of water with a few boats. The lower portion of the image shows a large, dark stone building with a gabled roof and several dormer windows. To the right of this building is a white lighthouse with a dark roof. The entire scene is set against a backdrop of trees with green and yellow foliage.

Integrated health risk management

4

4 Integrated health risk management



***T**he ice storm, contaminated water in Walkerton and the SARS epidemic have given us a rude awakening. Nothing will ever be the same again. In the not too distant past, the notion that a city's or a country's economy could suffer from the fear of a contagious disease or that a heatwave could kill thousands of people lay in the realm of fiction. History has caught up with us.*

We did not foresee the scope of the consequences of these threats on the social, economic or health systems that govern our society. Moreover, we underestimated globalization as a vector in the spread of disease. Why would we have thought, especially in North America, that the decisions of the World Health Organization could affect us so directly? We must face the fact that from the local to international levels, all efforts to maintain and improve the state of health are becoming increasingly interrelated. This became evident as shock waves resounded around the world with the announcement of the SARS epidemic.

Given its unique urban characteristics, Montréal both generates risks and is a potential target in view of its many activities at the international level. The 17 events analysed in Chapter 3 confirm the soundness of taking a critical look at our risk-management methods. It is not a question of harking to the past but instead of seeing how we can adapt and better act collectively to protect Montrealers' health.

The information gleaned from our own experience allows us to be proactive and follow the current trend, which, at all levels, calls for us to get back to the drawing board to review the processes and policies that must guide our actions and to agree on joint methods of optimizing our efforts. This final chapter goes beyond simple observation and examines the policy directions needed to collectively improve our strategies.

What we have learned

Joint expertise acquired over time

We have noted that for at least the last seven years, Montréal has experienced an array of health emergencies that fall into four categories.

- Unforeseeable or unknown situations that have tested our ability to respond and to respond rapidly, e.g. West Nile virus and terrorism.
- Longstanding situations that persist despite undisputed scientific knowledge and know-how, e.g. syphilis.
- Foreseeable situations where preparation is insufficient or the risks underestimated, e.g. the industrial accident at the Montpak plant.
- Anticipated risks that require taking precautions, e.g. the treatment of sprayed asbestos.

Depending on the nature of the risks, a number of organizations spring into action, each with its own set of responsibilities. Interrelationships are extensive and their complexity is readily apparent, especially when chemical, physical or climatic threats arise. This observation also increasingly applies to biological threats, in particular because of the malicious use of various products to terrorize civil society.

Fruitful collaboration has enabled partners in Montréal to gradually forge links and work more closely together, especially during the ice storm. Over time, the regular occurrence of a variety of emergencies or accidents has helped to consolidate each

partner's specific expertise and the sharing of interdisciplinary expertise. From one event to the next the partners are more comfortable with each other and understand their respective roles and responsibilities better.

Decisive public opinion

The perception of risk among the individuals affected, the parties concerned and the media is a factor that can no longer be overlooked when there is a crisis to resolve or even when less important events arise, since it affects decision-making in the area of risk-management strategies. Opinions differ regarding the evaluation of the likelihood and seriousness of a health threat depending on who is speaking, whether it is experts, those who engender risks, the public, pressure groups, the media or government or municipal decision-makers who must act for the public good. In an interconnected world where communications are all pervasive, each voice speaks out with varying degrees of insistence.

Depending on the forces in play, decisions concerning risk management are altered and sometimes seem contradictory. In the case of asbestos, for example, some countries deem unacceptable any health risk and have prohibited it. In Québec, an asbestos producer, the government advocates the safe management of risk and the use of asbestos in public buildings, especially schools and hospitals, despite the opinions of health officials. However, in practice, it has been difficult to control this risk in the construction and processing sectors in Montréal. The prevention of health problems stemming from West Nile virus is another example of balancing the perception and acceptability of risk of a disease caused by a virus against exposure to pesticides.

The perception of risk among the individuals affected, the parties concerned and the media is a factor that can no longer be overlooked when there is a crisis to resolve.

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in Montréal.*

The role of the media is hardly negligible. Air time devoted to an issue, the organizations or individuals granted speaking time, whether or not controversies arise, and the bias of reporting are all factors that affect the

public's perception of risk. This is true to such an extent that we sometimes have the impression that we are managing a media rather than a health crisis, as was the case with SARS in Montréal or the case of the apartment contaminated with mould.

It can thus be asserted that perception is decisive in risk management and the choice of options to resolve or contain the problem. Our experience shows that taking into account the social acceptability of risk, especially when fighting communicable diseases, is a guarantee of success.

Adoption of preventive behaviour, a difficult sell

The environmental assessment undertaken by the City of Montréal notes that Montrealers have, over the past decade, adopted safer behaviours concerning their environment. However, in emergencies, Montrealers are not always prepared, as was observed during the ice storm, when numerous cases of carbon monoxide poisoning occurred through improper use of heating equipment. This led the Nicolet Commission to recommend that Quebecers be made more aware of their responsibilities and that an emergency preparedness culture be developed. In particular, there needs to be a heightened awareness of the necessity of ensuring one's self-sufficiency during emergencies, e.g. an emergency supply kit that enables individuals to subsist for three days without outside assistance.

At another level, risks of infection continue to spread among certain vulnerable groups because of unsafe individual behaviour, illustrated by new outbreaks of syphilis and hepatitis A.

Our experience overall shows the need to pursue sustained educational and awareness initiatives among generators of risk and the public to foster the adoption of preventive behaviours.

A backdrop of uncertainty

All public health protection initiatives focus primarily on the health of the population. However, in some instances, such as asbestos in the schools or heatwaves, the potential effects of risk are known but the scientific evaluation of the true health risk is uncertain, in which case risk is deemed plausible. Health officials and decision-makers are nonetheless obliged to act in order to provide adequate protection and in response to the public's perception of risk, sometimes exacerbated by circumstances. The SARS epidemic is an extreme case in that it involved a new agent, an unknown clinical syndrome, unforeseen health impacts and general treatments. One thing is certain, however: the public wishes to be and must be protected.

In situations of scientific uncertainty, decisions must strike a proper balance between individual rights and the need to act to reduce health or environmental risks. Several countries have adopted the principle of precaution that establishes a decision-making rule according to the level of risk acceptable to the public.

This principle has become an option in risk management and its application depends on the extent of scientific knowledge and the degree of uncertainty related to the risk. Such a decision often gives rise to debate and controversy from a political and health standpoint since it involves substantial financial resources and raises the question of public health priorities. To intervene with precaution, openness and rigour is an ethical challenge facing all decision-makers.

Crisis-centred management logic still firmly rooted

Despite being highly recognized for our knowledge, experience shows that collectively we still need to develop our

know-how. We persist in maintaining crisis-centred management logic whereby we react from one event to the next. However, subsequent crises, such as epidemics or catastrophes, illustrate that having a plan does not guarantee its functionality.

The heart of the matter is the operational and technical facets of the plan where various shortcomings are readily apparent: lack of preparation, coordination of processes and harmonization of practices and procedures; few protocols; insufficient technical resources; a need to review the sharing of responsibilities; uneven leadership that varies depending on the type of risk; and few simulation exercises.

The ice storm marked a turning point that sparked a collective awareness. A significant upsurge in interest was noted in improving crisis management. The report entitled *Les enseignements du verglas 1998* set out a series of measures to develop organized emergency preparedness systems. Municipal and provincial authorities subsequently combined their efforts to foster partnerships with other government departments and interveners concerned with public health and safety. Legislation now makes provision for requirements and obligations and is the cornerstone of an emergency preparedness culture among Quebecers. Each organization has reviewed its plan in its respective field and regional emergency measures plans have been consolidated.

Since then, crises of this scope have, fortunately, been rare and the feeling of urgency to prepare ourselves is dwindling. We are not really taking advantage of the lull between two crises to bolster our defences. For example, it took the recent anthrax scare and the SARS epidemic to make us realize that, regardless of their nature, threats involve all of the partners. Risks associated with infections are no longer solely the concern of the health care system and the logic supporting intervention must centre on an integrated, systematic joint approach.

What to improve

Depending on the nature of the threat, the specific response may rely predominantly on one intervener rather than another. However, even when there is a substantial safety net, we must question our collective strategy in the areas of prevention, preparation, detection and reaction.

At present, the emergency measures plans of the health network and emergency preparedness organizations centre, above all, on catastrophes such as earthquakes, technological accidents, fires and floods. The risk of epidemics is mentioned but without providing details of operational aspects such as access to technical resources, explicit agreements covering concerted mobilization with hospitals, CLSCs, other establishments in the network and physicians in private practice. The plans are currently being revised, but each organization is facing the same problem in its sector, a plethora of ongoing activities. To achieve flexibility, it is important to pool the efforts of all interveners around priority issues.

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Intensify preventive measures

It is clear that our society has still not truly given priority to prevention and preparation at all levels, including that of the public. An emergency preparedness culture is lacking. Aside from taking measures to ensure their individual survival, Quebecers should be encouraged to participate collectively in discussions on the cataloguing and characterization of risks and on control strategies. The mixed municipal-industry committees operating in Montréal boroughs are attempting to respond to the public's determination to be heard, especially on potential technological risks.

It should be noted that in the areas of prevention and the search for more effective strategies, two facets must be given particular attention: the reduction of risk at source, whenever possible, among generators of risks and the municipalities; and a heightening of public awareness to ensure that Quebecers participate in all stages of risk management and adopt safe behaviours.

Consolidate capacity to anticipate risks

Our 17 case histories clearly show that the situations to which our systems must react are varied in terms of their nature, scope and social, economic and health impacts. Each jurisdiction in its respective field is responsible for ascertaining and monitoring risks and their potential impacts on safety and health. It must be acknowledged that in this respect, even with extensive legislation in place, shortcomings persist. We often possess only partial knowledge of the inventory of risks and their impact on health and we only carry out limited monitoring of their evolution.

Difficulties stem from our monitoring systems and our ability to obtain reliable, valid data that can be transmitted by computer in real time among interveners.

However, this is the cornerstone of effective preparation both from the standpoint of preventing risks and responding effectively to emergencies within a reasonable time. What ensues, as certain cases reveal, is a common weakness in our ability to anticipate emerging problems and we sometimes reach the limit of our scientific knowledge.

The difficulties stem, above all, from our monitoring systems and our ability to obtain reliable, valid data that can be transmitted by computer in real time among interveners.

In the realm of public health monitoring, we still often overlook or underestimate the prevalence and incidence of recognized epidemic-causing (reportable) diseases, as has been the case with tuberculosis,

hepatitis A, sexually transmitted diseases and HIV, and with problems posed by chemicals, through failure to promptly report such diseases to the DSP.

Moreover, as regards the detection of health effects, we do not possess systems to detect in a timely fashion unusual situations that cause: mortality, hospitalizations, consultations in emergency services and physicians' offices, calls to Info-Santé, and an increase in prescriptions for a type of drug that indicates an epidemic outbreak. It is not incorrect to claim that our existing systems would also have been tested to the limit had a genuine SARS case arisen or a heatwave persisted, as was the case last summer in France. Other factors are hampering our reaction such as the inadequacy of classification systems to properly categorize data pertaining to diseases, poisonings and infections, the impossibility of obtaining such data in real time, and the absence of an information system network linking laboratories, hospital emergency services, CLSCs, physicians' offices and the DSP.

Other partners are responsible for monitoring natural, anthropic or intentional threats, especially the City of Montréal, the CSST and government departments. Each partner in its particular domain catalogues, characterizes and monitors the evolution of risks that fall within its purview.

In the realm of emergency preparedness, however, knowledge of risks specific to the region stems from measures that compel risk generators to report and characterize technological risks by means of the so-called risk schema put forward by legislators in the wake of the Nicolet Commission's deliberations. However, we are still awaiting the provincial regulations that would make the application of these measures compulsory.

The ammonia leak at the Montpak plant and the fire in the abandoned paint factory clearly reveal the

Knowledge of risks specific to the region stems from measures that compel risk generators to report and characterize technological risks.

importance of being thoroughly familiar with risks. In the first instance, an ignorance of risk had serious consequences. Conversely, in the second instance, preparation made it possible to avoid the worst. The City of Montréal, spurred by concerns to promote sustainable development, made the first move by elaborating its first environmental assessment of the region. The project is still under way and will mark an important stage in the formulation of a comprehensive evaluation of the risks that the Greater Montréal area is facing.

Moreover, events such as the release of tear gas in the metro, the anthrax scare and terrorist threats have prompted the Service de police de la Ville de Montréal to set up a task force comprising partners in the region. The main concern of the Comité aviseur antiterrorisme de Montréal, in its field of expertise, is the identification and prioritization of certain risks such as anthrax and dirty bombs. Its initiatives can also serve as an example of how to achieve a common understanding of overall risks by all partners in the region.

Taken together, these initiatives will make it possible to prioritize our measures in light of what are deemed to be the most serious risks, and to adequately heighten awareness among physicians, interveners and the public at large of the important role they must play to ascertain and detect health threats in a timely manner.

Timely diagnoses

In most instances, undue delays have been noted in quickly diagnosing exposure to biological and chemical agents. Several factors contribute to this situation. The clinical diagnosis of infectious diseases may be underestimated or delayed because of the very limited prevalence or incidence of certain diseases in the community. Physicians very rarely encounter tuberculosis or syphilis during consultations. Confirmation of the diagnosis may be hampered by delays in receiving laboratory results or the absence of specialized laboratories, as was the case for West Nile virus (in 2002, analyses had to be conducted in Winnipeg). As for

chemical threats, inadequate preparation or the absence of equipment can also delay diagnosis.

Delays cannot be controlled in situations where the agent involved and the assessment of health risks are completely unknown, as is the case with emerging problems and chemical poisoning. It is important to make provision during the preparation phase for prompt initiation of the necessary research.

Improve coordination of measures at all levels

As we have seen, coordination and collaboration are becoming increasingly smooth at the higher echelons of organizations. Faced with intentional threats, the partners in the Montréal area have quickly noted that no organization is able to manage such a threat single-handedly and that complementarity of services and expertise ensures success. Joint protocols are being elaborated focusing on specific problems such as the management of suspicious parcels and dirty bombs. All of these cases are submitted for analysis by the CAAM which defines strategies to counteract the problem, each intervener's roles and responsibilities, and the organization and coordination of events.

This process is promising and should be extended to cover priority risks. The abandoned paint factory and West Nile virus illustrate the value of sound preparation, unlike the Montpak plant, where the absence of protocols and clearly defined roles and responsibilities delayed intervention. Moreover, intervention in response to infectious disease threats and disasters has revealed that local networking among boroughs, community police and fire stations, hospitals, CLSCs, medical clinics and the public health department should be consolidated.

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**Interdependence
must be specified
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and support systems.**

This has been observed in the management of outbreaks that regularly mobilize hospitals, CLSCs, the DSP and physicians in private practice. Hepatitis A, tuberculosis and syphilis highlight the everyday difficulties that arise when we intervene and apply control measures. The case of tuberculosis in the workplace clearly illustrates the problems encountered in the areas of coordination and collaboration, and the sharing among partners of roles and responsibilities related to an epidemiological investigation when it is a question of reaching the individuals affected and those likely to contract the disease. Access to medical and nursing services slowed down post-exposure follow-up since some individuals waited three months for a medical consultation. Nevertheless, we are thoroughly familiar with the outcome of these diseases and control measures are inexpensive and effective from a public health perspective.

The vaccination campaign against meningococcal infection in 2001 indicated the specific expertise that CLSCs had acquired in mass vaccination. The coordination of and collaboration among interveners to apply this measure on a large scale and in a short time period bore fruit. Vaccination coverage objectives were achieved among school students. However, when groups of individuals must consult regular medical services, problems of access can cause delays. Links and agreements must be consolidated with front-line physicians to build bridges that will facilitate the application of measures to combat communicable diseases.

Several situations, such as asbestos in the schools, the vaccination campaign against meningitis, and terrorism reveal the high degree of interdependence between the local, regional, provincial and even the national and international levels both inside and outside the public health network. Such interdependence is at once vertical and

horizontal within a given sector (CLSCs, physicians, hospitals and the DSP) and between sectors. Each intervener needs the others to confirm or invalidate crises or epidemics and to apply control measures and apportion resources. This interdependence must be specified in formal agreements governing joint plans and protocols, training, and support systems.

Bolster assessment of our responses

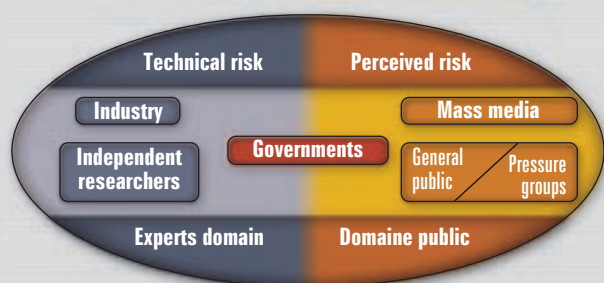
In the cases analysed, the absence of common feedback among partners cannot be overlooked as this is one way to pinpoint factors that contribute to or hinder success. A solid *a posteriori* analysis is only carried out in major crises, e.g. the coroner conducts an inquest following a death or a commission of inquiry is set up in the wake of a major disaster. However, it is not common practice to analyse our successes and failures as a group. As a result, we do not learn as much as we might from our experience, even though constructive examination would prove useful in enhancing our plans, methods and practices. At the conclusion of a crisis, operations that are put on hold during the crisis demand our attention, to the extent that, from one event to the next, we postpone a comprehensive analysis of all systems. This prevents us from pinpointing systemic failures and the resources needed to broaden our ability to respond. It takes major events such as the tainted blood scandal, contaminated drinking water in Walkerton or the SARS epidemic to remind us of our common responsibilities and our order of priorities.

Harmonization of risk communication

Experience has shown that the need to communicate risks goes without saying. Quebecers are increasingly concerned about the impact of risks on their health and safety. Public anxiety is palpable in the face of genuine risks and situations that are deemed to be health nuisances. It stems from a fear of the impact of risks on the health of vulnerable groups, e.g. the threat posed to children by discarded syringes and the difficulty of obtaining control measures in time because of a lack of

D4

Risk communication flow



access to medical services, as in the case of tuberculosis. Media frequently disseminate information on these topics, which in turn fuels public anxiety.

In the event of a crisis, the authorities, especially the DSP, are compelled to transmit openly and in a timely manner relevant information that presents simultaneously the facts to the victims and their families and friends, the parties concerned and, more broadly speaking, the general public. More than ever before, experts are being propelled to the forefront to inform, explain the notion of risk, even against a backdrop of uncertainty, and reassure the public.

More than ever before, experts are being propelled to the forefront to inform, explain the notion of risk, even against a backdrop of uncertainty, and reassure the public.

Between 1994 and 2003, we gradually learned from our experience. The results and the expertise acquired were, however, uneven. From a sporadic operation, communication has become permanent and more structured in the crisis-management approach. In most of the cases studied, we sought to transmit information concerning the event's impact on health and safety and the control measures for individuals affected, interveners and the public at large. In some instances, such as the case of the arenas, risk communication was the principal strategy used to solve the problem.

However, communication between partners is usually reactive rather than proactive, with each one developing its own methods and approaches to meet the needs of its sector. The result is that public messages are sometimes contradictory, as we saw with the SARS epidemic, when health experts publicly debated the very notion of risk.

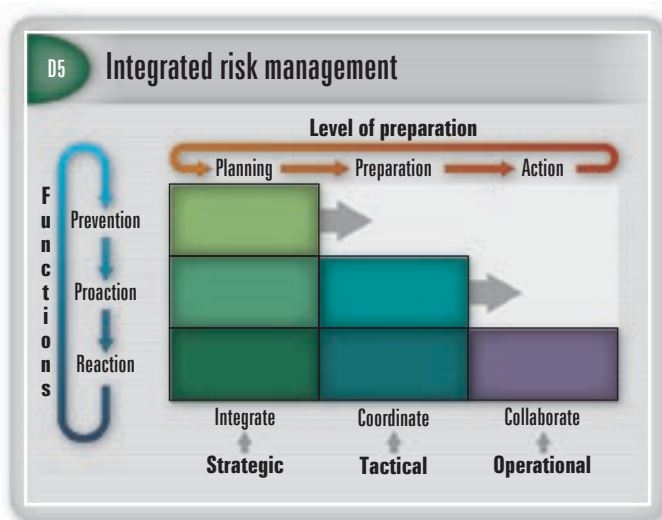
More effective use of financial resources

Disasters are costly. The PCB clean-up in Saint-Basile-le-Grand, which cost \$17.6 million, and the ice storm, which cost \$500 million, come to mind. As the Naylor Report produced by the federal government notes, the SARS crisis in Toronto has clearly revealed all of the possible repercussions such a disease can have not only in the health network but also on a city's social and economic life, where costs have escalated way beyond initial assessments.

Given our limited financial resources, there is good reason to consider that the expenditures engendered by crises could be converted into durable investments in prevention and preparation initiatives, thus ensuring greater benefits from a social and health standpoint.

Conditions for success

All interveners in the realm of public health and safety have the same objectives: to save as many lives as possible and to protect health. The approaches and expertise needed to achieve these objectives are found in different organizations. From individual residents to the mayor, from interveners in the field to strategic decision-makers, everyone has responsibilities that make health a priority. In a big city like Montréal, the success of the safety net depends on mutual assistance among individuals and collaboration among organizations. The integration and coordination of complex networks are inescapable if we are to effectively manage risk. Four basic principles must guide us: make the individual the focal point of our



concerns, develop a willingness to work together, learn to work under shared leadership, and pool information.

Rely on a common logic to prevent, prepare and react

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Collective risk management must focus on prevention, preparation and reaction. This can be done by using a systemic approach centred on three strategies: planning based on broader integration, preparation aimed at better coordination and the pooling of resources, and a reaction that places collaboration at the centre of all action.

Three prerequisites must be met to achieve broader integration: develop approaches by relying on complementarity between experts and key support functions, share common values, and rely on a network of interveners who strive to improve the outcome of initiatives. In other words, bearing in mind jurisdictions, organizations must

carry out joint initiatives and strengthen their relations to attain greater overall efficiency and efficacy.

To this end, we believe that it is necessary to consolidate two decision-making levels: a stronger strategic vision centred on a population-based approach, and a better articulated operational level to ensure harmonious, coordinated intervention.

In practical terms, this approach would result in:

- a description of risks that all interveners deem to be priorities, based on the seriousness of the situation and the ability to act collectively, i.e. key recognized and potential risks and those perceived by the public;
- a joint risk-management process enabling partners to better prevent, understand, detect, evaluate and communicate risks, and to better identify issues and strategies;
- joint preparation that produces protocols, plans and decision-making tools that will guide the participation of each organization involved;
- a network of organizations coordinated by the City of Montréal that facilitates the consolidation of multisectoral and operational teams;
- a functional link between key means of support, i.e. a shared, computerized information network that facilitates access by all authorized interveners to relevant information, measures aimed at the management of communications and the quality and efficiency of our joint action.

This logic clearly underlines the need to develop common values and strategies for change. Indeed, this trend is readily apparent among our partners but it must be reinforced in our region.

Develop concrete ways to acquire knowledge and intervene

This report reflects on how to better integrate our strategic decisions, coordinate our plans and collaborate in the field, while always respecting each intervener's mis-

***Better integrate
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sion and mandate. Working together does not imply paralyzing action but planning collective prevention, preparation and reaction initiatives in such a way that each intervener acts at the appropriate time, depending on the nature and intensity of the threat. Our proposals are certainly not exhaustive. They focus on the most critical and promising points that will allow us to make progress in the field of risk management and deal with avoidable mortality and morbidity.

Strengthen our monitoring and detection systems

Experience has shown that our collective ability to anticipate risks and their impact on health must be improved. To do so, systems must first be consolidated to identify on an ongoing basis and in real time risks and their impact on health that allow us to quickly detect problem situations.

All of the partners must:

- establish a comprehensive description of known or anticipated risks or risks perceived by the public;
- prioritize risks based on criteria pertaining to their seriousness and probability;
- prepare to receive notification and a characterization of risks from risk generators as soon as the impending regulation on emergency preparedness comes into force;
- develop effective, complementary information systems bearing in mind technological progress and globalization, e.g. call transmission systems.

Specifically, the health network must:

- set up in hospitals a rapid detection system of the causes of mortality and hospitalizations designed to ensure reporting of unusual clinical situations to the DSP;

- computerize the manual disease, poisoning and infection reporting system and make it accessible to physicians and the directors of public and private laboratories;
- set up a sentinel system in community pharmacies to detect unusual drug consumption that indicates an epidemic outbreak;
- encourage interveners in establishments and government departments and the directors of community institutions such as schools, day care centres and detention centres or businesses to report to the DSP real or anticipated threats to health;
- establish, according to the subregional service organization model, a network of sentinel physicians and nurses to monitor and promptly report suspicious clinical syndromes (hospitals, private physicians' offices, CLSCs).

Plan preparation to face known and unforeseen risks

To act with assurance despite uncertainty requires preparation if one is to succeed. Although it must be orchestrated in each organization, it must also be planned in collaboration with all partners at the local, regional, provincial and even international levels. Agreement must be reached, based on public perception and risks that are deemed to have priority, on which risks will be subject to a joint approach, especially in light of the complexity of the intervention required.

To this end, we propose that organizations:

- draw up joint protocols for all prioritized risks, with particular emphasis on strengthening: diagnostic and epidemiological capacities; technical and scientific resources; risk communication; management of psychosocial consequences; and organization of operations;

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- determine how leadership will be exercised during the event and in light of the type of risk;
- identify groups that are vulnerable to risks such as heatwaves and ensure *a priori* the collaboration of community and mutual-aid organizations;
- elaborate scenarios that simulate natural catastrophes and the accidental or deliberate release of toxic or biological agents, bearing in mind Montréal's characteristics;
- seek to harmonize professional skills through interdisciplinary training and simulation exercises;
- support the development of knowledge that will contribute to the identification and evaluation of health risks and agreement on research projects that will consolidate interdisciplinary networks of experts and help obtain funding.

We recommend that the health network:

- consolidate front-line services based on the sub-regional organization model involving hospitals, CLSCs and physicians in private practice to streamline the application of usual measures to prevent and combat communicable diseases and poisoning (access to laboratory tests, vaccination and chemoprophylaxis measures aimed at affected individuals or those likely to develop a communicable disease);
- formalize agreements with front-line services (physicians in private practice and CLSCs) to clarify their contribution to emergency measures.

Adapt key support and logistical measures

New information technologies

A systemic approach is only viable provided that we strengthen information management. Working with information technologies is an inescapable prerequisite that defines an integrated risk-management approach.

It is essential to acquire information systems that can transmit to all interveners useful, relevant information pertaining to detection, intervention and follow-up. Each

partner has its own systems in its respective sector. It is likely that the information network architecture will permit the pooling of relevant data while maintaining security and confidentiality. Moreover, the trend in this type of system development is to shift to the creation of networks of experts through transfers of knowledge and experience between interveners in different sectors. This, in turn, would foster the development of a community of practice.

Risk communication

Clear, open communication is the very crux of integrated risk management. A number of organizations are responsible for providing information on risks and their impacts on health.

Methods and approaches must essentially focus on:

- broadening dialogue and communication with the public and industry by means of mixed municipal-industry committees in the boroughs;
- pooling expertise and approaches to calm public anxiety in emergencies;
- networking the communications expertise of various sectors during emergencies;
- seeking a model for closer collaboration with media enterprises, and journalists' labour unions and federations, while respecting each one's roles.

Management of quality and performance

To engage in an ongoing critical examination of our approaches is a collective challenge. It is important for each intervener in its sector to ascertain after each event the extent to which it attained its objectives regarding health impact, efficiency and efficacy. If need be, this task should be shared with all of the partners.

To systematize collective feedback we propose that a logbook be developed based on the key stages in integrated risk

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management. This would enable us to take stock of the efficiency, efficacy, quality and performance of our efforts.

Establish a high-level steering committee

Montréal municipal authorities are clearly identified as being primarily responsible for the protection of individuals and property, the foundation of emergency preparedness. As we noted earlier, Montréal has already established a structure that assembles all of the partners: Emergency Preparedness Montréal oversees the municipal emergency preparedness plan. City council adopted an emergency preparedness policy in November 2002 that is also based on a systemic approach.

We advocate establishing a high-level steering committee to support integrated risk management in Montréal and to go beyond the emergency preparedness approaches so as to more broadly target

health protection. Participants in

this group should necessarily be decision-makers

who are empowered

to commit their organization's resources

while answering to the highest

decision-making level

in the municipal

administration.

Aside from

the usual partners in

the field of health protection and safety, other

participants to this committee

could include decision-makers from

the education, research and media sectors,

and organizations in civil society such as

the Red Cross.

The steering committee would, in particular:

- implement a strategic vision of risk management including integrated planning, joint preparation and the pooling of information and resources;

- consolidate the strategic alliance between all partners to facilitate the implementation of a better coordinated operations network;

- highlight risk communication by establishing closer ties with the media;

- promote integrated risk management and its impact at the provincial, national and international levels;

- promote the development of scientific knowledge with the education and research sectors;

- ensure the ongoing evaluation of quality and collective performance.

In addition, the steering committee could

also work with citizens and groups concerned

to encourage initiatives that would develop

an emergency preparedness culture and

promote preventive risk management in

the general population.

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Consolidate prevention measures

An approach that focuses on interdependence will naturally require changes in our respective organizational cultures, especially to deal with emerging risks. Current specialization and its corollary, the division of labour, pose three very practical challenges: systematize the linkage of our approaches, share our expertise and quickly exchange all relevant information. This is proposed to fulfill our sole objective, to better coordinate day-to-day preparation as well as preventive and reactive measures.

The implementation of an integrated risk management approach could also pave the way for a genuine emergency preparedness, prevention and sustainable development culture in our community. For this reason, all of our plans must be based on an ethical perspective and include, in particular, information strategies aimed at

victims, individuals likely to be affected but also the general public to ultimately promote safe behaviours related to the principal risks.

However, we must also act upstream from problems whenever possible to reduce risks at the source. By incorporating a broader concern for prevention, we will attain better results for the same level of effort and investment. Moreover, investing to promote avoidable morbidity and mortality also means contributing to greater social equity.

Indeed, the process that we are advocating could eventually lead to the development of genuine prevention policies that would call for a series of strategies designed to heighten public awareness, create environments more favourable to health and implement truly sound public policy.

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