HIV infection among Quebec women giving birth to live infants

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This is the first anonymous unlinked seroprevalence study in Canada to use serum samples from newborns to determine the seroprevalence rate of human immunodeficiency virus (HIV) infection among childbearing women. Of the 68 808 samples tested 42 were confirmed as positive, for an overall crude seroprevalence rate of 6.1 per 10 000 live births (95% confidence interval [CI] 4.4 to 8.3), or 1 woman in 1638. Women who lived on Montreal island had an overall rate of 17.9 per 10 000 live births (95% CI 12.2 to 25.4),, or 1 woman in 559. We observed a significant association between revenue index and seroprevalence; the rates were as high as 46.4 per 10 000 live births (95% CI 18.7 to 95.3), or 1 woman in 216, for Montreal island postal code areas with revenue indexes 20% or more below the provincial median. Extrapolation of the data suggested that 56 women with HIV infection gave birth to a live infant during 1989 in Quebec. Even though attempts to generalize the data from childbearing women to women of childbearing age have an inherent conservative bias, the results of our study suggest that 988 women (95% CI 713 to 1336) aged 15 to 44 years in Quebec had HIV infection in 1989. The actual number is likely substantially higher. The need for well-designed, creative interventions to prevent further HIV transmission to women is evident. Planning for the provision of medical and psychosocial services sensitive to specific needs of women who are already infected should start immediately.

Il s'agit de la première étude anonyme menée au Canada sur la séroprévalence à utiliser des prélèvements sanguins de nouveau-nés pour déterminer la séroprévalence du virus d'immunodéficience humaine (VIH) chez les femmes en âge de procréer. Des 68 808 échantillons testés, 42 étaient positifs, pour un taux de séroprévalence global non rectifié de 6,1 par 10 000 naissances vivantes (intervalle de confiance [IC] à 95% entre 4,4 et 8,3), soit 1 femme sur 1638. Le taux global chez les femmes habitant l'île de Montréal était de 17,9 par 10 000 naissances vivantes (IC à 95% entre 12,2 et 25,4), soit 1 femme sur 559. Il existe un lien révélateur entre l'index des revenus et la séroprévalence; les taux ont atteint 46,4 par 10 000 naissances vivantes (IC à 95% entre 18,7 et 95,3), soit 1 femme sur 216, pour les femmes des régions dont le code postal désigne les quartiers de l'île de Montréal où les revenus étaient inférieurs à 20% ou plus de la moyenne provinciale. L'extrapolation de ces données semble démontrer que 56 femmes infectées par le VIH ont donné naissance à un enfant vivant en 1989 au Québec. Bien que les tentatives pour extrapoler les données des femmes enceintes aux femmes en âge de procréer comportent des déviations, les résultats de notre étude suggèrent que 988 Québécoises (IC à 95% entre 713 et 1336) âgées de 15 à 44 ans ont présenté une infection par le VIH en 1989. Le nombre réel est vraisemblablement beaucoup plus élevé. La nécessité d'interventions créatrices bien structurées visant à freiner la transmission du VIH aux femmes est évidente. La planification de services psychosociaux et médicaux qui répondent aux besoins spécifiques de femmes déjà infectées devrait commencer sans délai.

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The magnitude of the acquired immunodeficiency syndrome (AIDS) epidemic in Canada during the 1990s will depend to a great extent on the current distribution and future spread of human immunodeficiency virus (HIV) infection in the population. Accurate estimates of the prevalence of HIV infection in Canada would greatly facilitate realistic planning for the treatment, care and support of Canadians who are already infected.[1-3] Knowledge of current patterns and temporal trends in the rates of HIV infection are important for evaluating the effectiveness of both general and targeted preventive efforts and for anticipating the need for changes in public policy.[4]

Estimates of the number of HIV-infected people in Canada have varied considerably. Numbers as high as 100 000 were reduced in 1987 after various backward and forward calculation methods produced results consistent with an estimate of 30 000.[5] There are still reports of wide variations in the estimated number of HIV-infected people in the United States despite a reduction from the 1986 estimate of 1 to 1.5 million[6] to the current estimate of 650 000 to 1.4 million derived by back-calculation methods[7] or 800 000 to 1.2 million determined on the basis of HIV seroprevalence data.[8] The range in estimates of future case loads is now being reduced because of the increasing availability of HIV seroprevalence data.

Population-based seroprevalence surveys and studies are part of a comprehensive, multifaceted approach to the monitoring of the HIV epidemic. A combination of results from studies in different populations will create a discernible mosaic of the pattern of HIV distribution across Canada.

Studies involving childbearing women provide an indication of the HIV infection rates and temporal trends in the rates among women of childbearing age. The generalizability of findings from such studies to all women of childbearing age is limited because seropositive women may be underrepresented in these studies if they are less likely to become pregnant than are seronegative women. This might occur if involuntary infertility were more prevalent as a complication of other sexually transmitted diseases or if voluntary infertility through contraception or abortion were more likely among seropositive than among seronegative women.

The HIV status of mothers can be conveniently determined by testing neonatal serum samples, since maternal anti-HIV IgG antibodies freely cross the placenta and appear in the neonate's blood in about the same concentration as in the mother's blood. Microtechniques for HIV antibody testing with the use of dried blood spots[9] have proficiency records equivalent or superior to test sequences performed with serum obtained through venipuncture (M.O.: personal communication, 1990). Blood samples on absorbent paper do not require refrigeration, and multiple specimens can be readily transported together in a plastic bag. This detection method provides information regarding the number of newborns carrying maternal HIV antibody but does not indicate the number of newborns who will actually be infected, since reported rates of vertical transmission have varied between 24% and 65%.[10-13]

Methods

Surplus blood samples obtained by means of heel-prick from newborns 2 to 7 days old for routine screening for genetic disorders such as hypothyroidism and phenylketonuria were used to determine the HIV seroprevalence rates among Quebec women delivering live infants.

In Quebec all specimens collected on filter paper for genetic screening are sent to the Réseau de médecine génétique, in Ste-Foy, PQ. Before any serologic testing was done the study samples and the accompanying demographic data were irretrievably unlinked from any nominal information that could identify either the infant or the mother. This link was broken after the demographic data (month of birth, first three digits of the mother's postal code, hospital of birth, age at which the sample was taken) had been transferred from the nominal file for genetic screening to the study file and before a random code was assigned to the data and the sample. The samples and the pertinent data were then sent to the Centre d'études sur le SIDA (CES), Department of Community Health, Montreal General Hospital.

A 3-month pilot period, from Oct. 1 to Dec. 31, 1988, was used to establish the laboratory, transportation and data analysis procedures. During this period the public relations strategy was launched. It included the distribution of a pamphlet through the 32 health units to every pregnant woman; this distribution was continued throughout the study period. The pamphlet gave information on the universal availability of HIV antibody testing on a voluntary, free-of-charge, confidential and, if desired, anonymous basis. The parents of all newborns in Quebec received the standard pamphlet from the Réseau de médecine génétique, which had been modified to indicate that newborn blood samples were being used in epidemiologic projects such as the anonymous surveillance of HIV prevalence among pregnant women. A total of 8065 general practitioners, obstetricians, pediatricians and hospital directors received a letter describing the study and a copy of the pamphlet for pregnant women. Finally, a media release describing the study in lay terms was distributed, especially to journalists

known to be working on AIDS topics. Once the main study was under way the Quebec Council on the Status of Women and the Quebec Ministry for the Status of Women were contacted to discuss the study methods and to allow for the preparation of comments before the release of any results.

From Jan. 1 to Dec. 31, 1989, 91 049 (provisional) births occurred in Quebec. Dried blood spots on filter paper were available for 89 594 (98.4%). After all but the first sample from multiple births had been removed to ensure that each mother was represented only once the total number was 88 963. When the link to the nominal information was broken 57 samples were lost. A 90% random sample was created from the remaining 88 906 samples by systematically discarding those with a randomly assigned code ending in a particular number.

The CES forwarded 81 145 (91.3%) of the samples, of which 115 (0.14%) were inadequate for testing, to the Bureau of Laboratory and Research Services, Federal Centre for AIDS, Ottawa. To date, 68 808 (84.9%) of the eligible samples have been tested. The microtechniques used, developed by Hoff and associates,[14] were as follows. A 6.3-mm punched-out disk of filter paper saturated with blood was eluted overnight in microplate wells containing phosphate-buffered saline–Tween 80 (pH 7.2; 0.05% Tween 80 and 0.005% sodium azide). Enzyme-linked immunosorbent assay (ELISA) was performed with the use of a commercial kit (Genetic Systems, Seattle). Reactive samples were those with optical densities equal to or greater than the cut-off density, which was calculated from the average of the negative control samples plus 0.225. In addition, all samples with optical densities within a grey zone (cut-off density less 10%) underwent a supplemental test. Positive reactions were validated by means of a micro Western blot technique, the minimal criteria for a positive result being an antibody reaction to any envelope band (gp160, gp120 or gp41) and to the gag antigen p24. Specimens exhibiting indeterminate results with the Western blot technique were tested by means of radioimmune precipitation assay (RIPA).

The data were analysed at the CES for each quarter of 1989. The HIV seroprevalence rates were calculated for the overall sample and by hospital of birth. The rates were determined according to the first three characters of the postal code — the forward sortation area (FSA). Confidence intervals (CIs) were calculated with the use of the exact binomial distribution.[15] Postal code information was not available for 1642 (2.4%) of the samples tested. One of those, from a newborn delivered in a Montreal hospital, was confirmed as positive. We assigned it to a Montreal island residence for analysis purposes on the basis that most women (64%) giving birth at Montreal hospitals actually reside on the island.

We created a crude socioeconomic status profile of the mothers of seropositive newborns using information from Statistics Canada on the revenue status of income tax filers in Quebec by postal code for 1986.[16] This databank provides median total income figures by FSA in urban areas and by postal code in rural areas. The median total income for both sexes in each postal code area is compared with the relevant provincial median and expressed as an index. An index of 80 indicates that the median total income for the area is 20% lower than the provincial median. We compared the revenue indexes of FSAs on the island of Montreal containing seropositive samples with those of areas with no seropositive samples, weighted for the number of specimens tested in each postal code area. A weighted revenue profile by postal code for all Montreal women delivering live infants in 1989 was compared with a weighted revenue profile of the total population filing income tax returns in each postal code area so that we could determine whether HIV-infected women giving birth to live infants are more likely than noninfected mothers to reside in areas with lower revenue percentiles. Finally, the seroprevalence rates for Montreal island were calculated by revenue index category.

To estimate the total number of women with HIV infection who gave birth to a live infant in 1989 we applied the seropositive rate for Montreal island to the provisional number of births in 1989 to women with a Montreal island residence. The same procedure was used for areas outside Montreal island, and the estimates were combined.

We calculated a crude estimate of the number of Montreal women with HIV infection by applying the seroprevalence rates for Montreal island postal code areas to 1986 census data concerning the distribution of women by postal code in the age group 15 to 44 years. This number was then compared with the number obtained through a simple application of the Montreal residence point estimate to the overall population of women aged 15 to 44 years on Montreal island, and CIs were calculated by means of the exact binomial distribution. This method was then used to estimate the number of women of childbearing age infected with HIV in metropolitan Montreal and in Quebec as a whole.

Finally, the provincial seroprevalence rate among childbearing women, as determined by our study, was used to estimate the number of children born in Quebec during 1989 in whom AIDS will develop within the first year of life.

Results

On initial testing 194 samples (0.28%) repeated-

ly had reactive ELISA results. Of the 34 samples that had indeterminate results on the Western blot technique 1 was confirmed as positive by means of RIPA. After confirmatory procedures 42 samples were found to be positive; the overall seroprevalence rate was 6.1 per 10 000 live births (95% CI 4.4 to 8.3), or 1 woman in 1638. The quarterly provincial estimates varied from 4.2 to 8.4 per 10 000 live births (Table 1).

Among women giving birth in Montreal the overall seroprevalence rate was 12.1 per 10 000 live births (95% CI 8.3 to 17.0), or 1 woman in 825; the quarterly estimates varied from 8.5 to 18.8 per 10 000 live births (Table 1). Among women residing on Montreal island the overall rate was 17.9 per 10 000 live births (95% CI 12.2 to 25.4), or 1 woman in 559. The quarterly rates varied from 13.0 to 27.8 (Table 1). Seasonal differences were not statistically significant by chi-squared analysis for any of the strata. One specimen with an indeterminate HIV-1 status by the Western blot technique (gag plus pol, no env) was found to be HIV-2 positive by that technique and RIPA.[17]

The number of mothers with HIV-1 infection distributed by postal code varied from one to seven and the rates 0 to 146.4 per 10 000 live births (Fig. 1). Montreal island postal code areas in which seropositive mothers resided had a weighted revenue index of 93.6, as compared with 108.8 for areas with no seropositive mothers. In contrast, women in general who gave birth to a live infant in 1989 and who resided on Montreal island had a weighted revenue index of 104.0, as compared with 101.2 for the general Montreal island population. A significant positive linear trend was observed when seroprevalence rates for Montreal island were analysed according to revenue index groups (Table 2). The rates varied from 5.6 per 10 000 live births for indexes above 120 to 46.4 for indexes below 80 ($\chi^2 = 10.8$, $p = 0.001$).

The crude estimate of the number of women with HIV infection aged 15 to 44 years on the island of Montreal was 679 when the seroprevalence rates were applied to 1986 census data by postal code and 688 when the residence point estimate was applied to the overall population of Montreal women in the same age group. The 95% CI for the latter estimate was 468 to 976 women.

The Montreal island data were combined with the data for the island of Laval to create an overall metropolitan Montreal residential rate of 16.2 per 10 000, or 1 mother in 616. This point estimate, when applied to the total population of women aged 15 to 44 years, gave an estimate of 821 infected women residing in the metropolitan Montreal area (95% CI 563 to 1153). The overall provincial rate applied to the total population of women of childbearing age in Quebec yielded a provincial estimate of 988 infected women (95% CI 713 to 1336).

An estimated 56 women with HIV infection

Table 1: Quarterly rates of human immunodeficiency virus (HIV) seroprevalence among childbearing women in Quebec, 1989

Group	No. of births†	No. of HIV-positive samples	Seroprevalence rate per 10 000 live births	95% confidence interval (CI)	1 mother in
January–March					
Montreal island residence	4 676	13	27.8	14.8–47.5	360
Montreal hospitals	7 439	14	18.8	10.3–31.6	531
Quebec	19 095	16	8.4	4.8–13.6	1 193
April–June					
Montreal island residence	5 041	7	13.9	5.6–28.6	720
Montreal hospitals	7 832	7	8.9	3.6–18.4	1 119
Quebec	19 404	10	5.2	2.5–9.5	1 940
July–September					
Montreal island residence	4 543	7	15.4	6.2–31.7	649
Montreal hospitals	7 251	8	11.0	4.8–21.7	906
Quebec	18 248	11	6.0	3.0–10.8	1 659
October–December*					
Montreal island residence	3 081	4	13.0	3.5–33.2	770
Montreal hospitals	4 711	4	8.5	2.3–21.7	1 178
Quebec	12 061	5	4.1	1.4–9.7	2 412
Total					
Montreal island residence	17 341	31	17.9	12.2–25.4	559
Montreal hospitals	27 233	33	12.1	8.3–17.0	825
Quebec	68 808	42	6.1	4.4–8.3	1 638

*Data collection incomplete for this quarter.
†Numbers adjusted for multiple births.

gave birth to a live infant during 1989 in Quebec (95% CI 40 to 75). If one assumes that AIDS will develop within the first year of life in 5% to 20% of infants born to such women,[18] then 2 to 15 infants will have AIDS. With estimated vertical transmission rates of 30% to 50% an additional 5 to 31 infants will have HIV infection but not AIDS by their first birthday.

Discussion

The blood samples collected from newborns for genetic screening were well suited for our large-scale epidemiologic study. Compliance with the screening program was excellent; fewer than 2% of the infants were not screened, presumably because it had been either refused or overlooked, or the newborn had died before the sample could be taken. The transportation and handling of the samples on filter paper was conducted with ease because of the stability of dried blood spots at room temperature for 30 days and at 4°C for 90 days.

The microtechnique algorithm performed well, 42 (21.6%) of the 194 repeatedly reactive ELISA results being confirmed by the Western blot technique or RIPA, or both. Despite the fact that the cutoff point was set below the manufacturer's recommended level in order to improve the test sensitivity, likely a small but finite number of true-positive samples were undetected. However, no additional true-positive samples were detected after further analysis of samples whose optical density fell within the grey zone. As with any sampling strategy there were probably seropositive specimens among those not sent for testing or among those waiting to be tested, although the calculation of 95% confidence limits accommodates any resultant random variation.

The provincial seroprevalence rates were higher than originally expected from AIDS case surveillance

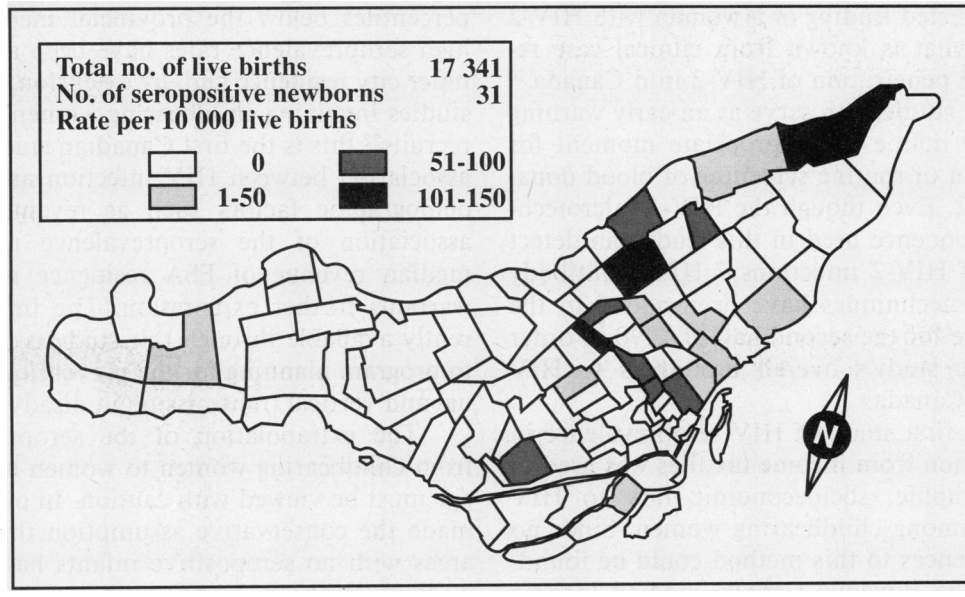

Fig. 1: Human immunodeficiency virus seroprevalence rates by first three digits of postal code (forward sortation area) for Montreal island, 1989.

Table 2: HIV seroprevalence rates among childbearing women with a Montreal island residence by revenue index, 1989

Revenue index*	No. of births	No. of seropositive samples	Seroprevalence rate per 10 000 live births	95% CI	1 woman in
60–79	1 510	7	46.4	18.7–95.3	216
80–99	5 780	15	26.0	14.5–42.8	385
100–119	6 458	7†	10.8	4.4–22.3	923
120–139	2 865	2	7.0	0.9–28.1	1 433
≥ 140	728	–	–	0.0–50.5	–
Total	17 341	31	17.9	12.2–25.4	559

*Weighted population revenue index for Montreal island is 101.2.
†Includes one sample assigned to Montreal island residence for which postal code information was unavailable.

information and data from the Blood Transfusion Service of the Canadian Red Cross. The variation in quarterly rates was not significantly different whether for the province as a whole, the Montreal hospitals or Montreal island residence. However, the rates underline the need to use full-year sampling in addition to calculation of CIs in such a study to smooth out the effects of seasonal differences due to chance variation. As this study is still under way temporal trends will be monitored with the use of data from the 1990 birth cohort.

In Quebec 130 AIDS cases among women have been reported as of July 15, 1990.[19] This represents 56.8% of the total cases among Canadian women. Since most people with AIDS in Quebec reside in the Montreal area the concentration of 31 of the 42 mothers with HIV infection on Montreal island is to be expected. The Montreal hospital rate was lower than the residence rate because many women living near Montreal who are apparently at low risk for HIV infection give birth in Montreal hospitals.

The unexpected finding of a woman with HIV-2 complements what is known from clinical case reports about the penetration of HIV-2 into Canada.[20] Seroprevalence studies can serve as an early warning system to help define the appropriate moment for the introduction of routine screening of blood donations for HIV-2. Even though the HIV-1 microtechnique testing sequence used in this study can detect 80% to 90% of HIV-2 infections,[17] HIV-2 antibody screening microtechniques have been added to the testing sequence for the second half of 1990 in order to increase the study's overall usefulness to HIV surveillance in Canada.

This is the first study of HIV seroprevalence in which information from income tax files was used to create a geographic, socioeconomic link to HIV seropositivity among childbearing women. Since no published references to this method could be found, we compared the Revenue Canada median income tax filer profiles for 1986 by Montreal FSA with the 1986 census data on median household income by Montreal FSA using a conversion program[21] after weighting for the number of households and converting into an index. The variance between the revenue indexes by postal code area was not statistically significant, as determined by Student's *t*-test ($p = 0.57$). The data from Revenue Canada, which is published annually, may be a useful indicator of socioeconomic status in studies conducted between census years. Researchers interested in health studies involving women should be alert, however, to the biases evident in this approach. First, in 1986, 63% of Canadians filed income tax returns, most children and a large portion of the elderly population not filing. Since people without an income tend not to file returns, the actual median incomes by postal code and those for Quebec and Canada are likely to be an overestimate. Second, the overall revenue index status of a postal code area cannot be presumed to reflect also the socioeconomic status of childbearing women residing in that area. It does reflect the socioeconomic status of the pregnant woman's immediate neighbourhood. Third, it is important to calculate a weighted revenue index for all women giving birth to live infants in order to ensure that the lower revenue indexes for postal code areas with seropositive samples do not simply reflect the overall revenue index status of childbearing women. In addition, this weighted revenue index must then be compared with a weighted index for all tax filers to verify that women giving birth to live infants are similar to the general population with respect to the socioeconomic status of their residential surroundings.

The results of our study clearly demonstrate a tendency for HIV-infected mothers on the island of Montreal to reside in postal code areas with revenue percentiles below the provincial median. Although high seroprevalence rates have been associated with inner city residence and, by extension, poverty in US studies involving childbearing women[14] and military recruits[22] this is the first Canadian study to report an association between HIV infection and geographic–demographic factors such as revenue status. The association of the seroprevalence rates with the median revenue of FSA residence is striking and warrants further exploration. The information currently available through this study is highly relevant to program planning for the prevention of heterosexual and vertical transmission in disadvantaged areas.

The extrapolation of the seroprevalence data from childbearing women to women of childbearing age must be viewed with caution. In our methods we made the conservative assumption that postal code areas with no seropositive infants have no infected women. Without being unnecessarily alarmist we believe that the overall estimate of 988 women aged 15 to 44 years with HIV infection in Quebec is likely an underestimate. Although the lower confidence limit on this modest estimate suggests that as few as 713 women may be infected, the true number is probably much closer to the upper confidence limit of 1336.

Since our study suggests that between 40 and 75 women in Quebec gave birth to a seropositive infant in 1989 questions may be raised about whether policies should be introduced that would establish standard procedures for the nominal testing of newborns or for routine prenatal screening among women. The first option requires a demonstrated value for the early detection of HIV infection in infants, including licensed, effective therapy for asymptomatic HIV-infected children who would otherwise

not benefit from therapy because of nondetection. Not only are these clinical indications currently nonexistent, but considerable expense and harm could be incurred by the identification and concomitant psychosocial and medical management of newborns who are seropositive but not HIV-infected. Arguments in favour of the second option focus mainly on the possibility of offering abortion services to pregnant women whose HIV seropositivity status is determined early in pregnancy. Little is known about the reproductive intentions of nonpregnant HIV-infected women in Quebec. In other settings HIV seropositivity has not been found to influence reproductive decision-making with respect to either abortion or contraception.[23,24] Complementary, unlinked seroprevalence studies of women presenting for abortion have begun in Quebec and Ontario that may provide additional information on the impact of seropositivity on reproductive decision-making. The results of these studies may influence the direction of policy-making pending the demonstrated efficacy of treatment regimens among newborns and pregnant women.

Significant effort has been made to improve the accuracy of estimates of HIV infection rates in order to predict future AIDS case loads and plan the provision of health care. Three of the methods most frequently used to date — calculation of HIV-infection:AIDS ratios, simple extrapolation of data on the incidence of AIDS with the use of mathematical models[25] and back calculation[26] — rely on AIDS case surveillance data. Therefore, the accuracy of these techniques depends highly on both the quality of available supporting epidemiologic data and the inherent limitations of the models used. According to information from cohort studies AIDS case reporting in Canada reflects an estimated 82% to 88% of the actual number of AIDS cases.[27] In addition to underreporting, if AIDS case surveillance data are used as cornerstone information allowances must be made for both reporting delays and the introduction of the new case definition for AIDS by the US Centers for Disease Control, Atlanta, in 1987.[28] The extrapolation method used in reports from the Federal Centre for AIDS currently predicts by 1993 a cumulative number of 7648 AIDS cases in Canada by means of a logistic model and 12 890 by means of the polynomial model.[29] The average cost of treatment has been estimated to be at least $82 500 in direct personal care;[30] therefore, the difference between those projections represents more than $432 million, a cost variation substantial enough to hinder rational planning for the provision of health care.

A new method has recently been reported in San Francisco for the projection of numbers of AIDS cases. It is the first one to be designed on the basis of a convolution model. The distribution of AIDS cases is calculated as the convolution of the distributions of both HIV infection and the incubation period, the latter estimated to be from 10.6 to 13.0 (median 11.0) years.[31] The assumed distributions of HIV infection are based on actual HIV seroprevalence surveillance data and estimates of the size of the populations at risk. This approach holds promise for more complete and accurate predictions. Our study will help considerably to improve predictions of the number of AIDS cases among childbearing women and among women of childbearing age in Quebec.

The introduction of the anonymous unlinked seroprevalence method for the determination of HIV infection rates in Canada required careful consideration of the ethical implications of testing without explicit consent from people. A person's decision to undergo HIV antibody testing may be influenced by many factors, including the availability of services, confidentiality, access to psychosocial and medical treatment, and the existence of antidiscrimination legislation. In 1987 the World Health Organization (WHO) recommended that no test for HIV infection should be performed unless the conditions of informed consent, the provision of appropriate counselling before and after testing and the confidentiality of records could be met.[32]

If HIV seroprevalence studies were to be conducted under conditions approved by the WHO, the basic right to refuse to participate might lead to biased results. Willingness to participate in a national HIV seroprevalence study was assessed in the United States; of 17 696 people 69% agreed, 21% refused, 7% were undecided, 2.5% gave an unspecific answer, and fewer than 1% gave no answer.[33] If those least willing to participate were more likely than others to be infected, then serious underestimates of the true extent of the epidemic would result. For example, in a sexually transmitted diseases clinic in Albuquerque, NM, the HIV seroprevalence rate was five times higher among those who refused to participate but whose blood sample was tested after unlinking than among those who agreed to participate in a nominal testing project.[34]

Blinded seroprevalence studies, in which specimens are irrevocably unlinked from nominal information before any testing, clearly permit the most acceptable compilation of accurate, comprehensive information on HIV infection rates in the community[35] as long as safeguards are introduced that respect individual rights. A consensus meeting of Canadian experts in ethics, law, medicine, theology, nursing, philosophy and public health examined ethical and legal considerations in the conduct of anonymous unlinked HIV seroprevalence research in Canada.[36] Internationally these guidelines are viewed as exemplary and are now considered to be the model for the thorough examination of the ethical and legal issues

posed by population-based epidemiologic studies of HIV seroprevalence.[37] In addition to basic requirements for the ethical conduct of these studies the Canadian guidelines emphasize the responsibility of researchers to anticipate, to a reasonable extent, the special communication needs of the population being tested. Communication with the public is to be clear and balanced, and researchers are to inform and educate physicians about the rationale for the use of unlinked HIV antibody testing for nontherapeutic purposes. The potential for indirect harm to groups of people should be anticipated, and, when relevant, specific interest groups should be involved in developing the communication plan for potentially sensitive research results.

The experience in our study has been that the general population readily supports unlinked studies in which careful attention is paid to ensuring that both study design and conduct protect the privacy of people and that the results are communicated to the study group and to the population in general in an understandable and respectful fashion.

The seroprevalence rates among childbearing women in Montreal are clearly cause for concern, and the need for creative interventions to prevent further HIV transmission to women is evident. Planning for the provision of medical and psychosocial services sensitive to the specific needs of women who are already infected should start immediately.

We thank Jean Morissette, MSc, Réseau de médecine génétique, Centre hospitalier de l'université Laval, Ste-Foy, PQ, for supervising the retrieval of samples and the entry of data; Sylvie Gendron, BScN, DPH, and Marcel Parent, MD, Département de santé communautaire, hôpital général de Montréal, for assisting with the feasibility assessment and cartography respectively; and Debbie Lepine, BSc, Laurie Malloch, BSc, Françoise Beaudoin, BSc, Diane Grummisch, RT, and Lynda Healey, BSc, Bureau of Laboratory and Research Services, Federal Centre for AIDS, Ottawa, for handling and testing the filter-paper samples.

This study was supported by grant 6605.3154.AIDS from the National Health Research and Development Program, Department of National Health and Welfare.

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19. *Surveillance des cas du syndrome d'immunodéficience acquise (SIDA)*, Centre d'études sur le SIDA, Québec, July 15, 1990
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Conferences

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Feb. 21-24, 1991: Pan-American Doctors' Club (Canadian section) 45th Meeting
Manzanillo, Mexico
Dr. Donald P. Hill, vice-president, Medical Affairs, Continuing Medical Education, Ottawa General Hospital, 501 Smyth Rd., Ottawa, Ont. K1H 8L6; (613) 737-8455

Feb. 25-Mar. 1, 1991: College of Family Physicians of Canada (Alberta Chapter) 36th Annual Scientific Assembly
Banff Park Lodge, Banff, Alta.
Mrs. E. Taschuk, administrative secretary, Alberta Chapter, College of Family Physicians of Canada, PO Box 3846, Stn. D, Edmonton, Alta. T5L 4K1; (403) 456-1518

Feb. 26-Mar. 2, 1991: 7th International Hypoxia Symposium — High Altitude Physiology and Medicine (sponsored by McMaster University and the Arctic Institute of North America in conjunction with the International Society for Mountain Medicine)
Chateau Lake Louise, Lake Louise, Alta.
Ingrid Ellis, conference coordinator, Rm. 1M10, McMaster University, 1200 Main St. W, Hamilton, Ont. L8N 3Z5; (416) 525-9140, ext. 2182

Mar. 8-9, 1991: 1st European Congress on Ambulatory Surgery
Brussels Congress Centre
Official language: English (simultaneous interpretation into French and Dutch)
Abstract deadline is Nov. 15, 1990.
Administrative Secretariat, European Congress Consultants and Organizers, rue Vilain XIIII, 17a, B-1050, Brussels, Belgium; telephone 011-32-2-647-87-80, FAX 011-32-2-640-66-97

Apr. 21-24, 1991: Canadian Organization for the Advancement of Computers in Health (COACH) 16th Annual Conference
Sheraton Centre, Toronto
Steven A. Huesing, executive director, Canadian Organization for the Advancement of Computers in Health, 1200-10460 Mayfield Rd., Edmonton, Alta. T5P 4P4; (403) 489-4553, FAX (403) 489-3290

Apr. 24-26, 1991: Western Phlebology Conference (18th Annual Meeting of the Canadian Phlebology Society)
Chateau Whistler Resort, Whistler, BC
Abstract deadline is Dec. 1, 1990.
Dr. Louis Grondin, scientific director, Western Phlebology Conference, c/o Ste. 10, 1420-40 Ave. NE, Calgary, Alta. T2E 6L1; (403) 250-3526, FAX (403) 291-9755

May 12-14, 1991: Canada's National Safety Conference — Safety Starts in Your Community
Hamilton, Ont.
Canada Safety Council, 6-2750 Stevenage Dr., Ottawa, Ont. K1G 3N2; (613) 739-1535, FAX (613) 739-1566

May 13-14, 1991: Canadian Life Insurance Medical Officers Association 46th Annual Meeting
Quebec
Dr. J.L. Guy Tremblay, La Solidarité compagnie d'assurance sur la vie, 925, ch. St-Louis, Québec, PQ G1S 1C1; (418) 688-8710, ext. 273

May 13-16, 1991: 7th World Congress on Emergency and Disaster Medicine
Palais de Congrès, Montreal
Ms. Ursula Schwarz, Meeting Secretariat, Kush Medical Communications, 210-16 Four Seasons Place, Etobicoke, Ont. M9B 6E5; (416) 621-5663, FAX (416) 621-5352

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