

# Canadian Experiences with AIDS and HIV Infection

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*Canada's first AIDS case was diagnosed in 1978, and a total of 2,003 cases had been recorded up to 19 September 1988. Nationwide, 82% of those afflicted have been homosexual or bisexual men, 5% have been immigrants from endemic regions, and 4.6% have been recipients of blood or blood products. Estimates of Canadians infected with HIV range from 10,000 to 50,000. A system of voluntary testing of individuals, combined with anonymous screening of populations for epidemiologic purposes, comprises the HIV testing program in Canada. Most major cities have volunteer AIDS support committees conducting education, advocacy, and support activities; Can\$48 million has been allocated to educate the public about AIDS over the next five years. Research and international cooperation are also receiving increased priority and funding.*

**T**he human immunodeficiency virus (HIV) epidemic began in Canada in the late 1970s. As a result, Canadians are now experiencing the consequences—an increasing number of acquired immunodeficiency syndrome (AIDS) cases with their concomitant political and social repercussions.

As the extent of this epidemic becomes more evident throughout the world, we all benefit from learning about the initiatives of individual countries and by comparing cultural differences in the control of HIV transmission. The article presented here describes Canadian experiences with AIDS and HIV infection.

## EPIDEMIOLOGY OF HIV INFECTION IN CANADA

### AIDS Cases

The first patient with AIDS in Canada was diagnosed in 1978, and in 1982 the Laboratory Center for Disease Control established a reporting system to monitor the emerging Canadian AIDS epidemic. AIDS is now a notifiable disease in all of Canada's 10 provinces and two territories.

As of September 1988, 2,003 cases of AIDS had been reported in Canada, with 90% of these occurring in the provinces of Ontario, Quebec, and British Columbia. Specifically, Ontario had reported 774 cases (for a cumulative incidence of 83 per million inhabitants), Quebec had reported 592 (89 per million inhabitants), and British Columbia had reported 416 (142 per million inhabitants). As would be expected, most of the Canadian cases reported were found among residents of the major urban centers—with Toronto, Montreal, and Vancouver alone accounting for about two-thirds of the cases.

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The rate of occurrence of new AIDS cases has changed over the course of the Canadian epidemic. In the initial period, from 1982 to 1986, the epidemic curve was exponential with a doubling time of under one year. Since 1986, however, the rate of increase has diminished, and the epidemic curve is now approximated by use of a polynomial equation. This change is normal in the course of a new epidemic and does not indicate that the epidemic is peaking at this time.

Adults between the ages of 20 and 49 years account for 88% of the cases. Among all of the 1,966 adult cases, 1,863 (95%) have occurred among males, yielding a male:female ratio of 18 to 1. Also, 1,667 (83%) of the cases have occurred among homosexual and bisexual men, 95 (4.7%) among immigrants from endemic regions, and 90 (4.5%) among recipients of blood and blood products. This latter group includes those presumably infected via blood transfusions and those who received contaminated clotting factors (Table 1).

However, the distribution by risk factor varies from province to province. In particular, the distribution among risk categories in the province of Quebec is differ-

ent from distributions in other provinces. As of 19 September 1988, Quebec men admitting to homosexual or bisexual contact accounted for 67% of the cases, immigrants from endemic regions 15%, others with heterosexual contact 4.7%, and pediatric cases 4.9%. In contrast, the proportions in these risk categories in the rest of Canada were as follows: men with homosexual or bisexual contact 90%, immigrants from endemic regions 0.4%, others with heterosexual contact 1.5%, and pediatric cases 0.6%. However, the number of cases among immigrants from endemic regions in Quebec has remained relatively stable since mid-1984, and hence they account for a declining share of overall AIDS cases, a share currently representing about 10% of the new cases in Quebec.

### HIV Infection

Knowledge of the epidemiology of HIV infection in Canada is inadequate. Only limited seroprevalence studies among homosexual men have been carried out to date. Nevertheless, on the basis of several independent epidemiologic and mathematical approaches, we estimate

**Table 1.** Reported cases of AIDS in Canada, by province and risk category, up to 19 September 1988.

Category	Province or area									
	Ontario		Quebec		British Columbia		Other		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Adult cases in:</i>										
Homosexual and bisexual men	696	(89.9)	396	(66.9)	391	(94.0)	184	(83.3)	1,667	(83.2)
I.V. drug abusers	8	(1.0)	4	(0.7)	1	(0.2)	1	(0.5)	14	(0.7)
Recipients of clotting factors	11	(1.4)	16	(2.7)	2	(0.5)	10	(4.5)	39	(1.9)
Heterosexual immigrants from endemic regions	5	(0.6)	89	(15.0)	0	(0.0)	1	(0.5)	95	(4.7)
Others with heterosexual contact	10	(1.3)	28	(4.7)	7	(1.7)	4	(1.8)	49	(2.4)
Transfusion recipients	22	(2.8)	11	(1.9)	8	(1.9)	10	(4.5)	51	(2.5)
Persons with no identified risk	20	(2.6)	19	(3.2)	6	(1.4)	6	(2.7)	51	(2.5)
<i>Pediatric cases</i>	2	(0.3)	29	(4.9)	1	(0.2)	5	(2.3)	37	(1.8)
<i>Total cases</i>	774	(100)	592	(100)	416	(100)	221	(100)	2,003	(100)

that approximately 30,000 Canadians were infected with HIV as of early 1988. This estimate is necessarily crude, and the true number could be as low as 10,000 or as high as 50,000 individuals.

## Trends

Empirical models have provided a basis for tentatively projecting the future of the Canadian AIDS epidemic. As mentioned above, a polynomial model currently provides the best empirical fit for the epidemic curve. On the basis of this model, the Department of National Health and Welfare's Federal Center for AIDS has estimated that something like the following numbers of new cases will emerge in the next five years: 1988, 1,061; 1989, 1,407; 1990, 1,805; 1991, 2,252; and 1992, 2,748. The cumulative total reached by the end of 1992 would be approximately 11,000 cases.

## Costs

A recent study by the Royal Society of Canada reported its findings in April 1988. According to this study (1), the personal direct cost associated with a case of AIDS in Canada is about Can\$82,500 per year. The cumulative indirect costs of mortality range from Can\$300,000 to Can\$1,000,000 for a person 20 to 39 years old.

On this basis, the investigators estimated that the hospital costs for AIDS cases diagnosed from 1979 to November 1987 were approximately Can\$76 million, and that the personal direct costs would total nearly Can\$165 million by 1992. The indirect costs are probably much higher but are difficult to estimate. It was the conclusion of the study that the cost of caring for AIDS patients is considerable and will represent a substantial and growing proportion of health care expenditures in the future.

## CANADIAN RESPONSES

### Surveillance

Surveillance of AIDS and HIV infection is critical to successful public health efforts designed to prevent transmission and care for those infected. As with other communicable diseases, effective surveillance permits evaluation of the nature and scope of the infection, facilitates rational planning of health services, and provides grounds for the appraisal and appropriate modification of preventive programs.

Monitoring the occurrence of AIDS provides a highly specific surveillance tool, but one limited by the infection's long incubation period. Thus, the current AIDS incidence reflects transmission patterns of five to seven and more years ago. The other main limitation of AIDS surveillance is its inability to assess the full spectrum of morbidity and even mortality associated with HIV infection. Thus, although AIDS surveillance must be continued and strengthened, it alone cannot completely answer all our questions.

Other approaches to surveillance of HIV infection include monitoring sexually transmitted diseases with short incubation periods (e.g., gonorrhea and syphilis), studying high-risk sexual behaviors in our population, and conducting large-scale seroprevalence studies. Regarding the latter, anonymous unlinked studies of population-based serum samples provide the most unbiased estimates of underlying seropositivity and have the additional advantage of being rapid and affordable. These surveys are currently being planned for different regions of Canada. Although usually initiated as research studies, they can easily be modified for ongoing use as a surveillance system monitoring the spread of HIV infection.

## HIV Testing

HIV antibody tests are available free of charge to any Canadian who requests the test. Whether a test is clinically indicated or patient-initiated, all three prerequisites advocated by the World Health Organization for the testing of individuals must be fulfilled. These conditions are informed consent, adequate pre-test counseling combined with appropriate post-test counseling, and confidentiality.

HIV testing facilities were created in each province in 1985 to provide an alternative to the Red Cross Blood Transfusion Service Testing Program for determining infection status. This step was taken in order to discourage use of the Red Cross program by individuals at high risk, who might test negative during the period shortly after exposure to HIV, thereby potentially exposing patients transfused with their blood to the virus. The initial test is an enzyme-linked immunosorbent assay (ELISA) test that is both sensitive and simple. Positive specimens are subsequently checked using a confirmatory test such as the immunofluorescent assay (IFA). Specimens that are equivocal or indeterminate on IFA testing undergo Western blot testing or the radioimmunoprecipitation assay (RIPA). In general, the confirmatory tests are more specific than ELISA, but they are also complex and require expert interpretation. In Canada, seropositive results are not released to the physician without having been confirmed, a process that causes some delay.

In seven of Canada's 10 provinces, HIV seropositivity is reportable to public health authorities. One of these provinces conducts a contact tracing program based on traditional sexually transmitted disease control principles. The other six provinces use some form of passive system that places prime responsibility on the patient for notifying his or her part-

ners, with support from the public health service.

Since 1985, seropositivity rates among the individuals tested in all risk categories have fallen as the demand for testing has increased. Since the people coming in are self-selected, it is not possible to draw conclusions about the overall infection rate in Canada from testing service data.

No mandatory testing of anyone has been approved. Both the National Advisory Committee on AIDS (2) and the Royal Society of Canada (1) have recommended against screening immigrants, prisoners, and surgical patients, among others. The only people who are systematically screened are donors of blood, sperm, tissues, and organs. Hence, at present a system of voluntary testing of individuals for personal or clinical reasons, combined with anonymous screening of populations for epidemiologic purposes, comprises the HIV testing program in Canada.

Proposals have recently been developed for anonymous seroprevalence surveys (especially of women of child-bearing age) in order to obtain an epidemiologic picture of HIV's penetration among the general population. In 1987 the National Advisory Committee on AIDS approved the following conditions for conducting these surveys: (1) Ethically justified studies should only be conducted in a blinded, anonymous fashion. (2) In general, ethically justified studies should only be done on specimens that have been obtained for other routine tests. (3) Only demographic information that is routinely attached to specimens should be collected. (4) Voluntary HIV antibody testing under conditions of informed consent, pre-test and post-test counseling, and confidentiality must be accessible to people who are being seen in the proposed study setting. (5) Finally, all cell sizes used for pur-

poses of analysis must be large enough to preclude any possible intentional or inadvertent linkage to any individual by deduction.

## Education

AIDS is a behavioral disease, and the main risk behaviors are well-documented: unprotected sexual intercourse with an infected individual and sharing contaminated needles and syringes with an infected person. Although it is too early to fully evaluate the impact of AIDS education efforts, those that have been successful are those that have been carefully targeted, using specific messages and appropriate language. These initiatives have also gone beyond simple transfer of knowledge to provide motivation and emphasize the need to change attitudes and beliefs.

In Canada, where Can\$48 million will be spent on educating the public over the next five years, the first initiatives in AIDS education were taken by volunteer groups. They started community-based activities and health-promoting education programs in the early 1980s. Most major Canadian cities now have volunteer AIDS support committees conducting education, advocacy, and support activities. The education programs of these groups usually include information and "safer sex" campaigns, news releases, documentation centers, information kiosks, speaker's bureaus, and telephone services providing information on AIDS. Thirty community-based volunteer organizations are now active members of the Canadian AIDS Society, working together nationally for the prevention of HIV infections.

Municipal and provincial efforts vary in their intensity and funding commitments. The provinces with the highest AIDS incidence have not always been the most aggressive in their education strate-

gies; and the Federal Government has been innovative in giving part of the mandate for improving Canadian AIDS education and awareness to a nongovernmental organization, the Canadian Public Health Association.

This organization's AIDS program has a clearinghouse function, in that it provides a resource center and publishes a bimonthly newsletter, *The New Facts of Life*. Consultation, coordination, and research activities constitute a large part of the program. Seminars and conferences have been organized for professionals, workers, students, and the general public; and educational projects (such as production of a video and workbook on AIDS risk reduction in collaboration with the Canadian Labor Congress) have been set up. The program has been most visible in the media and advertising field, where it has launched a national public service campaign that has included development of four television and radio service announcements.

Although formal evaluation of most of these interventions is still pending, and although many other factors are involved, there is now some evidence of behavior changes in the gay population. For instance, among a cohort of 600 homosexual men followed at an average interval of 19.4 months between March 1984 and September 1986, the average annual number of sex partners declined from 7.7 to 6.4 (3). The seroconversion rates in this same cohort during five successive nine-month periods from November 1982 to July 1986 were 4.4%, 9.1%, 5.2%, 4.3%, and 1.7% (4). The observed decline in the infection rate has continued since then, the 1987 rate being estimated at 0.9% (5). Recent documentation of reduced rectal gonorrhea rates in Quebec beginning in 1986 (data from Regional Infectious Diseases Office, Montreal) and in Alberta (6) also provide evidence of sexual behavior changes in the

gay community. In addition, overall reductions in the incidence of sexually transmitted disease in Canada in 1986 could also point to rising public awareness of the danger and of the safer sex practices that tend to prevent infection (7).

## Research

Over the past five years, research on AIDS-HIV infection in Canada has occurred primarily in the three major urban centers with the highest AIDS incidence: Toronto, Montreal, and Vancouver. Research teams are now forming in other centers as the epidemic progresses.

AIDS research has placed new demands on institutional ethics review committees for critical scrutiny—not only of confidentiality provisions but also of methodologic issues. Also, perhaps more than any other disease in recent history, AIDS has stimulated the development of teams providing multidisciplinary care.

Canadian scientists have made important contributions in the AIDS field. Among other things, they obtained the first confirmatory evidence of antepartum vertical transmission (8), provided a risk analysis demonstrating that oral sex is low-risk (4), and performed animal model testing of a promising envelope glycoprotein 160 vaccine (9).

Canadian research is funded by various entities including the Federal Government, provincial governments, and private organizations. Federal research support is administered mainly by the National Health Research Development Program (NHRDP), to which Can\$35 million has been allocated for AIDS-related projects over the five-year period 1988–1992. This sum reflects a significant increase in the Federal Government's annual level of spending on AIDS research, which previously stood at approximately Can\$3.52 million. Other federal agencies

funding Canadian researchers include the Medical Research Council (MRC), the International Development Research Center (IDRC), and the Social Sciences and Humanities Research Council (SSHRC).

Combining federal funding with that of provincial and nonprofit private agencies, the total funding provided in fiscal year 1987–1988 was Can\$4.26 million. Analysis of the allocation of funds from all these sources by area of research during the two-year period 1986–1988 shows that 37% of these funds were spent on epidemiologic studies; 30% went for virology studies (most of this being spent to establish or improve laboratory facilities); and the remainder was distributed between immunologic (13%) and clinical (14%) investigations, with only 5% of the total going to research in economics and the other social sciences (10).

Current priorities of the major federal agency funding research (NHRDP) include encouragement of joint agency funding—such as NHRDP-IDRC funding of cooperative research initiatives in the developing world and NHRDP-SSHRC funding of social sciences research. Also, researchers who are new to AIDS are being encouraged to join established AIDS researchers in collaborative projects.

In general, Canadian researchers are looking forward to the opportunity for receiving their colleagues from around the world that will be offered by the Fifth International Conference on AIDS, which is to be held during June 1989 in Montreal.

## International Cooperation

Canada has important contributions to make in the international effort to prevent HIV infection. It possesses a long tradition of overseas commitments, and its bilingual heritage is an important asset.

However, AIDS has only recently come to receive priority among the overseas health commitments of Canadian institutions, and the funds involved are limited. For example, it is estimated that as of 1987 a total of Can\$15 million had been used to support Canadian international initiatives compared to Can\$2 billion spent on international AIDS research and training by the United States (R. Wilson, personal communication). However, in 1987 the Canadian International Development Agency (CIDA) contributed Can\$5 million to WHO's Global Program on AIDS, a further Can\$5 million was allocated for 1988, and an additional Can\$6 million is to be spent over the next five years.

We have also noted increasing collaboration between the Federal Center for AIDS, the Canadian Public Health Association, and Canadian funding agencies—these latter including the International Development Research Center, the National Health Research and Development Program, and various Canadian nongovernmental organizations. This collaboration has allowed better coordination in conducting AIDS awareness programs overseas. A good example of this increasing collaboration is provided by a research project on children and HIV infection that is jointly funded by IDRC and NHRDP, having been developed by Spanish and Canadian scientists.

Regarding human resource development in developing countries, there is a priority need for AIDS-related training in a broad range of fields including epidemiology, nursing care, laboratory work, health education, communications, service management, and evaluation (11). At this point the best approach to the problem through international cooperation would appear to be an integrated one directed at training primary health care workers and emphasizing partnerships with developing countries.

## CONCLUSIONS

Since there is still no treatment and no vaccine for AIDS, and since HIV is transmitted by human action, the principal way of preventing transmission and subsequent disease is through aggressive educational measures designed to change human behavior. In the past, public health interventions of this sort have proven effective in dealing with smoking, cardiovascular diseases, drug abuse, and other sexually transmitted diseases. There is some evidence that the HIV epidemic in Canada will not grow to be the same relative size as that found in the United States (1); but we can certainly learn from past experiences so as to improve our strategies for changing sexual behavior, thereby improving our chances for controlling the political and social consequences of this pandemic.

## REFERENCES

1. Royal Society of Canada. *AIDS: A Perspective for Canadians*. Ottawa, 1988.
2. Somerville, M. A., and N. Gilmore. Human Immunodeficiency Virus Antibody Testing in Canada. Federal Center for AIDS, Ottawa, January 6, 1988.
3. Willoughby, B., M. T. Schechter, W. J. Boyko, K. J. P. Craib, M. S. Weaver, B. Douglas, et al. Sexual Practices and Condom Use in a Cohort of Homosexual Men: Evidence of Differential Modification Between Seropositive and Seronegative Men. Paper presented at the III International Conference on AIDS held in Washington, D.C., 1-5 June 1987.
4. Schechter, M. T., W. J. Boyko, M. S. Weaver, et al. Progression to AIDS, Predictions of AIDS, and Seroconversion in a Cohort of Homosexual Men: Results of a Four-year Prospective Study. Paper presented at the III International Conference on AIDS held in Washington, D.C., 1-5 June 1987.
5. Willoughby, B., M. T. Schechter, B. Douglas, K. J. P. Craib, P. Constance, M. Maynard, et al. Risk Reduction and Sero-

- conversion in a Cohort of Homosexual Men. Paper presented at the IV International Conference on AIDS held in Stockholm, 12-16 June 1988.
6. Romanowski, B., and J. Brown. AIDS and changing sexual behavior. *Can Med Assoc J* 134:872, 1986.
  7. Todd, M. J., J. Doherty, A. G. Jessamine, and K. S. Hutchinson. Sexually transmitted disease in Canada, 1986. *Can Dis Wkly Rep* 14:85-88, 1988.
  8. Lapointe, N., J. Michaud, D. Peskovic, J. Chausseau, and J. M. Dupuy. Transplacental transmission of HTLV-III. *N Engl J Med* 312:1325-1326, 1985.
  9. O'Shaughnessy, M. V., M. Cochran, and G. Smith. HIV Verification Testing: A Comparative Study of the Immunoreactivity of a Cloned Envelope Protein (gp160) and Commercially Available Viral Lysate. Paper presented at the III International Conference on AIDS held in Washington, D.C., 1-5 June 1987.
  10. Heathcote, G. M. Research on AIDS and HIV in Canada: Recent and current funding. In: *Background Papers—AIDS: A Perspective for Canadians*. Ottawa, 1988.
  11. Canadian Society for Tropical Medicine and International Health. Canadian Human Resource Development Against AIDS in Developing Countries: Summary Report. Ottawa, February 1988.



### *V International Conference on AIDS*

From 4 to 9 June 1989, the V International Conference on AIDS will be held in Montreal, Canada. The themes to be discussed include AIDS and the individual; AIDS, society, and behavior; ethical and legal questions surrounding the epidemic; international considerations relating to AIDS; and the economic impact of AIDS. Inquiries should be addressed to Kenness Canada Inc., 1010 St. Catherine Street West, Suite 628, Montreal, Québec H3B 1G7, Canada; telephone (514) 874-4006.