

Health Status on Canadian Indian Reserves 1971-1984.

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## Abstract

This thesis examines life expectancy and mortality rates on Canadian Indian reserves in Quebec, Ontario, and Manitoba during two time periods, 1971-77 and 1978-84. Life expectancy increased among Indians narrowing the gap between Canadians and Indians from 6 to 2 years. Increased age-standardized mortality rates were observed whether Indians were compared to the total provincial population or to non-natives living in the same county as Indian reserves. There was notable improvement in all-cause mortality and, particularly, deaths from accidents and violence, fires, infectious and parasitic diseases, pneumonia, and suicide. There was no improvement for deaths from drowning, alcoholism, cirrhosis of the liver, cervical cancer, and diabetes. Nevertheless, mortality and life expectancy was worse among Indians during each period for all causes of deaths except some neoplasms.

Cette thèse étudie l'espérance de vie et les taux de mortalité dans les réserves indiennes du Canada situées dans les provinces du Québec, Ontario, et Manitoba pendant deux périodes, 1971-77 et 1978-84. L'espérance de vie a augmenté parmi les Indiens, diminuant la différence entre les Indiens et les Canadiens de 6 à 2 ans. Les taux ajustés selon l'âge étaient élevés si les Indiens étaient comparés à l'ensemble de la province ou aux personnes non-indiennes demeurant dans le même comté que les réserves. Il y avait une amélioration remarquable des taux de mortalité pour toutes causes confondues et, particulièrement, pour les décès par accident et violence, incendie, maladies infectieuses, parasitoses, pneumonie, et dans quelques provinces le suicide. Il n'y avait pas d'amélioration pour les décès par noyade, alcoolisme, cirrhose, cancer du col et diabète. Néanmoins, les taux de mortalité et l'espérance de vie étaient toujours pire parmi les Indiens pendant chaque période pour toutes les causes de mortalité sauf quelques sièges de cancer.

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## CHAPTER 1: INTRODUCTION

Despite improvements over the past ten to twenty years, mortality rates for Indians remain well above the national average (Mao et al., 1986). For all age groups, except those over 50 years, Indian mortality rates are presently two to three times the national average (Mao et al., 1986). The mortality experienced by Indians living on reserves is known to differ significantly from that of other Canadians. Indians are at increased risk of death for almost all causes of death, with the exception of neoplasms. Particularly elevated causes of death are all forms of accidents, respiratory disease, and infectious and parasitic diseases (Mao et al, 1986; Young, 1983b).

Although the Indian population still retains certain demographic features of a developing, non-industrialized society, epidemiologically it has "graduated" from the disease patterns characteristic of the Third World (Young, 1983a). For example, in sharp contrast to Third World countries, where infectious and parasitic diseases account for one third to one half of all deaths, less than five percent of deaths among Indians are due to these causes (Young, 1983a). Rather, injuries and poisonings are a major health problem and account for thirty percent of Indian deaths, one of the highest proportionate mortality rates in the world (Young, 1983a).

A diverse group of government agencies is responsible for the many facets of Indian health care and administration. The National Department of Health and Welfare places a high priority on promoting Indian health. Its Indian Service Bureau, part of the Medical Services Branch, has the mandate to provide health service to all status Indians and to those people residing above the sixtieth parallel, while its Health Protection Branch has the mandate to conduct

health surveillance and disease control in Canada including the Indian population. Indian and Northern Affairs Canada (INAC) maintains an Indian Registry to administer and record the vital statistics of the status Indian population. Additional demographic data about the Indian population are obtained by the Census conducted every five years by Statistics Canada and from the vital statistics division of Statistics Canada.

Data from these sources have been used in this thesis to examine the health status (defined as life expectancy and mortality risks) of residents of Indian reserves. Mortality on Indian reserves in five provinces (Quebec, Ontario, Manitoba, Saskatchewan, and Alberta) is compared to that in two different reference populations: 1) the total provincial population; 2) the non-Indian population living in the same counties as Indian reserves. The life expectancy and mortality risks for residents of Indian reserves between two time periods are also compared.

Mortality data have been obtained from the Canadian Mortality Database at Statistics Canada for each of the three populations. Population data for Indian reserves have been obtained from the INAC Indian Register. Population data for the two reference populations were obtained from the 1976 and 1981 Statistics Canada Censuses.

From these data, crude age-specific and age-standardized mortality rates were calculated to compare the mortality experience of residents of Indian reserves between 1971-77 and 1978-84 and to compare mortality on Indian reserves for each time period to both reference populations. Age, sex, and cause-specific mortality rates for Indian reserves and each of the two reference populations have also been compared.

The comparison of two time periods and the use of a subset of the entire Canadian population with similar demographics as the Indian reserves as a

reference to assess Indian health status have not previously appeared in the literature. Thus, this study will be useful in Indian health policy and program development and will provide a clearer picture of health changes over time.

## CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

### INTRODUCTION

As the Canadian Indian population continues to undergo rapid political and sociological changes, the health status of native Canadians needs to be re-examined on a regular basis to aid health planners and service providers. It is immediately important to establish reliable baseline mortality rates. Few epidemiological studies have examined mortality among the Canadian Indian population and data on the Canadian Inuit (Eskimo) are also scarce. It is important, however, to examine these studies for their strengths and weaknesses, so that future studies will be effective.

#### The Indian People

Native people are a small proportion of Canada's total population, with the 1981 census counting about a half a million individuals who reported native ancestry. They fall into four broad groups: status Indians, non-status Indians, Métis, and Inuit (Statistics Canada, 1981). Status Indians are native people who meet the criteria for registration under the Indian Act<sup>1</sup>. Non-status Indians are native people who identify themselves as Indians but do not meet the criteria for registration. The Métis are descendants of people of mixed aboriginal and European ancestry who formed a distinct socio-cultural entity in the nineteenth century. The Inuit are a distinct cultural group who generally live north of the tree line, most of whom share a native language, Inuktitut (Statistics Canada, 1981).

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<sup>1</sup> The legal status of "Treaty" or "registered" Indians is defined by the Department of Indian and Northern Affairs under the Indian Act of 1959.



In the 1981 census, 60 % of native people were status Indians and 20 % were Métis. Non-status Indians and Inuit accounted for 15 and 5 % of the native population, respectively. The 292,700 individuals who identified themselves as status Indians in the 1981 census constituted just one percent of the total Canadian population (Statistics Canada, 1981)

Status Indians are not evenly distributed across the country. East of Manitoba, they constitute less than one percent of the population. In the Prairie provinces and British Columbia, they represent about 1 to almost 4 percent of the population. In the Northwest Territories, although 60 percent of the people claim a native origin, only 6 percent are actually status Indians. In the Yukon, 8 percent of the population are status Indians (Statistics Canada, 1981).

Indian reserves are territories established by treaties between the federal government and Indians. Although status Indians are the only native group with significant numbers living on reserves, less than 60 percent of all status Indians actually reside on reservations. However, in every province, more than half of the status Indians live on reserves (Statistics Canada, 1981).

About 40 % of native people make their homes in urban areas compared with nearly 80 % of Canadians. Native people are also less apt to live in very large cities. Only 24 percent of natives were in cities with populations greater than 100,000 in 1981 while 52 percent of non-natives lived in these same regions. The census indicated that non-status Indians most favoured urban living: seven out of ten were in urban areas as were six out of ten Métis. By contrast, just 20 % of Inuit and 30 % of status Indians were city dwellers (Statistics Canada, 1981).

Officially, the health of status Indians in Canada is the responsibility of the the Medical Services Branch of the Department of National Health and Welfare,

but it actually provides only about 15 percent of treatment services delivered to native people. Most services are provided by private practitioners, university faculties of medicine, work-sharing arrangements with other levels of government and, increasingly, programs run by native communities (Health and Welfare, 1983).

### **PATTERNS OF MORTALITY AMONG THE CANADIAN INDIAN**

The mortality experience of native groups is known to differ significantly from that of other Canadians. In a nationwide study of mortality on Indian Reserve Areas (1977-82), Mao and his colleagues (1986) found that almost half of the deaths were due to accidents, poisoning and violence. Increased mortality was also observed for infectious and parasitic diseases, pneumonia, alcoholism, cirrhosis of the liver, diabetes, and kidney disease (Table 1). Mortality rates for cancer were lower than those experienced by the Canadian population as a whole.

Young (1983b) found a generally similar pattern in the Sioux Lookout Zone (SLZ) of northwestern Ontario, a remote region of 25 communities and home to 8000 Indians (Table 1). In Alberta, too, almost one third of the deaths reported from 35 Indian reserves and settlements resulted from accidents and violence (Jarvis et al., 1982). Other Indian groups in Canada (Schmitt et al., 1966) and in the United States (Conrad et al., 1974; Ogden et al., 1970) also have high rates of mortality from accidents and violence.

In particular, suicide has been shown to be higher among Indians than the general population both in Canada and in the United States. In Canada, Mao et al. (1986), Jarvis et al. (1982), and Young (1983b) found higher rates of suicide among natives on Indian reserves compared to the Canadian population (Table 1).

Experience in the United States shows that the rate of suicide is five to ten times the national average in many tribes. There are some exceptions, however, in the Navajo, the Papago Indians, and the Northwestern tribes the suicide rates are either near the national average or only slightly higher (Conrad et al., 1974).

Intestinal diseases, tuberculosis, and other infectious diseases have traditionally been very prevalent in native populations. However, since 1979, the incidence rates for tuberculosis in the Inuit and Indian populations have equaled those for the Canadian population (Health and Welfare, 1983). Moreover, in recent years deaths due to these causes have declined considerably, so that infectious diseases now constitute only a small proportion of deaths nationally on Indian reserves (Mao et al., 1986; Health and Welfare, 1981) and in the Sioux Lookout Zone (SLZ) (Young, 1983b) (Table 1). In the SLZ, diarrheal diseases, tuberculosis, whooping cough, and septicemia were the only diseases in this group that caused deaths. However, residents of the SLZ and nationally on reserves studied by Mao et al (1986) were more likely to die from this group of conditions than other Canadians (Table 1).

Studies have also shown that death rates for meningitis (classified under nervous system disorders) are high both in the SLZ (Table 1) and in the central Arctic (Wotton et al., 1981). As well, death rates from pneumonia, conditions with an infectious etiology, are higher among Indians nationally on Reserves (1977-82) and in the Sioux Lookout Zone (Table 1) than in the Canadian population.

Mortality due to cancer is of particular interest since the existing reports have indicated an unusual pattern of the disease among Indians and Inuit as well as a reduced incidence and mortality compared with that among Canadians nationally. Cancer has been studied in the Inuit of the Northwest Territories

(Schaefer et al., 1975; Hildes et al., 1984), Indians in British Columbia (Gallagher et al., 1979), the Cree-Objiwa of northwestern Ontario (Young et al., 1983), Manitoba reserve Indians (Young et al., 1985; Choi, 1968), and Indians in Alberta (Morgan et al., 1981).

Consistently in these studies, cancers that are "common" in the Canadian population, (e.g. lung, breast, and colon) are less frequent among the Indians (Table 2a, 2b). Conversely, some female Indians have higher rates for cancer of the kidney, gallbladder, and cervix. High mortality or incidence rates of kidney cancer were found in the Sioux Lookout Zone, among females on Manitoba IR (Young et al., 1985a), and on Indian Reserve Areas (1977-82) (Mao et al., 1986), but not in British Columbia (Gallagher et al., 1979) or Alberta (Morgan et al., 1981). High incidence and mortality due to gallbladder cancer, especially among females, was found in the Sioux Lookout Zone, on Manitoba IR, in British Columbian and Alaskan Indians (Lanier et al., 1986) and among the Indians of southwestern United States (Morris et al., 1982; Black et al., 1977). Mortality from cancer of the cervix was higher among British Columbia Indians (Gallagher et al., 1979) and nationally on Indian reserves (Mao et al., 1986) but incidence was equal on Manitoba Indian reserves (Young et al., 1985a) compared to the national population. Interestingly, the very high rates of cancer of the salivary gland, kidney, and nasopharynx in Eskimos between 1950 and 1966 (Schaefer et al., 1975) have since declined and the most frequent tumours in the most recent period studied, 1966-1980, were lung, cervical, and colorectal cancer (Hildes et al., 1984).

Nationally, Indians on reserves are at higher risk of death from diabetes mellitus than the general population although Indians in the Sioux Lookout Zone are not at increased risk (Table 1). Relative to the general population in Canada,

the prevalence of diabetes mellitus is higher in the Cree-Objiwa (Young et al., 1985b) and the Mohawk Indians of Quebec (Montour et al., 1985) but lower among Eskimos (Schaefer, 1968). Variations in the incidence and mortality of diabetes mellitus among various Indian groups has been found by West (1974) who reviewed 80 tribes and found that diabetes mellitus, which had been very rare among Indians prior to World War II, has reached epidemic proportions in some tribes while remaining infrequent in others.

In addition, mortality associated with alcoholism and cirrhosis of the liver is elevated among Indians nationally (Mao et al., 1986), while the rate of death due to circulatory disease is lower among Indians in the Sioux Lookout Zone and slightly higher nationally on Indian Reserves compared to the general population (Table 1).

Although it is generally recognized that Indian infant mortality in Canada is far in excess of that of white infants (Last, 1982, Spady et al., 1982; Brett et al., 1976; Holubowsky, 1976, Health and Welfare, 1981), there have been few systematic attempts to characterize the problem. Morrison et al. (1986) have recently described infant mortality on Indian reserves in five Canadian provinces for the period 1976 to 1983 (Table 3). Indian reserve neonatal mortality<sup>2</sup> was over one third higher than that experienced by the Canadian population, while postneonatal<sup>3</sup> mortality was almost four times higher. Significantly elevated postneonatal causes of death included infectious and parasitic diseases, pneumonia, Sudden Infant Death Syndrome (SIDS), acute bronchitis, meningitis, suffocation, and fires (Table 3).

Infant mortality has also been studied in the Sioux Lookout Zone (Young,

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<sup>2</sup> Deaths of liveborn infants in the first 28 days of life.

<sup>3</sup> Deaths from 28 to 365 days.

1983b) where the neonatal mortality rate was found to be slightly higher than that in the Canadian population. A similar distribution of deaths to that found by Morrison et al. (1986) was seen in the Sioux Lookout Zone, although SIDS was not found to be elevated (Table 3). Neither was SIDS found to be elevated among Oklahoma Indians (Kaplan et al., 1984); however, SIDS has been reported to be elevated among Alaskan Indians (Fleshman et al., 1977).

### **MORTALITY DATA SOURCES**

Studies of mortality among Indians have employed different data sources to obtain estimates of the frequency of Indian deaths (numerators) and the size of Indian populations (denominators) (Table 4). Each of these sources has certain strengths and limitations.

#### **Estimates of the number of deaths**

The number of deaths among registered Indians and Inuit is collected by the Medical Services Branch and presented annually as non-standardized proportionate mortality ratios for the various causes of deaths. Unfortunately, the data collection and coverage methods vary by province (Rowe et al., 1985). For the Atlantic and Ontario regions, data on deaths are reported only for the on-reserve population, while in Quebec, data are collected from only some reserves. In Manitoba and Saskatchewan, births and deaths are tabulated through the provincial Health Insurance Department and reported to the Medical Services Branch. In Alberta and British Columbia statistics are only collected from those Indians who register themselves with the Medical Services Branch. In the Yukon and Northwest territories, information about deaths is obtained from reports of nurses working on reserves or settlements (Rowe et al., 1985).

Data collection by the Medical Services Branch in small regions such as the Sioux Lookout Zone (Young, 1983b; Young et al., 1983) may be quite reliable but because they have been collected for a small, isolated region, the small population size often makes the calculation of mortality rates fairly unstable. For larger areas, such as those studied by Spady et al. (1976) and Jarvis et al. (1982), the number of deaths may be underreported because collection depends on reports from nurses or public health workers.

While many researchers rely on mortality data collected by the Medical Services Branch, others have found alternative means to tabulate deaths among Indians. In some provinces, such as British Columbia, ethnicity is reported on the death certificate so that the number of Indian deaths is directly available from Vital Statistics (Gallagher et al., 1979; Schmitt et al., 1966). The Manitoba Cancer Register records usual place of residence so that it is possible to determine the number of deaths which have occurred on Indian reserves in Manitoba (Choi et al., 1968). Schaefer et al. (1975) and Hildes et al. (1975) have performed chart reviews at all the pertinent referral centres to determine the number of deaths which have occurred to Inuit in the Northwest Territories.

Recently, Mao et al. (1986) and Morrison et al. (1986) used the Canadian Mortality Database at Statistics Canada to tabulate deaths on Indian Reserve Areas (see Appendix I for a description). All death certificates in Canada can be searched for persons whose usual place of residence is on an Indian Reserve<sup>4</sup>.

### **Estimates of the Indian population**

At the national level, estimates of the size of the status (registered) Indian

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<sup>4</sup> Each death certificate is assigned a geocode for the usual place of residence of the individual. Indian reserves in most provinces are assigned separate and identifiable geocodes enabling deaths that occur to residents of Indian reserves to be tabulated through the Canadian Mortality Database.

population are available from two sources: the Census and the Department of Indian and Northern Affairs (INAC). At the regional level, population estimates are available as band lists produced by each reservation.

The population estimates from Indian and Northern Affairs (INAC) are obtained from the Indian Register, a listing of all registered Indians (see Appendix 2). Indians must register with Indian and Northern Affairs to obtain their rights and privileges. Since there are advantages to the individual, it is believed that every status Indian will be in the Indian Register.

Estimates of the on-reserve Indian population are generally smaller in the Census than INAC reports probably because many Indians refuse to participate in the federal government census (Allan, 1986). The ratios of Census provincial totals to the INAC provincial totals for on-reserve registered Indians in 1981 ranged from 0.85 in Saskatchewan to 1.02 in Quebec (Mao et al., 1986). For ages less than one year, however, the Statistics Canada populations were larger, probably due to late-reporting of births in the Indian Register.

Ram et al. (1985) found that 45 to 92 percent of births between 1971 and 1981 in the Indian Register were not reported in the same year as they occurred, with some births recorded up to eleven years late. By contrast, half of the deaths are recorded in the same year as they occur, 98% within three years (Rowe et al., 1985). Data from these two studies now make it possible to adjust the INAC population estimates for late and underreporting of births and deaths to obtain more accurate population estimates.

### **Strengths and weaknesses of different data sources**

In the past, both Census and uncorrected INAC data have been used to estimate the size of the Indian population (Table 4) and neither appears a completely accurate estimate. Studies (Gallagher et al., 1979, Hildes et al.,



1984, Schaefer et al., 1975) which have used the Census to determine the number of registered Indians will probably have underestimated population size and, therefore, overestimated mortality in any given year (except for zero to one year olds where the reverse occurs). However, it is only possible to estimate the number of Métis, Inuit, and non-status Indians in Canada if you use the Census.

Mortality data collected by the Medical Services Branch are unreliable because the collection methods are not consistent from year to year making it impossible to compare the number of deaths within regions over time periods. Studies which rely on the reporting of ethnicity on death certificates or in cancer registries present problems because (1) ethnicity among some natives is difficult to define and (2) it is not always recorded. Chart reviews, while feasible in areas where there are few referral centres, are only useful in small regional studies.

Indian reserve mortality data tabulated from the Canadian Mortality Database and the Manitoba Cancer Registry are possibly the most reliable, but even these have limitations. First, the Indian Reserve Area population is not homogeneous: 5 to 10 percent of the on-reserve population is non-Indian (Morrison et al., 1986) so that geocode identification will overestimate the number of Indian deaths. Secondly, if a resident of an Indian reserve has migrated to an urban centre for medical care, the geocode indicated on the death certificate may not be his/her usual address but the urban centre to which he/she has temporarily migrated. A third difficulty is the more general problem, not unique to the Indian reserve population, of incorrect coding of residence and cause of death on death certificates.

A recent Statistics Canada quality assessment indicated that the error rate

for residence in a sample of deaths was 9 % with a further 2.4 % not recorded, and the errors were not random. Additionally, the disease coding error rate in a random sample of deaths was 7.2 %, with two-thirds of the errors involving the first or second digit of the 4 digit code (Mao et al., 1984). In a study by Mao et al. (1984) of excess mortality in the community of Maniwaki, the number of deaths attributed to the Indian reserve population jumped from 13 to 61 when residency coding was corrected. The result of this misattribution can be the underestimation of mortality rates for Indian Reserves, especially when an Indian Reserve is located close to a large population.

### **JUSTIFICATION OF THE STUDY**

Several data sources for death and population estimates are now available for the study of Indian mortality. The most consistent estimates of the mortality and population size of registered Indians are obtained from the Canadian Mortality Database and the Indian Register. Although these two sources limit the focus of study to mortality mainly among the status on-reserve Indian population, this population is of great interest. These data also make it possible to study time trends in mortality because these data can be accurately determined and compared over time.

Because reserves are usually located in rural areas while the Canadian population is largely urban, comparing their mortality rates may be problematic and reflect differences between "places" as well as between "people". For instance, the high mortality rates due to accidents may not reflect the particular Indian condition but rather the fact that they are a rural population. It may be appropriate, therefore, to compare mortality among Indians with that

among non-Indians in defined and similar geographic areas instead of using national or provincial aggregates as comparison groups.

This thesis will study the mortality rates and life expectancy of residents of Indian reserves in five provinces (Quebec, Ontario, Manitoba, Saskatchewan, and Alberta) over two time periods (1971-77 and 1978-84). This furthers the work done by Mao et al. (1986) which studied mortality on Indian Reserve Areas during one time period (1976-83). As well, the mortality of residents of Indian reserves will be compared to the total provincial population and the non-Indian population living in the same counties as Indian reserves. The comparison of two time periods and the use of a subset of the entire Canadian population with similar demographics as Indian reserves as a reference to assess Indian health status have not previously appeared in the literature. Thus, this study will be useful in Indian health policy and program development and will provide a clearer picture of health changes over time.

## CHAPTER 3: METHODS

### INTRODUCTION

To study Indian health status, mortality patterns on Indian reserves (IR) in Quebec, Ontario, Manitoba, Saskatchewan, and Alberta<sup>0</sup> were identified and compared with both the non-Indian population living in the same counties as Indian reserves and with the total provincial population in the same province as the IR. Mortality was compared by age group (0-4, 5-14, 15-34 and 35-64 years of age), sex, time period (1971-77 and 1978-84) and province using age-standardized mortality rates (ASMR), standardized mortality ratios (SMR), and proportionate mortality ratios (PMR). Life expectancy of residents of IR was also determined.

### MORTALITY DATA

#### **Estimate of the number of deaths**

The number of deaths in the IR, county, and provincial populations for the years 1971 to 1984 was retrieved from the Canadian Mortality Database (CMDB) at Statistics Canada (see Appendix 1 for a description of the Canadian Mortality Database). Data are available for each county, by sex, 5-year age group, and cause of death. Deaths are coded by place of usual residence in the CMDB and residents of Indian reserves can be identified and sorted by the unique geocode

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<sup>00</sup> The Yukon and Northwest Territories and the provinces of Newfoundland, New Brunswick and British Columbia were excluded from the study either because they have no Indian reserves, or because reserves are not assigned separate geographic codes. Nova Scotia was excluded because of a perceived deficiency in reporting Indian mortality (Mao et al., 1986). Prince Edward Island was excluded because its Indian reserve population is extremely small

assigned to Indian reserves<sup>1</sup>. The number of deaths for non-natives living in the same counties as Indian reserves was estimated by subtracting the deaths on Indian reserves from the total county deaths for each county containing an Indian reserve<sup>2</sup>.

Deaths were coded to the 9th revision of the International Classification of Diseases (ICD-9) for 1979-83, and converted from the 8th revision, when possible, for 1971-78. These were then converted to LCDC (Laboratory Center for Disease Control) codes.

Twenty-four causes of death were examined. These causes of death are shown in Table 5 along with their corresponding Laboratory Center for Disease Control (LCDC) and International Classification of Disease (ICD) codes. Most of the major causes of death and interesting subcategories, were included in this study. Congenital anomalies (ICD 740-759) and perinatal mortality (ICD 760-779), which are important causes of death in the 0 to 1 year age group were excluded because of an oversight.

The number of deaths was verified using independently obtained totals of deaths from the CMDB to ensure that the frequency of deaths was correct after preparation of the data tapes. Deaths were verified for a sample of years in each province by county, sex, and 5-year age intervals.

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<sup>1</sup> Indian reserves are assigned separate and identifiable geocodes in most provinces.

<sup>2</sup> The number of deaths among Indians living off-reserve in counties containing Indian reserves is likely to be small. Approximately 60 % of registered Indians live on-reserve and 40 % off-reserve (half living in urban areas not usually located in counties containing Indian reserves). If the number of deaths among on-reserve Indians is 4093, approximately 2700 deaths would be expected among Indians living off-reserve. This represents 1.2 % of the total deaths (227124) in counties containing Indian reserves.

Because the number of deaths each year on Indian reserves in each of the provinces is small, deaths were aggregated to two time periods (1971-77 and 1978-84) and four age groups<sup>3</sup> (0-4, 5-14, 15-34, and 35-64 years of age) for analysis.

### **Indian reserve population**

Two sources of population data are available for Indian reserve populations. (1) Indian reserve populations by province, sex, and 5-year age groups can be obtained for the census years 1976 and 1981 from Statistics Canada. Populations for non-census years can be estimated by linear interpolation and extrapolation within sex and age groups. (2) Yearly population counts can be obtained from the Indian Register of the federal department of Indian and Northern Affairs Canada and from band lists (see Appendix 2 for a description of the Indian Register).

The Indian Register was used to estimate the Indian reserve population in this study because it avoids the possible problem of a census undercount (Mao et al., 1986)

### **County and provincial population.**

Two reference populations were constructed for each province: the total provincial population, and the non-native population living in the same counties as Indian reserves. An estimate of the total population by province, sex, and 5-year age groups was obtained for the census years 1976 and 1981 from Statistics Canada. Populations for non-census years were estimated by linear interpolation and extrapolation within sex and age groups.

Population estimates for non-natives living in the same counties as Indian

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<sup>3</sup> Indians 65 years and older were not specifically examined because the cause of death in this age group is often not well documented.

reserves were obtained by subtracting the Indian reserve population from the total county population for each county containing an Indian reserve<sup>4</sup>. This was performed for each province, by sex and 5-year age group for the census years 1976 and 1981. Populations for non-census years were estimated by linear interpolation and extrapolation within sex and age groups.

## MEASURES OF RISK

### Life expectancy

In this thesis, life tables for the Indian reserve population were constructed using the number of deaths obtained from the CMDB and population estimates from the Indian Register. Life expectancies, the further years of life expected, and the probability of death in each age group were used to compare the health status of Indians between 1971-77 and 1978-84.

Abridged life tables were constructed using five-year age intervals. Chiang's method (Chiang, 1985) was used to calculate the fraction of the last age interval of life ( $a'_x$ ). The fraction of last year of life represents the average fraction lived by the individuals in each time interval. The fraction of last year of life is invariably 0.5 for single years, sexes and ethnic groups after age 5. For example, in a group of 50 to 51 year olds who have died, the expectation is that the average fraction lived in this interval will be 0.5 years. That is half the individuals die between 50 and 50.5 years, the other half between 50.5 and 51 years. The fraction of the last age interval of life is required in this study because five-year age intervals are used. When ages are

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<sup>4</sup> The number of Indians living off-reserve in counties surrounding Indian Reserves is likely to be small (see footnote 2, p.24).

grouped together the fraction of the last age interval of life is no longer 0.5. For instance, among 5 to 10 year olds more deaths will occur from 5 to 7.5 years of age than between 7.5 to 10 years of age. In this case, the average fraction of the last age interval of life lived is 0.45. That is, half the deaths in this age interval occur in the first 0.45 of this interval, the other half in the last 0.55 of the interval.

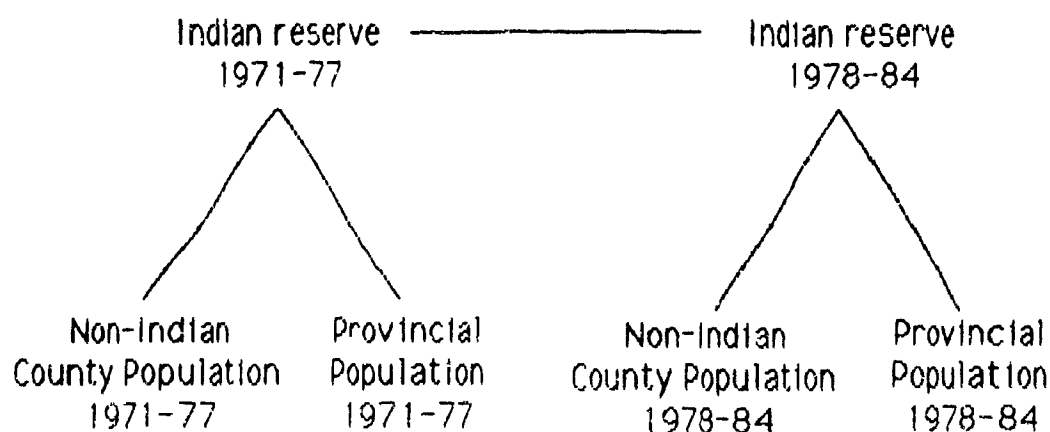
### **Mortality**

Mortality was assessed using crude age-specific mortality rates, age-standardized mortality rates (ASMR), standardized mortality ratios (SMR), and proportionate mortality ratios (PMR).

Crude mortality rates for Indian reserve, county, and provincial populations were standardized to the age and sex distribution of the 1971 total Canadian population to generate age-standardized mortality rates (ASMR) for each sex. The 1971 total Canadian population was used as a "standard" because most of the government documents use this as the standard population enabling comparisons of the ASMR to be made. Age-standardization is necessary because of the difference in age structures between the registered Indian population and the Canadian population (Appendix 3)

Standardized mortality ratios (SMR) were used 1) to compare the Indian reserve mortality of 1978-84 to 1971-77; 2) to compare Indian reserve to county mortality in each of the two periods, 1971-77 and 1978-84, and 3) to compare Indian reserve to provincial mortality in each of the two periods, 1971-77 and 1978-84. Therefore, there are five comparisons: 1) Indian reserves 1978-84 to 1971-77, 2) Indian reserves to the county population 1971-77 and 3) 1978-84, and 4) Indian reserves to the provincial population 1971-77 and 5) 1978-84. These are depicted below.





The standardized mortality ratio is the ratio of the number of deaths observed in the Indian reserve population to the number of deaths expected if the age-standardized mortality rates in the "comparison" population were applied to the age-sex distribution of the Indian population. Significance levels for standardized mortality ratios in this thesis are based on the method of Ballar and Ederer (1964). Indirect standardization was used in order to avoid the large sampling error of age-specific rates in the small Indian reserve population.

The standardized mortality ratio has several limitations. Using an overall SMR can sometimes mask age-specific or sex-specific differences in mortality if the differences are in "opposite" directions. To avoid this, the SMR was computed by sex and age group. Also, because the SMR is an indirect age adjustment, SMR calculated for two or more separate cohorts cannot be directly compared, even though the same "standard" population rates may have been used to determine the expected deaths (Mausner and Kramer, 1985). Thus, the SMR calculated for Indian reserves in different provinces are not directly comparable.

A common alternative to the SMR is the proportionate mortality ratio (PMR). The proportionate mortality ratio is the number of deaths from a given cause per 100 total deaths in a specified time period (Mausner and Kramer, 1985). The

chief problem with this statistic is that the PMR for one cause is not independent of the PMR for other causes. Thus, if the mortality rate in a cohort is unusual, the PMR due to a particular cause of death may be distorted (Mausner and Kramer, 1985). Because the mortality rate in the Indian population and in the reference populations are assumed to be very different, the PMR cannot be used to compare mortality between these two populations. However, the PMR can be used to illustrate changes in mortality separately in the Indian, county, and provincial populations between 1971-77 and 1978-84.

## **CHAPTER 4: RESULTS**

### **INTRODUCTION**

This chapter describes two measures of health status on Indian reserves: life expectancy and mortality. The life expectancy of residents of Indian reserves (IR) in Quebec, Ontario, Manitoba, Saskatchewan, and Alberta between 1971-77 and 1978-84 is compared to the life expectancy of the total Canadian population in 1976 and 1981. The mortality of IR residents is compared first with the total non-Indian population living in those counties with Indian reserves (county population) and second, with the total population living in the same province as the reserves (provincial population). Mortality is also described by age group (0-4, 5-14, 15-34, and 35-64), cause, sex, province, and period (1971-77 and 1978-84).

### **LIFE EXPECTANCY**

During the period 1971-77, the life expectancy for males living on IR in Quebec, Ontario, Manitoba, and Alberta ranged from 62.7 to 66.9 years (Table 6) while that for females ranged from 71.0 to 76.4 years. (In Saskatchewan, males and females had unrealistically high life expectancies of 91.3 and 102.3 years respectively). By comparison, the life expectancies for males and for females in the total 1976 Canadian population were 70.2 and 77.5 years, respectively, suggesting that male and female IR residents were expected to live 5.6 and 4.4 fewer years than their Canadian counterparts in this time period.

By the 1978-84 period, life expectancies for males and females had increased for residents of Quebec, Ontario, and Manitoba IR but decreased for

residents of Alberta IR (Table 6). These decreases in life expectancy in Alberta (5.0 years for males and 4.8 years for females) contrast with a 6 year increase for males in Quebec, Ontario, and Manitoba, a 9 year increase for females in Quebec, a 4 year increase for females in Ontario, and a 2 year increase for females in Manitoba. Yet, despite these increases, even in this later period male and female residents of IR, excluding Alberta, could still expect to live fewer years (1.7 and 1.9 years respectively) than their Canadian counterparts.

In both the Canadian and Indian reserve populations, the further years of life expected for females was higher across all age groups than for males. In fact, even though the further years of life expected for Ontario males was uniformly higher in 1978-84 than in 1971-77, it was still lower than that for Ontario females in the 1971-77 period (Figure 1). This pattern was repeated in Quebec, Manitoba, Alberta and in the total Canadian population.

The probability of death in each age group was examined to determine 1) why Saskatchewan IR residents had higher life expectancies (1971-77) and 2) why life expectancy had decreased for Alberta IR residents between 1971-77 and 1978-84.

The probability of death in each age group on Saskatchewan IR (1971-77) was uniformly one-half to one-sixth that on Ontario IR (Figure 2 and 3). This suggests that underreporting of deaths was occurring in every age group and probably explains the elevated life expectancies in this province.

In Alberta, Indians 0-1 years of age and 50 years and older had a lower probability of dying than Ontario Indians the same ages between 1971-77<sup>1</sup> (Figure 2 and 3), but there was a generally higher probability of dying among all

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<sup>1</sup> Quebec, Ontario, and Manitoba all had very similar probabilities of death therefore for clarity only Ontario is presented.

age groups between 1978-84 (Figure 4 and 5). Therefore, the decrease in life expectancy observed among Alberta Indians from 1971-77 to 1978-84 may reflect both underreporting of infant and childhood deaths in the earlier period and a true increased probability of death in every age group in the later period.

In summary, the life expectancies of males and females on Indian reserves in Quebec, Ontario, and Manitoba increased between the 1971-77 and 1978-84 periods, narrowing the gap between their life expectancies and those of the Canadian population. Data from Alberta and Saskatchewan suggest that deaths between 1971-77 were underreported in these two provinces.

### MORTALITY

Mortality for Indian reserve residents of Quebec, Ontario, and Manitoba was compared with mortality in the county and provincial populations in these three provinces. Alberta and Saskatchewan IR were excluded from this analysis because the apparent underreporting of deaths in 1971-77 makes judgements about changes in mortality between periods hazardous.

From 1971-84, there were approximately 4000 deaths among residents of Indian reserves, 250,000 deaths in the county population (the non-Indian population in counties surrounding the Indian reserves), and 800,000 deaths in the provincial population. The number of deaths for each age group in the Indian, county and provincial populations are shown in Appendix 4. Children (0-4 and 5-14 year olds) and young adults (15-34 year olds) contributed 30 to 40 % of the total deaths on IR between 1971-77 and 1978-84 (Table 7). By contrast, children and young adults were responsible for less than 10 % of the total deaths in the county and provincial populations (Table 7). However, this partially

reflects the fact that the Indian population is younger than the county or provincial populations.

The standardized mortality ratios (SMR) comparing all-cause mortality in the Indian population to 1) the county population and 2) the provincial population are shown in Table 8 for 1971-77 and 1978-84.

Using the standardized mortality ratio (SMR)<sup>2</sup> as a comparison statistic, males and females in the Indian population were more likely to die than their corresponding members of both the provincial and county population. More precisely, except for females in Quebec, Indians were 10 to 110% more likely to die 1971-77 and 9 to 21% more likely to die 1978-84 than the county population (Table 8). As well, they were 13 to 55% more likely to die 1971-77 and 9 to 21% more likely to die 1978-84 than the provincial population (Table 8).

When mortality rates for Indian reserve residents for 1978-84 are compared to those for 1971-77 using the standardized mortality ratio, Indians were less likely to die in the later period (SMR ranges from 0.60 to 0.78) (Table 9).

### **The Leading Causes of Death**

Overall, circulatory disease<sup>3</sup>, accidents, poisonings and violence (APV)<sup>4</sup>, and cancer, in that order, were the three leading causes of death among the Indian population in both periods (Appendix 5). In the county and provincial populations, circulatory diseases, cancer, and accidents, poisonings and violence, in that order, were the leading causes of death (Appendix 5).

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<sup>2</sup> Unless explicitly stated otherwise, all differences noted in this paper are significant at  $p < 0.05$ .

<sup>3</sup> Circulatory disease includes coronary heart disease, cerebrovascular disease, and other types of circulatory disease

<sup>4</sup> Accidents, poisonings, and violence (APV) includes drownings, fires, suicides, homicides, motor vehicle traffic accidents (MVTA), accidental falls and other types of accidents, poisonings and violence.

Compared to both the county and provincial populations, using the standardized mortality ratio (SMR), residents of Indian reserves were at significantly increased risk of death from accidents, poisonings, and violence (except Quebec females 1978-84) (Table 10). Conversely for cancer, male Indians were at significantly lower risk and female Indians were at no greater risk than the county and provincial population (Table 11). Males Indians were also at decreased risk for circulatory disease between 1978-84, and at no greater risk between 1971-77; female Indians were at no greater risk between 1971-77, and at decreased risk between 1978-84 (Table 12).

The standardized mortality ratios for overall deaths, as well as for deaths caused by accidents, poisonings, and violence, cancer, and circulatory disease are very similar when Indians are compared with the county or with the provincial populations (Tables 8,10-12). All further mortality comparisons, therefore, will use the county population only, since the population is probably demographically similar to the Indian reserve population.

Specific causes of death for males and females, all ages, in each period for the IR and the county populations are ranked using age-standardized mortality rates in Table 13. The standardized mortality ratios (SMR) for specific causes of death in each province are shown in Appendix 6 to allow for comparison with rates in the county population and to illustrate changes between the two periods in the Indian population. Among males in the county population between 1971-77, coronary heart disease was the leading cause of death (ASMR 246 per 100,000), followed by cerebrovascular disease (67), digestive tract cancer (49), bronchus and lung cancer (43), and motor vehicle traffic accidents (34). For male Indians, coronary heart disease was first (204), followed by motor vehicle traffic accidents (74), cerebrovascular disease (65), pneumonia (63), and suicide (36).

Among females in the county population between 1971-77 coronary heart disease was first (114), followed by cerebrovascular disease (54), digestive tract cancer (32), breast cancer (20), and pneumonia (14). On Indian reserves, coronary heart disease was first (121) followed by cerebrovascular disease (48), pneumonia (45), motor vehicle traffic accidents (33), and diabetes (29).

The ASMR increased significantly between 1971-77 and 1978-84 for bronchus and lung cancer among males and females in the county population. Among county females the ASMR decreased for breast cancer and cerebrovascular disease and increased for cancer of the cervix. For female Indians, the ASMR decreased for coronary heart disease, pneumonia, diabetes, and motor vehicle traffic accidents. For county males, the ASMR decreased for cerebrovascular disease and MVTA, and increased for digestive tract cancer and suicide, while the ASMR decreased for coronary heart disease, pneumonia, MVTA and cerebrovascular disease among Indian males.

### **Mortality by age group**

#### **0-4 years olds**

Zero to four year olds in the Indian population in all three provinces were 2 to 4 times more likely to die than 0-4 year olds in the county populations in both study periods (Table 14) even though the all-cause age-standardized mortality rates for Indian children decreased significantly from 1971-77 to 1978-84 (Table 15).

One-half to three-quarters of all deaths in the 0 to 4 year old age group were unspecified mainly because perinatal mortality and congenital



abnormalities were not specifically studied. The remaining deaths were due to infectious and parasitic diseases, pneumonia, fires, drownings and other accidents, poisonings and violence (Figure 6).

### **Accidents, poisonings, and violence**

Figure 7 shows the age-standardized mortality rates (ASMR) for accidents, poisonings and violence (APV) among 0-4 year olds in the county and Indian populations during both periods. On average, Indian children were 5 times more likely to die from APV than the county population between 1971-77 and up to 4.5 times more likely in 1978-84, despite substantial decreases in the ASMR on Indian reserves between 1971-77 and 1978-84.

Indian children were 15 times more likely than the county population to die from fires between 1971-77 and up to 9 times more likely in 1978-84. Mortality rates due to fire decreased for male children in each province (average SMR=0.80) and for females in Ontario (SMR=0.25) from 1971-77 to 1978-84.

By contrast, the probability of death by drowning on IR did not significantly change over time in Ontario and Manitoba. Mortality from this cause was 4 to 9 times higher in the Indian than in the county population in both time periods. In Quebec, mortality from drowning was not significantly different between the Indian and the county populations.

### **Infectious diseases**

Figure 8 shows the age-standardized mortality rates (ASMR) for infectious and parasitic diseases among 0 to 4 year-olds in the Indian and county populations for each of the study periods. Zero to 4 year-olds on IR between 1971-77 were more likely (SMR ranges from 6 to 17) to die of infectious and parasitic diseases than children of similar ages in the county population. Mortality was not uniformly increased in the Indian population

compared with the county population in 1978-84. Whereas, Indian children in Ontario and Manitoba were 1/5 as likely to die from infectious and parasitic diseases in the later period, there was no significant change in the rate of death from infectious and parasitic diseases for Quebec Indian children.

### **Pneumonia**

Figure 9 shows the age-standardized mortality rates (ASMR) for pneumonia among 0 to 4 year-olds in the Indian and county populations during both periods. Mortality was 3 to 19 times higher in the Indian population than in the county population in both periods for all but Manitoba males between 1978-84. Once again, Quebec Indian children were an exception and did not show a significantly decreased rate of death from pneumonia over time as seen in Ontario and Manitoba.

### **5-14 years olds**

Except for 5-14 year olds in Quebec, Indian children this age were 2 to 4 times more likely to die than the county population in each of the two study periods (Table 16). Moreover, there was little change in the probability of death over time (Table 17), except for female Indians in Manitoba (SMR=0.3).

Sixty to seventy-five percent of all deaths among 5-14 year olds in the Indian and county populations were due to APV. Most of these deaths were from motor vehicle traffic accidents (MVTA), fires and drownings, with a smaller proportion attributed to suicide and homicide (Figure 10). The proportion of deaths due to overall APV in the Indian and county population decreased while that due to MVTA increased from 1971-77 to 1978-84.

### **Accidents, poisonings, and violence**

Indian children, except in Quebec, were as likely to die from APV as the county population in both periods. Furthermore, their risks did not significantly change from 1971-77 to 1978-84, except for Manitoba females (SMR=0.34).

Ontario Indians were 14 times (1971-77) and 6 times (1978-84) more likely to die from fires than the county population, Indians in Quebec and Manitoba, by contrast, were equally as likely to die from fires as the county population in each time period. Only Ontario Indian children were less likely to die from fires during 1978-84 than during 1971-77.

Between 1971 and 1984, eleven suicide deaths occurred among 5 to 14 year-olds in the Indian population. Suicide rates among females in the Indian population were 11 to 30 times higher than in the county population, with female suicides outnumbering male suicides in the Indian population by 4:1. This was the reverse of the county population where male suicides outnumbered female suicides 3:1.

Homicides, motor vehicle traffic accidents (MVTAs) and drownings were generally no higher in the Indian population than in the county population in either time period. The only exceptions were Quebec Indian girls who were 14 times (1971-77) and 16 times (1978-84) more likely to die from homicides; Manitoba Indian girls who were 11 times more likely (1971-77) and 1/5 less likely (1978-84) to die from drownings, and Quebec and Manitoba males who were both 4 times more likely to die (1978-84) from drownings.

### **15-34 year olds**

Fifteen to 34 year-olds in the Indian population were more likely to die than the county populations in both time periods (SMR ranged from 1.1 to 5.2, Table

18) although Indians 15 to 34 were 1/3 to 4/5 as likely to die between 1978-84 than 1971-77 (Table 19).

Even though the age-standardized mortality rates for males were much higher than for females, the distribution of specific causes of death was very similar for both males and females for both the Indian and county populations. Eighty percent of all deaths among 15-34 year olds in the Indian population and 60% in the county population were due to accidents, poisonings and violence by motor vehicle traffic accidents (MVTAs), suicides, homicides and drownings (Figure 11). Another 2% of all deaths in both populations were due to alcoholism and cirrhosis of the liver, while 10 % of deaths were due to cancer in the county population.

### **Accidents, poisonings and violence**

Figure 12 shows the age-standardized mortality rates (ASMR) for APV among 15-34 year olds in the Indian and county populations during both periods. In this age group, males consistently have rates about 3 times higher than females in both the Indian and county populations. Although Indians 15 to 34 years old were 4 times more likely to die from APV than the county population in both time periods, Indian deaths due to this cause were on average 1/2 as likely in 1978-84 than in 1971-77.

Suicides in the Ontario and Manitoba Indian population were 6 times higher than in the county population in 1971-77 and in 1978-84 despite decreases of 50 % over time in females. Suicides in Quebec Indians increased 4 times among males between 1971-77 and 1978-84.

Homicides in the Ontario and Manitoba Indian populations were 12 times higher than in the county population between 1971-77 and 1978-84 with a 2-

fold increase among Manitoba females and by decrease of half among Ontario and Manitoba males over the two time periods.

Motor vehicle traffic accidents were never more than 2 times higher in the Indian population than in the county population in either time periods. Compared with the county population, drownings in both periods were 6 times higher among male Indians but not among females, with the exception of Quebec (1971-77) (SMR=8.6). The risk of drowning decreased by half among Manitoba males from 1971-77 to 1978-84.

### **Cancer**

Cancer mortality in this age group was no different in the Indian population than in the county population. There were two cervical cancer deaths among Quebec females, 1978-84, compared to less than 1 expected.

### **Alcoholism**

Alcoholism was generally elevated among male Indians (1971-77 and 1978-84) compared with the county population (SMR ranged from 0 to 14.12), and male Indians were just as likely to die of alcoholism between 1978-84 as they were between 1971-77. Cirrhosis of the liver was not higher among male Indians compared with the county population in either time period.

Alcoholism and cirrhosis of the liver were both higher (SMR ranged from 1.4 to 41.7) among female Indians in Ontario during both time periods; and there were no improvements between the two time periods.

### **34-64 year olds.**

Mortality rates (ASMR) for 35-64 year olds are compared using the standardized mortality ratio (SMR) in Table 20. Overall, Indians in this age

group were at most 2 1/2 times more likely to die than the county population. Male Indians were one-quarter less likely to die in 1978-84 than in 1971-77 but only females in Ontario showed a significant decrease in mortality (SMR=0.83) from 1971-77 to 1978-84 (Table 21).

Specific causes of death for males and females in each period for the IR and the county populations are ranked using age-standardized mortality rates in Table 22 and 23. Among males in the county population between 1971-77, coronary heart disease was the leading cause of death (ASMR=254 per 100,000), followed by bronchus and lung cancer (60), digestive tract cancer (52), cerebrovascular disease (35) and cirrhosis of the liver (29). For male Indians, coronary heart disease was first (234), followed by motor vehicle traffic accidents (87), cerebrovascular disease (55), cirrhosis of the liver (54), and homicide (44).

Among females in the county population, coronary heart disease ranked first (63), followed by breast cancer (40), digestive tract cancer (34), cerebrovascular disease (27) and bronchus and lung cancer (12). Among Indian females, coronary heart disease was first (103), followed by cerebrovascular disease (44), motor vehicle traffic accidents (42), diabetes (38), and breast cancer (27).

The age-standardized mortality rates for most causes of death remained the same for males and females in both the county and Indian populations. The only exception was an increase in the mortality rate for bronchus and lung and digestive tract cancer among males in both populations, bronchus and lung cancer among females in both populations, digestive tract cancer among female Indians and breast cancer among county females.

### **Circulatory disease**

The age-standardized mortality rates (ASMR) for circulatory disease in the Indian and county populations are shown in Figure 13. Circulatory deaths were at most 2 times as high as the county population in any province during either period, but were generally not different. There were no differences between the mortality rates for circulatory diseases in the Indian population in the two time periods, except for Quebec males (SMR=0.76).

Because of their importance, two specific types of circulatory disease were examined in depth: coronary heart disease, which includes acute myocardial infarction, and cerebrovascular disease.

There were no significant differences between the age-standardized mortality rates for coronary heart disease in the Indian population and the county population in either study period, except among Ontario females 1971-77 (SMR=1.83) and 1978-84 (SMR=1.78).

The standardized mortality rates for cerebrovascular disease in the Indian population were generally 2 to 3 times higher than in the county population during both periods.

### **Cancer**

While Manitoba males and Quebec females were less likely than county populations to die from cancer 1971-77, males and females in the other provinces showed no differences. All males and Quebec females were only half as likely to die from cancer as the county population between 1978-84, while there was no difference for Ontario and Manitoba females. Male Indians were 2 times as likely to die from cancer in 1978-84 as they were 1971-77.

With respect to specific sites of cancer, comparisons of Indian and county rates across time periods showed varying patterns. Female Indians were as

likely to die from cancer of the bronchus and lung as the county population in each of the time periods, male Indians were either equally or less likely to die from cancer at this site as the county population in both time periods.

For cancer of the digestive system, the Indian population did not differ from the county population in either time period. Similarly, except for Quebec women 1978-84 (SMR=0.11), Indian women were just as likely to die from breast cancer as the county population in both time periods, and there was no change in breast cancer rates among Indian women between 1971-77 and 1978-84.

Cervical cancer mortality among Indian women showed regional differences when compared with the county populations. Cervical cancer mortality was no different among Indian women in Quebec but higher among Manitoba Indian women 1971-77 (SMR=12.2) and 1978-84, (SMR=8.0) and Ontario Indian women 1978-84 (SMR=5.4). Indian women were as likely to die from cervical cancer in 1971-77 as in 1978-84.

### **Cirrhosis of the liver and alcoholism**

Compared to the county population, Ontario males were 3 times as likely to die from cirrhosis of the liver in 1971-77, and females 3 times more likely to die in both 1971-77 and 1978-84. Mortality due to cirrhosis of the liver decreased for male Ontario Indians from 1971-77 to 1978-84.

Ontario females were 17 and 11 times more likely to die from alcoholism in 1971-77 and 1978-84, respectively, compared to the county population. Male Indians were also more likely to die from alcoholism compared with the county population in both time periods. There was no improvement in mortality due to alcoholism in the Indian population from 1971-77 to 1978-84.



**Pneumonia**

Indians were generally more likely to die from pneumonia than the county population in both time periods, and their risk of death was the same in 1978-84 as 1971-77, except among Manitoba males where deaths due to pneumonia decreased (SMR=0.23).

**Diabetes**

Females 35-64 years of age were 4 to 7 times as likely to die from diabetes than the county population in both time periods. Mortality did not improve for Indian women from 1971-77 to 1978-84.

Male Indians showed regional difference in mortality rates from diabetes. Quebec male Indians were as likely to die from diabetes as the county population, but Ontario and Manitoba Indians were 2 and 5 times, respectively, more likely to die in both time periods. Mortality did not improve for diabetes among male Indians from 1971-77 to 1978-84.

## **CHAPTER 5: DISCUSSION**

### **INTRODUCTION**

This study has shown that the life expectancy of Indians in Quebec, Ontario and Manitoba increased between 1971-77 and 1978-84. As well, mortality was lower for Indians during 1978-84 than in 1971-77, with noticeable change in mortality rates from accidents, poisonings, and violence (particularly fires and drownings), infectious and parasitic diseases, and pneumonia. Nevertheless, mortality and life expectancy are worse among Indians than in the comparison populations.

Data from only three provinces was useful in this study because mortality was underestimated in one of two study periods in Alberta and Saskatchewan. Nevertheless, data from Quebec, Ontario, and Manitoba give a picture of improved mortality and life expectancy although the need for much more improvement remains.

### **LIFE EXPECTANCY**

Life expectancy on Indian reserves in Quebec, Ontario, and Manitoba increased by an average of 6.3 years for males and 5.2 years for females between 1971-77 and 1978-84. During this same time span, the gap between the life expectancy for Indians and the Canadian population decreased from approximately 6 years to less than 2 years.

These data contrast with those of Rowe et al. (1985) who, by solely using data from the Indian Register, reported life expectancies 4 to 8 years less than those found in this study among the combined group of on-reserve and off-

reserve Indians. It may be that the correction they used for underreporting of deaths was too extreme. Alternatively, the life expectancy of on-reserve Indians may be much higher than that for off-reserve Indians, thereby explaining the more optimistic picture we obtained. Another possibility is the underestimation of the number of deaths in this study due to incorrect residence coding, although it is not likely to explain a difference this size.

The life expectancies in Alberta and Saskatchewan raise questions about the quality of the data. Clearly, the life expectancy of Saskatchewan Indian reserve residents between 1971-77 was unrealistic; the decreased probability of death across all age groups suggests widespread underreporting in these years. In Alberta, the decrease in life expectancy between the two periods raises suspicions that these data were also underreported in the earlier years.

### **MORTALITY**

Residents of Indian reserves all ages experienced elevated all-cause mortality compared with both the county and provincial populations in both time periods, however, mortality was lower for Indians of all age groups, except 5-14 between 1978-84 than 1971-77. This is consistent with available national and regional results (Young, 1983b; Health and Welfare Canada, 1983; Mao et al., 1986). Among children (0-4, 5-14 years old) and young adults (15-34 years old) accidents, poisonings, and violence were responsible for a large proportion of deaths, while circulatory disease was the leading cause of death among 36-64 year olds.

### **Accidents/poisonings/violence**

The high mortality rate from accidents, poisonings, and violence among Indians does not appear to result from the hazards of a rural and remote lifestyle, which includes common use of firearms for hunting, higher risk of fire and poorer access to medical facilities. The mortality rates for accidents, poisonings, and violence for many northern mining communities are only 50 to 100 % higher than the national figures, however, mortality rates for APV in this study were almost 3 times higher among Indians living on reserves. Increased mortality rates were observed for Indians whether they were compared to the total provincial population or to the non-Indian population living in the same county as Indian reserves. This study supports the conclusion that the higher risk of death from APV on Indian reserves is a consequence of culture not geography.

Deaths due to accidents, poisonings, and violence significantly decreased in all but the 5-14 year olds between 1971-77 and 1978-84. This dramatic decrease cannot be ignored, and may have resulted from heightened native awareness and the effectiveness of drug and alcohol prevention programs implemented by native communities and the federal government. A resurgence of interest in native culture in many communities in the last decade may also be a factor.

Despite the decrease with time, however, the most significant difference between mortality on Indian reserves and that experienced by other Canadians remains the much higher mortality rate for accidents, poisonings, and violence on Indian reserves. One-third of the deaths on the Indian reserves studied were due to accidents, poisonings, and violence. This is consistent with data from Medical Services (Health and Welfare, 1983) and Alberta Indian Reserves (Jarvis

et al., 1982). Mortality rates were about 3 times higher in all age groups during both periods compared with the county population.

The striking excess of deaths due to accidents, poisonings, and violence was especially evident for fires, drownings, suicides, and homicides but not for motor vehicle traffic accidents or accidental falls. This pattern has been seen in previous studies (Mao et al., 1986; Jarvis et al., 1982; Young 1983b).

Fires were a particularly important cause of death among 0-4, and 5-14 year olds. While there were overall decreases in mortality due to fires among Indians in most age groups from 1971-77 to 1978-84, improvement was not uniform. The high mortality rates due to fires has been attributed to substandard housing on most Indian reserves (Department of Indian and Northern Affairs, 1980). The general decrease in deaths due to fires may reflect an improvement in the standard of housing between the two periods, an increased use of smoke detectors, or an increase in the fire-fighting capabilities on Indian reserves.

Drownings were frequent on Indian reserves and were an important cause of death among 0-4 year olds in Ontario and Manitoba, and 15-34 year old males in all three provinces during both time periods. There was no improvement seen between 1971-77 and 1978-84. Males 15-34 years old may be at higher risk of drowning because they spend more time fishing or crossing lakes by snowmobile in the winter to hunt than others (Young, 1983b). Alcohol consumption may also play a factor in many of the drownings (Jarvis et al., 1982)

### **Suicide**

Approximately one in ten deaths among males on reserves resulted from intentional violence (i.e. suicide or homicide) a somewhat lower proportion than that previously reported for males on Alberta reserves (Jarvis et al., 1982).

Suicide was significantly increased for males and females all ages in Ontario and Manitoba in both 1971-77 and 1978-84, decreasing for females between periods. In Quebec, males and females all ages showed no significant differences from the county population for either period, however, suicide increased among males between periods.

In contrast to the Canadian population, where the trend is for suicide rates to increase with advancing age (Health and Welfare, 1983), the Indian suicide rate is highest in the 15-34 year olds. Among 15-34 year old Indians, suicide rates were higher than in the county population in both study periods. While the suicide rates decreased for Indians in Ontario and Manitoba between 1971-77 and 1978-84, it increased 400 % for males in Quebec. Interestingly, Indian girls 5-14 committed suicide 4 times more often than boys 5-14 years old. In the general population, boys 5-14 commit suicide 3 times more often than girls. High rates of suicide at these ages may reflect the unusually disruptive conditions, stresses of acculturation, and ambivalence about the culture bestowed at birth experienced by adolescent and young adult Indians (Sievers et al., 1981) and may be more pronounced in girls than boys.

Although higher rates of suicide among Indians are the "norm" there are considerable variations in the rates of suicide between tribes (see literature review), suggesting the important influence of local factors. Where suicide is frequent, alcoholism, homicides, and self-destructive behavior also appear to be common (Sievers et al., 1981). Jarvis et al. (1982) found that in a great majority of violent native deaths on Alberta Indian Reservations, the victim was legally impaired by alcohol.

Improved medical care might decrease the number of deaths resulting from accidents, poisonings, and violence. However, Young (1983b) found that 92 % of deaths from injuries and poisonings in the Sioux Lookout Zone occurred before

the medical care system could be involved. Better training of personnel in emergency trauma management and a more sophisticated air ambulance system would be unlikely to reduce the mortality rate significantly in that remote region. Instead, the causes of most deaths indicates that primary prevention strategies ranging from safety instruction in the use of boats etc. are needed.

### **Alcohol related diseases**

Both mortality and morbidity due to alcoholism, alcoholic poisonings, alcoholic psychosis, and cirrhosis of the liver have previously been found to be high among Indians (Mao et al., 1986, Romanowski et al., 1981; Jarvis et al., 1982) This study showed that mortality from alcoholism, alcoholic poisoning, and alcoholic psychosis was higher among males 15-34 and 35-64 in Quebec, Ontario, and Manitoba, and cirrhosis of the liver higher among males 35-64. Male Indians were as likely to die from cirrhosis of the liver and alcoholism between 1978-84 as between 1971-77.

Ontario females (15-34 and 35-64 years) had significantly higher rates of death for alcoholism and cirrhosis of the liver in both time periods than the county population, only deaths from cirrhosis of the liver among 35-64 year olds decreased over time. There is evidence that women who drink are at an increased risk, compared to men, of developing cirrhosis of the liver, and that the onset of disease occurs earlier in life (Tuyns et al., 1984; Romanowski et al., 1981).

Although genetic heterogeneity has been evoked to explain rate differences in alcoholism and cirrhosis of the liver between various tribes, available evidence does not support this hypothesis (Slevers et al., 1981). In fact, "underlying factors in alcoholism among Amerinds likely include their prolonged

catastrophic social and cultural disruption and economic deprivation" (Slevers et al., 1981).

### **Pneumonia and infectious and parasitic diseases**

Intestinal diseases, tuberculosis and other infectious diseases have traditionally been frequent in native populations (see literature review) This study shows that infectious and parasitic diseases and pneumonia remain an important cause of death among 0-4 year olds for whom deaths due to these causes were significantly elevated compared to the county population in both study periods.

Several factors are believed to contribute to the increased risk of pneumonia and infectious and parasitic diseases among Indian children. The average number of persons per home is higher on Indian reserves than in the general population (DIAND, 1980) and this may facilitate the spread of infectious agents. As well, most Indian homes have no running water (70 %) and no indoor toilet (80 %) (Gilmore, 1979), some Indian homes are inadequately or irregularly heated, and some small homes are smoke-filled from the heating system (Houston et al., 1979).

Deaths due to pneumonia and infectious and parasitic diseases among children zero to four years old decreased over time in Ontario and Manitoba, but stayed consistent in Quebec. A possible protective factor against infectious diseases is breastfeeding. Schaefer (1971) found that among the Inuit, breast-fed children had much less otitis media than bottle-fed children and Ellestad-Sayed and colleagues (1979) reported that breast-fed Indian children in northern Manitoba had far fewer lower respiratory and gastrointestinal tract infections than bottle-fed infants, even though the social conditions of the breast-fed infants were, in general, poorer. Although a recent survey of



breastfeeding has been completed among Indians in Canada during 1983 (Health and Welfare, 1985), we lack time trend data to determine if the decrease in diseases of infectious etiology among 0-4 year olds in Ontario and Manitoba is related to an increase in breastfeeding.

### **Circulatory Disease**

The overall risk of death due to circulatory disease was equal or slightly higher among 35-64 year old residents of Indian reserves 1971-77 and 1978-84 than in the county population. More specifically, the risk of death from coronary heart disease was equal to that in the county population, 1971-77 and 1978-84, whereas that from cerebrovascular disease was 2 to 3 times higher for Indians.

While these results are consistent with those previously found by Mao et al. (1986) (Table 1), mortality rates among Indians for circulatory disease have generally been lower in other studies. In the Sioux Lookout Zone, the risk of death for circulatory disease among residents all ages was found to be significantly decreased, and cerebrovascular disease equal. Among the southwestern American Indians, coronary heart disease and acute myocardial infarction are also uncommon (Sievers, 1967, Ingelfinger et al., 1976; Sievers, 1979; Coulehan et al., 1986) although ischemic heart disease has become more prevalent during the past 15-20 years (Sievers and Fisher, 1979a) paralleling increases in the frequencies of obesity, diabetes mellitus and hypertension (West, 1974; Sievers, 1976, 1977).

Although genetic factors may explain the relatively low levels of coronary artery disease among southwestern Indians in the United States (Sievers et al., 1981) it is more likely that these Indians have a lower accumulated exposure to extrinsic risk factors. In Canada, by contrast, the prevalence among Indians of

risk factors such as smoking, obesity, serum cholesterol, and diabetes mellitus are high and in some cases increasing.

### **Cancer**

North American Indians are considered to be a population at low risk for cancer (see literature review). The standardized mortality ratios for death from cancer for males in the three provinces studied were decreased compared to the county population, on average, by 36 % and 48% in the 1971-77 and 1978-84 periods, respectively. These data are, therefore, consistent with those in the literature.

Several studies have shown that the relative deficit of cancer mortality and incidence is greater among male than among female Indians (Creaghen et al., 1972, Gallagher et al., 1979, Lanier et al., 1986; Young et al., 1983, Young et al., 1985a), and our data follow this pattern. The standardized mortality ratios for deaths from cancer for females in all provinces was no different from the county population between 1971-77 and lower only for Quebec females between 1978-84.

With respect to specific sites, cancer in Indians shows a different distribution than cancer in the general population. Previous studies in Canada have shown that Indians have significantly lower mortality rates for cancer of the lung, breast, and colon, but higher rates for cancer of the gallbladder, kidney, and cervix (Table 2a and 2b). Our data were in accord for breast, cervical and bronchus and lung cancer.

Interestingly, lung cancer mortality has remained stable among the Indian reserve populations of Quebec and Ontario but is increasing among males (SMR=2.10) and females (SMR=3.06) living on Indian reserves in Manitoba. Increases in lung cancer were also found among the Eskimos who have become

heavy cigarette smokers during the last 20 to 30 years; lung cancer has increased from 7 % of all malignant tumors, in 1950-66, to 25 % in 1969-74 (Schaefer et al., 1975).

Lung and bronchus cancer are associated with smoking. The Nutrition Canada Survey (1970-72) reported a higher percentage of current smokers among Indians aged 30 or more compared to the general population<sup>1</sup> but the higher prevalence of smoking among Natives is believed to have largely occurred only since 1945 (Wigle et al., 1982). Consequently, the average pack-years of exposure may, in fact, be lower in Indians (Mao et al., 1986) and this would explain why they currently have lower or similar rates of lung and bronchus cancer than the county population. As their average pack-years of exposure increases, it is likely that lung and bronchus cancer will also increase among Indians.

### **Cervical cancer**

A significantly higher mortality rate for cervical cancer was observed for females all ages and 34-64 years old in Ontario and Manitoba in both time periods. In Quebec, cervical cancer rates were only elevated between 1978-84 for 15-34 year olds with two observed cases to less than one expected.

An elevated risk for cervical cancer mortality among Indian women has been previously reported among American (Creaghen et al., 1972) and British Columbian Indian women (Gallagher et al., 1979). By contrast, Lanier et al (1986; 1980) found no difference in the number of cases of cervical cancer among Alaskan Indian women. Young et al. (1985a) also found no difference in the number of cases of cervical cancer in Manitoba between 1970-79. Since mortality due to cancer of the cervix is generally higher among native women

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<sup>1</sup> Indian men 65 % versus 45 % and Indian women 55 % versus 33%

despite the absence of an increase in the number of cases, we hypothesize that native women are more likely to die from, not to develop, cervical cancer.

The apparent excess mortality may be due, in part, to underutilization of cervical cytology screening programs by Indian women (Gallagher et al., 1979). For example, in British Columbia more Indian women with cervical cancer presented at an advanced stage of disease than white women, while a study of seven reserves in northern Manitoba indicated that only one-third of Indian women over age 15 had had a Papanicolaou smear in the previous 2 years, and that 45 % had never had one (Young et al, 1985a). By contrast, cervical cancer screening programs may be more adequate in Quebec, since Indians women there do not die more often from cervical cancer.

This study also shows that there has been no improvement in cervical cancer rates among Indian women in any of the provinces between 1971-77 and 1978-84. This observation has serious implications. If the incidence of cervical cancer is not higher among native women (Young et al., 1985a) and if Indian women present with more advanced cases of cervical cancer (Young et al., 1985a), then the effectiveness of cervical cancer screening programs should be examined to determine how best to eliminate the unnecessary deaths that appear to be occurring.

### **Breast cancer**

Female residents of Indian reserves were less likely to die from breast cancer than the county population in both time periods, with an average 55 % deficit in breast cancer deaths among native women in the three provinces. In contrast to the county population, where breast cancer deaths exceeded cervical cancer deaths 6 to 1, breast cancer and cervical cancer deaths were almost equal among the native female population.

Previous studies showed the incidence of breast cancer to be significantly lower among residents of IRA in Manitoba between 1970-79 (Young et al., 1985a), and among the residents of the Sioux Lookout Zone of northwestern Ontario (Young et al., 1983). In British Columbia, the relative risk of death for breast cancer among native Indian women was also lower, but not significantly so between 1964-1973 (Gallagher et al., 1979) as was the prevalence of breast cancer among the Eskimos of the western and central Arctic between 1949 and 1974 (Schaefer et al., 1975).

First birth before age 20 has been associated with a reduced risk of breast cancer (Miller et al., 1980). Increased parity has also been associated with decreased breast cancer (MacMahon et al., 1973). The low risk of breast cancer among Indian women may be partially attributable to their tendency to reproduce early in their lives and their high parity. In a cross-sectional analysis of births 1978-79, the proportion of first births to women 20 years old or less was over three times higher on Indian reserves than for Canada as a whole. As well, status Indian women living on reserves who have ever been married had an average of 4.8 children compared to 2.5 in the general population. Thirty-five percent of the Indian women have had six or more children compared to only eight percent of women in the general population (Statistics Canada, 1981).

### **Digestive tract cancer**

Cancer of the digestive tract encompasses a large number of anatomic sites (see Table 5). Our inability to separate the contribution of each of these sites to the total mortality due to digestive tract cancer severely limits the interpretation of our observations. However, males had significantly lower rates of death due to digestive tract cancer in both time periods while females showed no significant differences in mortality due to this cause.

## Diabetes

Deaths due to diabetes were greatly in excess for all IR females 35-64 and for males 35-64 on Indian reserves in Ontario and Manitoba but not Quebec. For these Indians there was no improvement in diabetes mellitus mortality rates between 1971-77 and 1978-84.

Published data on diabetes mellitus among Canadian natives are scarce, but a study by Young (1985b) among the Cree and Ojibwa (Saulteaux) Indians in northwestern Ontario and northeastern Manitoba showed that the prevalence rate for diabetes mellitus was higher than that for the general population, with female patients outnumbering males 2.5 to 1. The overall male:female death ratio for the Indian population in this study is 1:1.3 and 1:1.2 for the county population.

It is difficult to determine if high mortality rates for diabetes mellitus among Indians are a consequence of higher incidence rates or an indication of the poorer availability and use of health care on Indian reserves which leads to poor control of this chronic yet not necessarily fatal disease. Other data suggest the latter, for example, in studies of American Indians with diabetes mellitus, several complications were more prevalent among natives than among the general population (West, 1974). Among the Pima Indians, for instance, about one-half of all deaths from vascular causes in diabetics are attributed to renal disease (diabetic nephropathy) as compared to only 11% in the US general population. On the other hand, three-fourths of vascular associated deaths in the general diabetic population are considered to have cardiac causes, whereas, the proportion for this cause in Pima Indian diabetics is 31% (Bennett et al., 1976). Diabetes in most tribes is also complicated relatively often by kidney failure.

### **Chronic obstructive pulmonary disease (COPD)**

Although chronic obstructive pulmonary disease is not a common cause of death among Indians it is nevertheless interesting because heavy smoking, rural living, and low socioeconomic status, all prevalent among Canadian Indians, are risk factors for COPD (Enterline, 1967; Mitcheli, 1974). Southwestern Indians rarely have chronic obstructive pulmonary disease (Muggia, 1971; Goldman et al., 1972; Samet et al., 1980), but heavy or even moderate cigarette smoking is unusual in these tribes (Sievers, 1968). COPD occurs occasionally among Oklahoma Indians, in whom both cigarette smoking and partial non-Indian heritage are more frequent than in tribes of the southwest (Sievers, 1966; 1968). Thus, we expect COPD rates, like lung cancer rates, to show increases over time as the accumulated years of smoking take their effect on the Indian population.

### **SUMMARY**

This study was only able to study Indian reserve populations in Quebec, Ontario and Manitoba. Indian reserves in Alberta and Saskatchewan had to be excluded because mortality was underestimated in one of the two study periods, most likely the result of underreporting of deaths or incorrect residence coding. Although it may be possible that mortality in Quebec, Ontario, and Manitoba was also underestimated, this does not appear to be the case. However, if this had occurred mortality rates in this study would be more conservative than the true rates.

Within the reserve population we found areas of improvement in health over time as well as areas of no change. The life expectancy of residents of Indian reserves in Quebec, Ontario and Manitoba improved between 1971-77 and 1978-84, narrowing the gap between the life expectancy of Indians and that of the general Canadian population from 6 to 2 years. While Indians remained at increased risk for death by accidents, poisonings, and violence particularly fires, suicide, and homicide during both periods, mortality due to these causes did generally improve for Indians between the two time periods.

Indian children remained at increased risk of death from infectious and parasitic diseases and pneumonia compared to their non-native counterparts during both periods even though mortality from these causes decreased between 1971-77 and 1978-84 except in Quebec. As well, older Indians were generally at increased risk of death from alcoholism, alcoholic poisoning, and alcoholic psychosis, cirrhosis of the liver, diabetes, and cervical cancer and at equal or decreased risk of death for overall cancer, breast cancer and circulatory diseases compared to the non-native population, with no changes in the risk of death for any of these causes (except lung cancer in Manitoba) between 1971-77 and 1978-84. Thus, no matter the specific cause of death, and despite certain improvements over time, Indian mortality is, except for some specific cancer sites, still worse than non-natives. Much remains to be done to improve their health and our surveillance of it.

The high mortality rate from accidents among Indians does not appear to result from the hazards of a rural and remote lifestyle. Increased mortality rates were observed for Indians whether they were compared to the total provincial population or to the non-Indian population living in the same county as Indian reserves. Although the county population is assumed to be



demographically similar to the Indian reserve population, this should be confirmed through further work.

### **Future work**

A record linkage of the INAC Register to the Canadian Mortality Data Base is the next logical step in the study of Indian mortality. This record linkage is necessary because the Indian Register does not specify the cause of death. This method of studying Indian mortality in Canada will have several advantages. First, it will provide mortality and population data from the same sampling frame. Second, the Indian Register contains information about both on and off-reserve Indians, thereby facilitating study of the mortality experience of these two groups. Third, retrospective studies using the Indian Register, established in 1966, will allow mortality trends to be analysed. Fourthly, the Indian Register and the Canadian Mortality Data Base are quick to use and currently available for research purposes. These will improve surveillance and aid health planners and health analysts.

Table 1 Standardized mortality ratios (SMR) and proportionate mortality ratios (PMR) for Indian reserves (1976-83) <sup>(1)</sup>, the Sioux Lookout Zone (1972-1981) <sup>(2)</sup>, Alberta reservations (1976-1977) <sup>(3)</sup>, and Medical Services (1981) <sup>(4)</sup>.

Cause	Indian reserves <sup>(1)</sup>		Sioux Lookout Zone <sup>(2)</sup>	Alberta <sup>(3)</sup>		Medical Services <sup>(4)</sup>
	Male SMR	Female SMR	Total SMR	Male PMR	Female PMR	Total PMR
Infective and parasitic dis	2.88**	4.44**	4.50**	-	-	1.4
Intestinal diseases	-	-	7.70**	-	-	-
Pneumonia	2.92**	3.45**	6.50**	-	-	-
Tuberculosis	-	-	9.50**	-	-	-
Meningitis	-	-	12.10**	-	-	-
All cancer	0.53**	0.82*	0.90	3.9	11.4	9.5
Digestive tract cancer	0.53**	0.57**	-	-	-	-
Lung cancer	0.50**	0.80	-	-	-	-
Breast cancer	-	0.35**	-	-	-	-
Cervical cancer	-	3.95**	-	-	-	-
Accidents/poisonings/violence	3.17**	3.74**	4.50**	-	-	35.3
Motor vehicle accidents	2.13**	2.28**	0.97	10.7	8.6	11.2
Accidental falls	2.36**	2.28	1.00	-	-	1.0
Fires	5.87**	6.85**	10.80**	13.6	8.6	2.4
Drownings	5.56**	5.44**	6.50**	-	-	4.4
Suicide	3.20**	3.50**	1.80*	11.7	8.6	6.7
Homicide	7.84**	5.76**	9.40**	4.9	1.4	-
Circulatory disease	1.02	1.52**	0.60**	9.7	4.3	23.9
Cerebrovascular disease	1.39*	2.06**	0.80	-	-	-
Diabetes Mellitus	2.16**	4.12**	0.20	-	-	-
Kidney diseases	2.04*	4.34**	-	-	-	-
Alcoholism	3.97**	10.44**	-	-	-	-
Cirrhosis of liver	1.37*	3.02**	0.30	-	-	-
Chronic obstructive lung dis	0.76	1.32	-	-	-	-
Other causes	-	-	-	45.6	58.6	4.2

\* p < 0.05 \*\* p < 0.01

(1) Mao et al., 1986 (2) Young, 1983b (3) Jarvis et al., 1982 (4) Health and Welfare, 1981.

Table 2a- Comparative ranking of standardized mortality ratios (SMR), relative risks (RR), standardized incidence ratios (SIR) for selected cancer sites for male Indians

Site of cancer	Sioux Lookout <sup>(1)</sup> Zone SMR	British Columbia <sup>(2)</sup> RR	Manitoba <sup>(3)</sup> SIR	NWT Inuit <sup>(4)</sup> SMR	Manitoba <sup>(5)</sup> SMR
Kidney cancer	6.90*	-	1.17	4.0	-
Prostate	0.93	0.50*	0.68*	-	-
Bladder	-	0.60	0.28*	-	-
Digestive Cancer					
Gallbladder/bile ducts	5.90	0.90	0.74	-	-
Pancreas	0.49	0.50	0.13*	1.9	-
Colon	0.50	0.50*	0.19*	0.3	0.10*
Stomach	0	0.50*	0.41*	-	0.22*
Rectum	-	0.60	0.51	0.3	0.17*
Liver	-	-	-	9.9	-
Trachea/Bronchus/Lung	0.26*	0.30*	0.33*	3.4+	-
Salivary gland (50+ years)	-	-	-	32.0	-
Nasopharynx (45+ years)	-	-	-	195.2	-
Esophagus	-	-	-	-	-
Brain	-	0.50	-	-	-
Lymphoma/Hodgkin's	-	0.70	-	-	-
Myeloid leukemia	4.00	-	0.28*	-	-
other skin	-	-	0.16*	-	-
Other	-	-	-	-	-
All sites	0.67*	0.50	0.37*	-	-

+ Significant at  $p < 0.001$  for ages 45-59

\* Significant at  $p < 0.05$

(1) Young et al (1983)

(2) Gallager et al (1979) Relative risk = ratio of age-standardized mortality rate among Indians to that of white males

(3) Young et al (1985) Standardized Incidence Ratio = ratio of observed/expected cancer cases

(4) Schaefer et al (1975)

(5) Choi (1968)

Table 2b Comparative Ranking of Standardized Mortality Ratios (SMR), Relative Risks (RR), and Standardized Incidence Ratios (SIR) of Selected Cancer Sites for female Indians

Site of cancer	Sioux Lookout <sup>(1)</sup> Zone SMR	British Columbia <sup>(2)</sup> RR	Manitoba <sup>(3)</sup> SIR	NWT Eskimos <sup>(4)</sup> SMR	Manitoba <sup>(5)</sup> SMR
Kidney	13.1*	-	2.66*	-	-
Digestive cancer					
Stomach	0	1.6	0.58	-	0.80
Colon	1.7	0.5	0.35	1.2	0.42
Rectum	1.7	0.8	0	1.2	0.91
Gallbladder	6.8*	5.3*	3.07*	-	-
Pancreas	1.6	0.6	1.08	-	-
Esophagus	-	-	-	12.5	-
Bladder	-	-	0.32	-	-
Lung	0.88	0.7	0.72	18.0+	-
Breast	0.77	0.7	0.44*	-	-
Ovary	1.3	0.5*	0.12*	-	-
Cervix uteri	0	4.5*	1.34	2.5	-
Liver	-	1.6	-	51.9	-
Brain	-	0.8	-	-	-
Leukemia	-	0.5	0.65	-	-
Salivary gland (25-44 yrs)	-	-	-	425.4	-
Nasopharynx (45-59 yrs)	-	-	-	161.2	-
Other skin	-	-	0.23*	-	-
Other sites	-	-	-	-	-
All sites	1.44	-	0.53*	-	-

\* p < 0.05

+ 25-49 years old

(1) Young et al (1979)

(2) Gallagher et al (1983) Relative risk = ratio of age-standardized rate among Indians to that of white males

(3) Young et al (1985) Standardized Incidence Ratio = ratio of observed/expected number of cancer cases

(4) Schaefer et al (1975)

(5) Choi (1968)

Table 3: Causes of infant deaths for the Sioux Lookout Zone (1972-81)<sup>(1)</sup> and Indian reserves (1976-83) in Quebec, Ontario, Manitoba, Saskatchewan, and Alberta<sup>(2)</sup>

Cause	SIOUX LOOKOUT ZONE		INDIAN RESERVES	
	Neonatal	Post-neonatal	Neonatal	Post-neonatal
	PMR <sup>(3)</sup>	PMR	SMR <sup>(4)</sup>	SMR
Infectious and parasitic diseases	3.9	9.2	2.54	11.79**
Intestinal diseases	3.9	7.9		
Whooping cough	0	1.3		
Neoplasms				1.94
Endocrine, nutritional, metabolic and immunity disorders	0	2.6		
Diseases of the nervous system	2.0	5.2		2.93**
Meningitis	2.0	2.6		4.30*
other	0	2.6		
Diseases of the circulatory system	0	1.3		
Diseases of the respiratory system	5.9	38.2	3.85**	9.94**
Pneumonia	3.9	30.3		12.12**
Acute bronchitis and bronchiolitis				21.23**
other	2.0	7.9		
Diseases of the genitourinary system	0	1.3		
Congenital anomalies	19.6	10.5	1.11	1.30
CNS anomalies			1.21	0.77
Circulatory anomalies			1.16	1.50
other			1.00	1.42
Perinatal conditions	52.9	0	1.46**	
Low birthweight			1.86**	
Intrauterine hypoxia, anoxia			1.54	
Resp. distress syn.			1.52	
Compl. placenta/cords/mem			0.87	
Maternal complications			0.71	
Symptoms, signs, ill-defined	11.8	25.0		
Sudden infant death syndrome	7.8	23.7	3.52*	3.61*
Unknown	3.9	1.3		
Injuries and poisonings	3.9	6.6	6.03**	3.83**
Motor vehicle traffic accidents				3.47
Fires				8.24**
Suffocation			8.36*	4.36**
Hunger, thirst, exposure, neglect			91.99**	
TOTAL	100.0	100.0	1.38**	3.99**

\* p<0.05 \*\* p<0.01

(1) Young, 1983b

(2) Morrison et al., 1986

(3) PMR=proportionate mortality ratio =number of deaths per given cause given 100 total deaths

(4) SMR=standardized mortality ratio

Table 4 Summary of mortality studies among the Canadian Indians

Reference	Population studied	Source of population data	Source of mortality data	Comment
Choi, 1968	Manitoba Indian Reserves	?	Manitoba Cancer Registry	usual place of residence not always accurate
Gallagher et al., 1979	British Columbia Indians	BC Vital Statistics list of registered Indians	BC Vital Statistics	deaths based on reported ethnicity, may include Metis, status and non-status Indians, population is registered Indians
Hildes et al., 1964	Inuit of central and western arctic	1961 Census	referral centres	ascertainment of deaths through referral centres probably incomplete
Jarvis et al., 1962	35 Alberta reserves	INAC band lists	Native case workers, cross reference to Med Services, band list	method is time-consuming, may be incomplete
Mao et al., 1966	Indian reserves-all Canada except PEI, Nfld, BC	INAC Register	Canadian Mortality Database	usual place of residence not always accurate
Health and Welfare, 1963	Registered Indians and Inuit	Medical Services	Medical Services	non-standardized proportionate mortality ratios only

Table 4 (continued) Summary of mortality studies among the Canadian Indians

Reference	Population studied	Source of population data	Source of mortality data	Results
Morrison et al., 1986	Indian reserves-all Canada except PEI, NS, BC, Nfld	INAC Register	Canadian Mortality Database	usual place of residence not always accurate
Schaefer et al., 1975	Inuit	1971 Census	referral centre records	ascertainment of deaths through referral centres probably incomplete
Schmitt et al., 1966	British Columbia Indians	BC Vital Statistics INAC band lists	BC Vital Statistics	deaths based on reported ethnicity may include Metis, status and non-status, population is registered Indians
Spady et al., 1982	Inuit of the NWT	Medical Services	Medical Services	non-standardized proportionate mortality ratios only
Young, 1983b	Sioux Lookout Zone	INAC band lists	Medical Services	small region, good mortality and population estimates
Young et al., 1983	Sioux Lookout Zone	INAC band lists	Medical Services	small region, good mortality and population estimates

Table 5: Laboratory centre for disease control (LCDC) and International Classification of Disease (ICD) codes for causes of death

Cause of death	LCDC code	ICD code (1979-84)	ICD code (1971-78)
<u>All causes</u>	1	001-999	000-999
<u>Cancer</u>	19	140-208	140-209
Digestive Tract (Includes Esophagus, Stomach, Small intestine, Large Intestine and Rectum, Liver, Gallbladder, Pancreas, Peritoneum, Digestive nervous system)	43	150-159 150 151 152 153,154,159 155 0,155. i 156 157 158 159.1, 8, 9	150-159 150 151 152 153,154 155 156 157 158 159
Bronchus and Lung	46	162.2, 3, 4, 5, 8, 9	162 1
Breast	64	174,175	174
Cervix uteri	65	180	180
<u>Circulatory Disease</u>	8	390-459	390-458
Coronary heart disease (Ischemic heart disease) (Includes Acute Myocardial Infarction)	117	410-414 410	410-413 410
Cerebrovascular disease	118	430-438	430-438
<u>Accidents/Poisonings/Violence</u>	18	800-999	800-999
Motor vehicle traffic accidents	157	810-819	810-819
Accidental falls	159	880-888	880-887
Fires	160	890-899	890-899
Fires in private dwellings	161	890	890
Drownings	162	910	910
Suicide	163	950-959	950-959
Homicide	164	960-969	960-969



Table 5 (continued): Laboratory centre for disease control (LCDC) and International Classification of Disease (ICD) codes for causes of death

Cause of death	LCDC code	ICD code (1979-84)	ICD code (1971-78)
<u>Other causes of death</u>			
Infective and Parasitic Diseases	2	001-139	000-136
Diabetes Mellitus	109	250	250
Influenza	130	487	470-474
Pneumonia	131	480-486	480-486
Kidney disease	153	580-593	580-593
Alcoholic psychosis, alcoholism and Alcohol Poisoning	112	291,303, 305 0,860	291,303 860
Cirrhosis & other liver disease	166	570-573	570-573
Chronic obstructive pulmonary disease	174	490-496	NE

Table 6: Life expectancy of Indian reserve residents and the Canadian population, 1971-77 and 1978-84

	1971-77		1978-84	
	Male	Female	Male	Female
Quebec IR	65.0	71.0	71.5	80.1
Ontario IR	62.7	72.1	68.2	76.3
Manitoba IR	63.8	72.7	70.8	75.0
Saskatchewan IR	91.3	102.3	68.6	76.1
Alberta IR	66.9	76.5	61.9	71.7
Total Canadian <sup>1</sup>	70.2	77.5	71.9	79.0

<sup>1</sup> Life expectancies for the Canadian population are for 1976 and 1981

Table 7: Distribution of deaths by age group in the Indian, county, and provincial population, 1971-77 and 1978-84.

Age group	Indian Population  % of total deaths (N= 7,758)	County Population  % of total deaths (N=486,915)	Provincial Population  % of total deaths (N=1,578,586)
<b>0-4 years</b>			
1971-77	17.4	3.9	3.6
1978-84	9.3	2.5	2.3
<b>5-14 years</b>			
1971-77	3.4	1.1	1.0
1978-84	3.1	0.7	0.6
<b>15-34 years</b>			
1971-77	17.1	5.4	5.0
1978-84	16.1	4.7	4.5
<b>35-64 years</b>			
1971-77	25.1	27.5	27.0
1978-84	27.9	24.6	25.4
<b>65 years +</b>			
1971-77	37.0	62.1	63.4
1978-84	43.6	67.5	67.2

Table 8: Standardized mortality ratios (SMR) for all-cause mortality among the male and female Indian reserve population compared to a) the provincial population and b) the county population, 1971-77 and 1978-84

	Males		Females	
	SMR Indian vs province	SMR Indian vs county	SMR Indian vs province	SMR Indian vs county
<b>1971-1977</b>				
Quebec	1.13**	1.10*	1.55**	1.36**
Ontario	1.34**	1.68**	1.38**	1.78**
Manitoba	1.43**	1.85**	1.37**	2.10**
<b>1978-1984</b>				
Quebec	0.92*	0.88**	0.94	0.93
Ontario	1.21**	1.13**	1.24**	1.18**
Manitoba	1.09*	1.09*	1.21**	1.21**

\* p<0.05

\*\* p<0.01

Table 9: Age-standardized mortality rates (ASMR per 100,000) and standardized mortality ratios (SMR) for all-cause mortality on Indian reserves during 1978-84 compared with 1971-77.

Region	Males			Females		
	ASMR 1971-77	ASMR 1978-84	SMR	ASMR 1971-77	ASMR 1978-84	SMR
Quebec	1040	761	0.73**	741	465	0.60**
Ontario	1106	890	0.77**	691	568	0.78**
Manitoba	1013	754	0.67**	647	485	0.69**

\* p<0.05

\*\* p<0.01

Table 10: Standardized mortality ratios (SMR) for accidents, poisonings, and violence on Indian reserves compared with 1) the county population and 2) the provincial population, 1971-77 and 1978-84.

Region	Male		Female	
	SMR Indian vs County	SMR Indian vs Province	SMR Indian vs County	SMR Indian vs Province
<b>1971-77</b>				
Quebec	1.67**	1.88**	2.29**	2.43**
Ontario	4.83**	4.31**	8.72**	4.74**
Manitoba	3.75**	3.28**	4.80**	3.56**
<b>1978-84</b>				
Quebec	1.67**	1.85**	1.14	1.20
Ontario	2.80**	3.37**	2.97**	3.28**
Manitoba	2.66**	2.55**	2.81**	2.67**

\*  $p < 0.05$

\*\*  $p < 0.01$

Table 11: Standardized mortality ratios (SMR) for cancer on Indian reserves compared with 1) the county population and 2) the provincial population, 1971-77 and 1978-84.

Region	Male		Female	
	SMR Indian vs County	SMR Indian vs Province	SMR Indian vs County	SMR Indian vs Province
<b>1971-77</b>				
Quebec	0.78**	0.78**	0.77	0.73*
Ontario	0.64**	0.48**	1.15	0.81
Manitoba	0.50**	0.38**	1.00	0.72*
<b>1978-84</b>				
Quebec	0.62**	0.64**	0.64**	0.64**
Ontario	0.53**	0.54**	0.84	0.84
Manitoba	0.40**	0.41**	0.78	0.79

\* p<0.05

\*\*p<0.01

Table 12: Standardized mortality ratios (SMR) for circulatory disease on Indian reserves compared with 1) the county population and 2) the provincial population, 1971-77 and 1978-84.

Region	Male		Female	
	SMR Indian vs County	SMR Indian vs Province	SMR Indian vs County	SMR Indian vs Province
	<b>1971-77</b>			
Quebec	0.74**	0.75**	0.96	0.96
Ontario	1.01	0.81**	1.05	0.82**
Manitoba	1.09	0.83**	1.18	0.86
	<b>1978-84</b>			
Quebec	0.67**	0.68**	0.77**	0.78**
Ontario	0.81**	0.87**	0.84**	0.91
Manitoba	0.74**	0.74**	0.74**	0.75**

\* p<0.05

\*\*p<0.01



Table 13a: Age-standardized mortality rates (ASMR per 100,000)<sup>1</sup> of major causes of death, for males 71-77 and 1978-84

<b>Males 71-77</b>				
Rank	Indian reserve		County population	
	Disease	ASMR	Disease	ASMR
1	Coronary heart disease	204	Coronary heart disease	246
2	Motor vehicle traffic accidents	74	Cerebrovascular disease	67
3	Cerebrovascular disease	65	Digestive tract cancer	49
4	Pneumonia	64	Bronchus and lung cancer	43
5	Suicide	36	Motor vehicle traffic accidents	34
6	Homicide	32	Pneumonia	24
7	Drowning	29	Suicide	16
8	Fires	27	Cirrhosis	14
9	Digestive tract cancer	26	Diabetes	11
10	Bronchus and lung cancer	25	Accidental Falls	8

<b>Males 78-84</b>				
Rank	Indian reserve		County population	
	Disease	ASMR	Disease	ASMR
1	Coronary heart disease	179	Coronary heart disease	244
2	Cerebrovascular disease	49	Bronchus and lung cancer	63
3	Motor vehicle traffic accidents	44	Cerebrovascular disease	58
4	Suicide	38	Digestive tract cancer	57
5	Digestive tract cancer	33	C.O.P.D.	30
6	Pneumonia	32	Motor vehicle traffic accidents	28
7	Bronchus and lung cancer	28	Pneumonia	24
8	Diabetes	24	Suicide	21
9	C.O.P.D.	23	Cirrhosis	14
10	Drowning	20	Diabetes	12

<sup>1</sup> The age-standardized mortality rates are a weighted average for Quebec, Ontario, and Manitoba.

Table 13b: Age-standardized mortality rates (ASMR per 100,000)<sup>1</sup> of major causes of death, for females all ages, 1971-77 and 1978-84.

<b>Females 71-77</b>				
<b>Rank</b>	<b>Indian reserve</b>		<b>County population</b>	
	<b>Disease</b>	<b>ASMR</b>	<b>Disease</b>	<b>ASMR</b>
1	Coronary heart disease	121	Coronary heart disease	114
2	Cerebrovascular disease	48	Cerebrovascular disease	54
3	Pneumonia	45	Digestive tract cancer	32
4	Motor vehicle traffic accidents	33	Breast cancer	20
5	Diabetes	29	Pneumonia	14
6	Digestive tract cancer	28	Diabetes	13
7	Fires	20	Motor vehicle traffic accidents	12
8	Cirrhosis	14	Bronchus and lung cancer	7
9	Breast Cancer	14	Cirrhosis	5
10	Suicide	14	Suicide	5

<b>Females 78-84</b>				
<b>Rank</b>	<b>Indian reserve</b>		<b>County population</b>	
	<b>Disease</b>	<b>ASMR</b>	<b>Disease</b>	<b>ASMR</b>
1	Coronary heart disease	92	Coronary heart disease	114
2	Cerebrovascular disease	46	Cerebrovascular disease	47
3	Pneumonia	26	Bronchus and lung cancer	36
4	Digestive tract cancer	25	Cervical cancer	24
5	Diabetes	23	Breast cancer	15
6	Motor vehicle traffic accidents	15	Pneumonia	14
7	Cirrhosis	13	Diabetes	11
8	Cervical cancer	11	Motor vehicle traffic accidents	10
9	Bronchus and lung cancer	11	COPD	7
10	Breast Cancer	11	Cirrhosis	6

<sup>1</sup> The age-standardized mortality rates are a weighted average for Quebec, Ontario, and Manitoba

Table 14: Standardized mortality ratios (SMR) for 0-4 year olds in the Indian population compared with the county population, 1971-77 and 1978-84.

REGION	Male	Female
	SMR	SMR
<b>1971-77</b>		
Quebec	2.31**	3.09**
Ontario	4.31**	3.92**
Manitoba	3.90**	3.30**
<b>1978-84</b>		
Quebec	2.33**	3.12**
Ontario	2.27**	2.02**
Manitoba	1.29	2.12**

\*p<0.05

\*\*p<0.01

Table 15: Age-standardized mortality rate (ASMR per 100,000) and standardized mortality ratios (SMR) among 0-4 year olds in the Indian population during 1978-84 compared with 1971-77

Region	Males			Females		
	ASMR 1971-77	ASMR 1978-84	SMR	ASMR 1971-77	ASMR 1978-84	SMR
Quebec	992	615	0.61**	1023	615	0.60**
Ontario	1182	617	0.52**	893	401	0.46**
Manitoba	1382	380	0.28**	942	512	0.55**

\* p<0.05

\*\* p<0.01

Table 16: Standardized mortality ratios (SMR) for 5-14 year olds in the Indian population compared with the county population, 1971-77 and 1978-84.

REGION	Male	Female
	SMR	SMR
<b>1971-77</b>		
Quebec	1.44	1.24
Ontario	2.46**	2.16*
Manitoba	2.10**	4.22**
<b>1978-84</b>		
Quebec	1.98	1.91
Ontario	1.99**	1.97*
Manitoba	1.88**	1.32

\*p<0.05

\*\*p<0.01

Table 17: Age-standardized mortality rate (ASMR per 100,000) and standardized mortality ratios (SMR) among 5-14 year olds in the Indian population during 1978-84 compared with 1971-77.

Region	Males			Females		
	ASMR 1971-77	ASMR 1978-84	SMR	ASMR 1971-77	ASMR 1978-84	SMR
Quebec	86	73	0.84	52	51	0.97
Ontario	88	71	0.81	43	46	1.06
Manitoba	107	85	0.84	96	32	0.33**

\*  $p < 0.05$

\*\*  $p < 0.01$

Table 18: Standardized mortality ratios (SMR) for 15-34 year olds in the Indian population compared with the county population, 1971-77 and 1978-84.

REGION	Male	Female
	SMR	SMR
<b>1971-77</b>		
Quebec	1.71**	2.47**
Ontario	4.38**	5.18**
Manitoba	3.64**	4.01**
<b>1978-84</b>		
Quebec	1.80**	1.05
Ontario	2.32**	2.29**
Manitoba	2.47**	2.36**

\*p<0.05

\*\*p<0.01

Table 19: Age-standardized mortality rate (ASMR per 100,000) and standardized mortality ratios (SMR) among 15-34 year olds in the Indian population 1978-84 compared with 1971-77.

Region	Males			Females		
	ASMR 1971-77	ASMR 1978-84	SMR	ASMR 1971-77	ASMR 1978-84	SMR
Quebec	335	274	0.82*	166	54	0.33**
Ontario	557	324	0.59**	228	114	0.49**
Manitoba	542	343	0.61**	195	116	0.61**

\*  $p < 0.05$

\*\*  $p < 0.01$



Table 20: Standardized mortality ratios (SMR) for 35-64 year olds in the Indian population compared with the county population, 1971-77 and 1978-84.

REGION	Male	Female
	SMR	SMR
<b>1971-77</b>		
Quebec	1.19*	1.26*
Ontario	1.86**	2.45**
Manitoba	1.76**	2.22**
<b>1978-84</b>		
Quebec	0.94	1.30*
Ontario	1.34**	1.72**
Manitoba	1.21*	1.60**

\* $p < 0.05$

\*\* $p < 0.01$

Table 21: Age-standardized mortality rate (ASMR per 100,000) and standardized mortality ratios (SMR) among 35-64 year olds in the Indian population during 1978-84 compared with 1971-77

Region	Males			Females		
	ASMR 1971-77	ASMR 1978-84	SMR	ASMR 1971-77	ASMR 1978-84	SMR
Quebec	1156	773	0.66**	637	498	0.89
Ontario	1191	966	0.80**	785	654	0.83*
Manitoba	985	782	0.80**	637	561	0.88

\*  $p < 0.05$

\*\*  $p < 0.01$

Table 22: Age-standardized mortality rates<sup>1</sup> (ASMR per 100,000) of major causes of death, for males 35-64, 1971-77 and 1978-84.

<b>Males 71-77</b>				
<b>Rank</b>	<b>Indian reserve</b>		<b>County population</b>	
	<b>Disease</b>	<b>ASMR</b>	<b>Disease</b>	<b>ASMR</b>
1	Coronary heart disease	234	Coronary heart disease	254
2	Motor vehicle traffic accidents	87	Bronchus and lung cancer	60
3	Cerebrovascular disease	55	Digestive tract cancer	52
4	Cirrhosis	54	Cerebrovascular disease	35
5	Homicide	44	Cirrhosis	29
6	Bronchus and lung cancer	42	Motor vehicle traffic accidents	27
7	Pneumonia	39	Suicide	25
8	Alcoholism	37	Pneumonia	9
9	Suicide	34	Diabetes	9
10	Digestive tract cancer	31	Accidental Falls	7

<b>Males 78-84</b>				
<b>Rank</b>	<b>Indian reserve</b>		<b>County population</b>	
	<b>Disease</b>	<b>ASMR</b>	<b>Disease</b>	<b>ASMR</b>
1	Coronary heart disease	218	Coronary heart disease	245
2	Bronchus and lung cancer	58	Bronchus and lung cancer	83
3	Digestive tract cancer	44	Digestive tract cancer	59
4	Cerebrovascular disease	36	Cerebrovascular disease	30
5	Motor vehicle traffic accidents	34	Suicide	30
6	Suicide	30	Cirrhosis	29
7	Cirrhosis	26	Motor vehicle traffic accidents	23
8	Diabetes	25	C.O.P.D	14
9	Alcoholism	19	Diabetes	10
10	Homicide	17	Pneumonia	8

<sup>1</sup> The age-standardized mortality rates are a weighted average for Quebec, Ontario, and Manitoba.

Table 23: Age-standardized mortality rates<sup>1</sup> (ASMR per 100,000) of major causes of death, for females 35-64, 1971-77 and 1978-84.

<b>Females 71-77</b>				
<b>Rank</b>	<b>Indian reserve</b>		<b>County population</b>	
	<b>Disease</b>	<b>ASMR</b>	<b>Disease</b>	<b>ASMR</b>
1	Coronary heart disease	103	Coronary heart disease	63
2	Cerebrovascular disease	44	Breast cancer	40
3	Motor vehicle traffic accidents	42	Digestive tract cancer	34
4	Diabetes	38	Cerebrovascular disease	27
5	Breast cancer	27	Bronchus and lung cancer	12
6	Digestive tract cancer	25	Motor vehicle traffic accidents	11
7	Cirrhosis	24	Cirrhosis	11
8	Pneumonia	23	Suicide	9
9	Cervical cancer	21	Diabetes	8
10	Fires	19	Cervical cancer	6

<b>Females 78-84</b>				
<b>Rank</b>	<b>Indian reserve</b>		<b>County population</b>	
	<b>Disease</b>	<b>ASMR</b>	<b>Disease</b>	<b>ASMR</b>
1	Coronary heart disease	63	Coronary heart disease	61
2	Cerebrovascular disease	45	Breast cancer	45
3	Digestive tract cancer	35	Digestive cancer	37
4	Diabetes	27	Bronchus and lung cancer	26
5	Cirrhosis	22	Cerebrovascular disease	24
6	Bronchus and lung cancer	22	Cirrhosis	12
7	Breast cancer	21	Suicide	11
8	Cervical cancer	20	Motor vehicle traffic accidents	10
9	Infectious and parasitic disease	14	Diabetes	7
10	Pneumonia	14	C.O.P.D	7

<sup>1</sup> The age-standardized mortality rates are a weighted average for Quebec, Ontario and Manitoba

Figure 1: Further years of life expected for male and female residents of Ontario Indian reserves, 1971-77 and 1978-84.

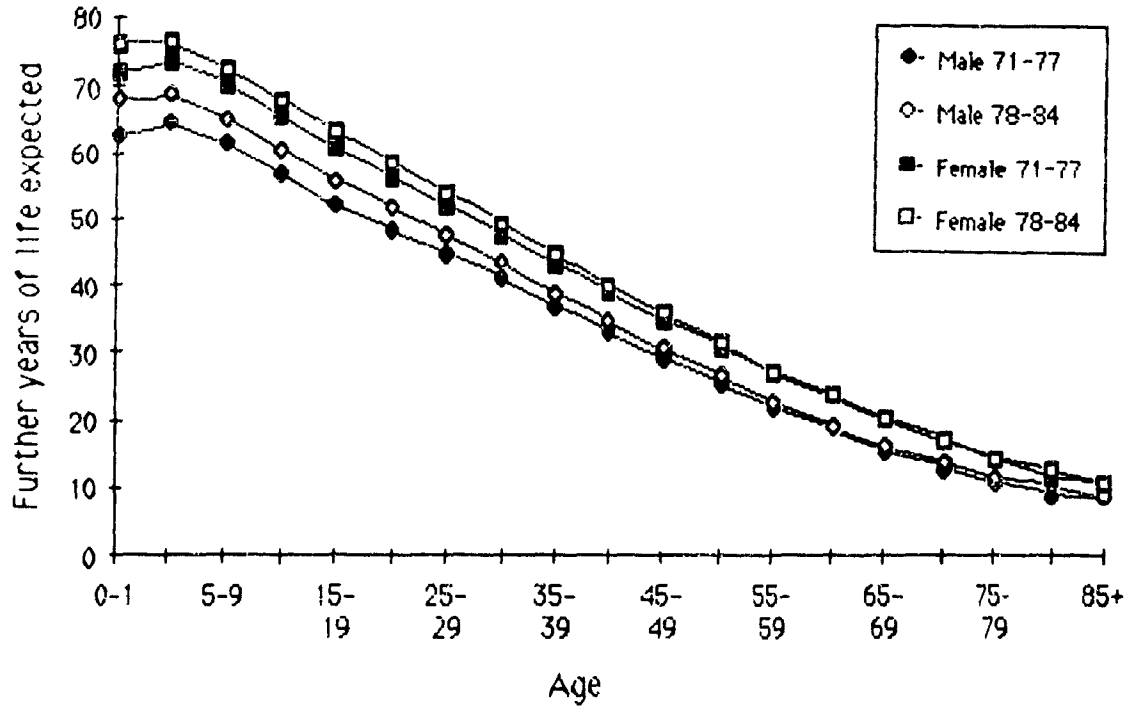


Figure 2: Probability of death for males on Ontario, Saskatchewan, and Alberta Indian reserves, 1971-77

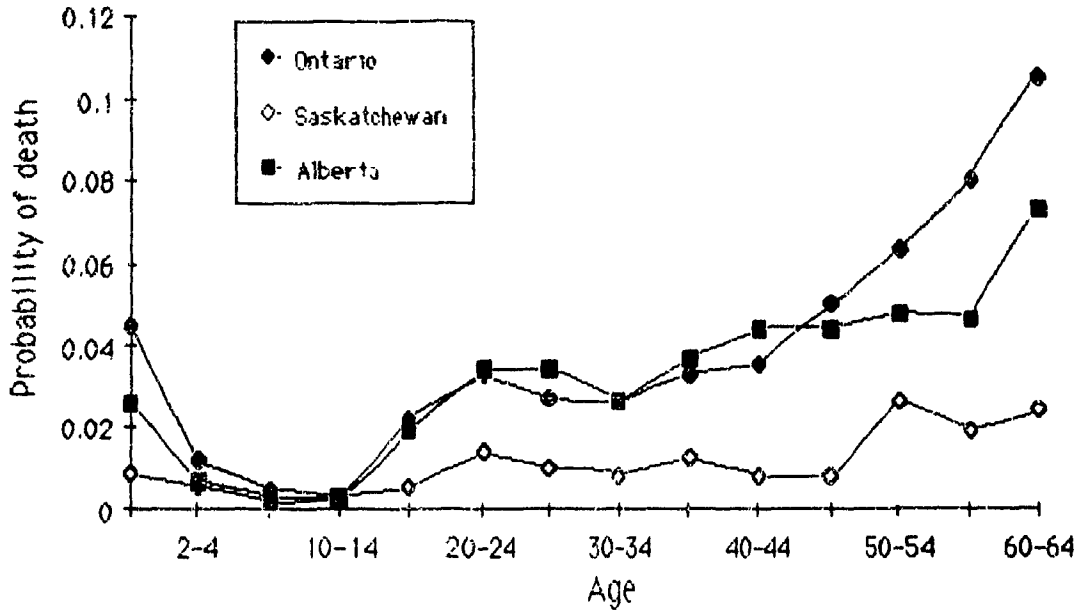


Figure 3: Probability of death for females on Ontario, Saskatchewan, and Alberta Indian reserves, 1971-77.

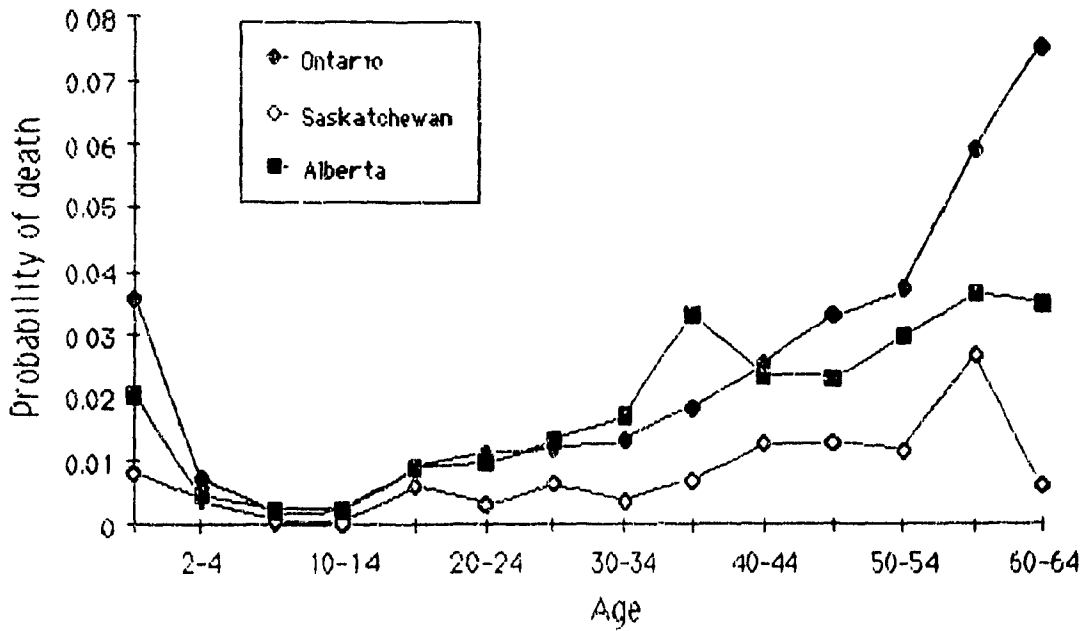


Figure 4: Probability of death for males on Ontario, Saskatchewan, and Alberta Indian reserves, 1978-84.

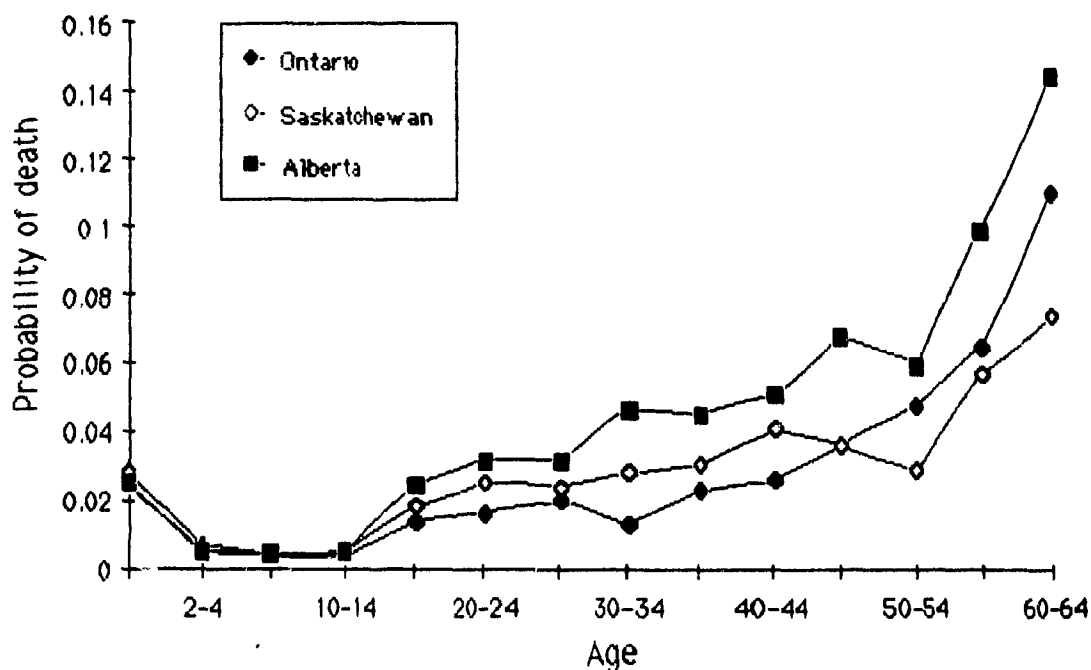


Figure 5: Probability of death for females on Ontario, Saskatchewan, and Alberta Indian reserves, 1978-84.

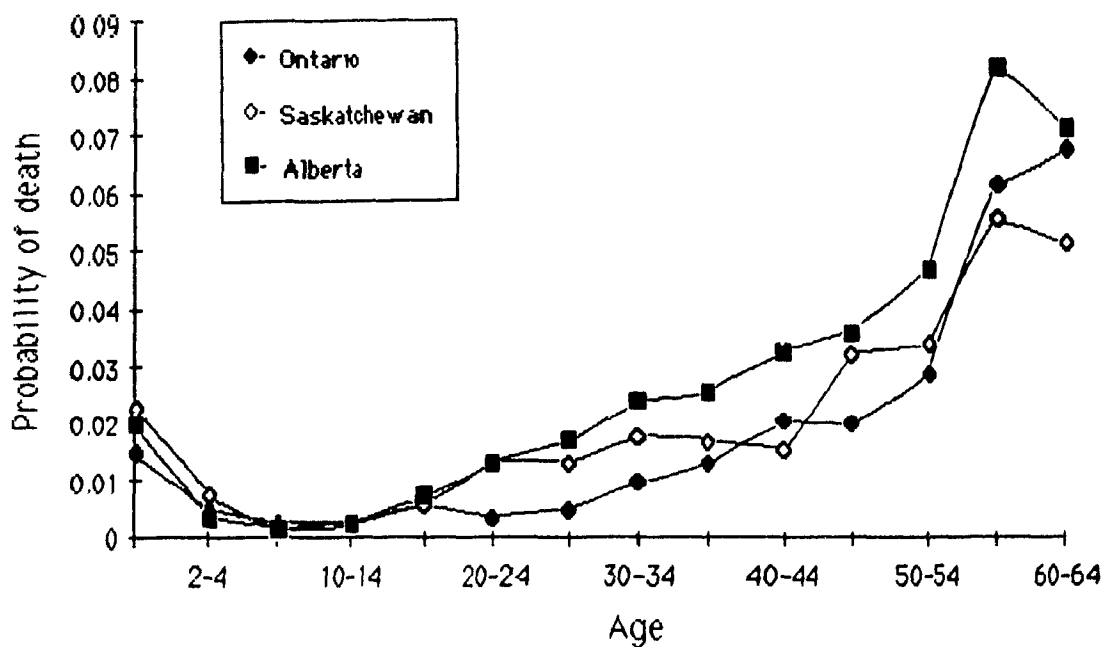
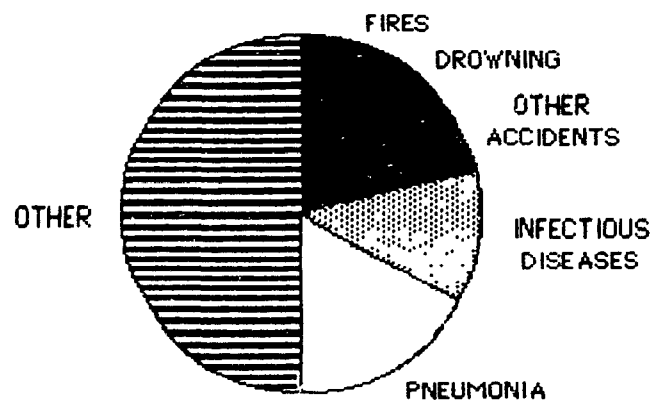
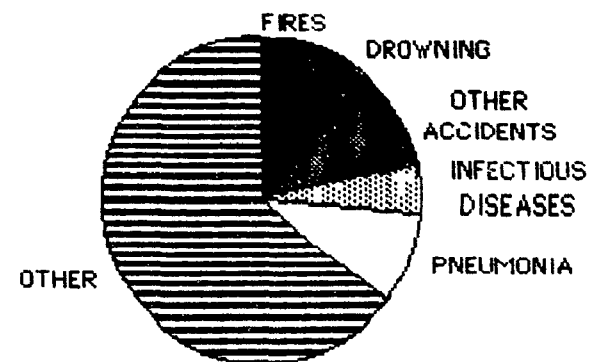


Figure 6 Causes of death among 0-4 year olds, 1971-77 and 1978-84

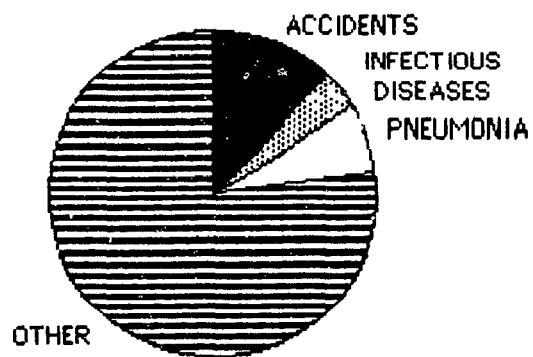
a) Indian reserves, 1971-77.



b) Indian reserves, 1978-84.



c) county population, 1971-77



d) county population, 1978-84.

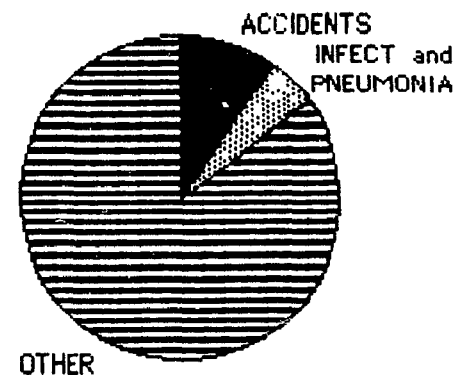
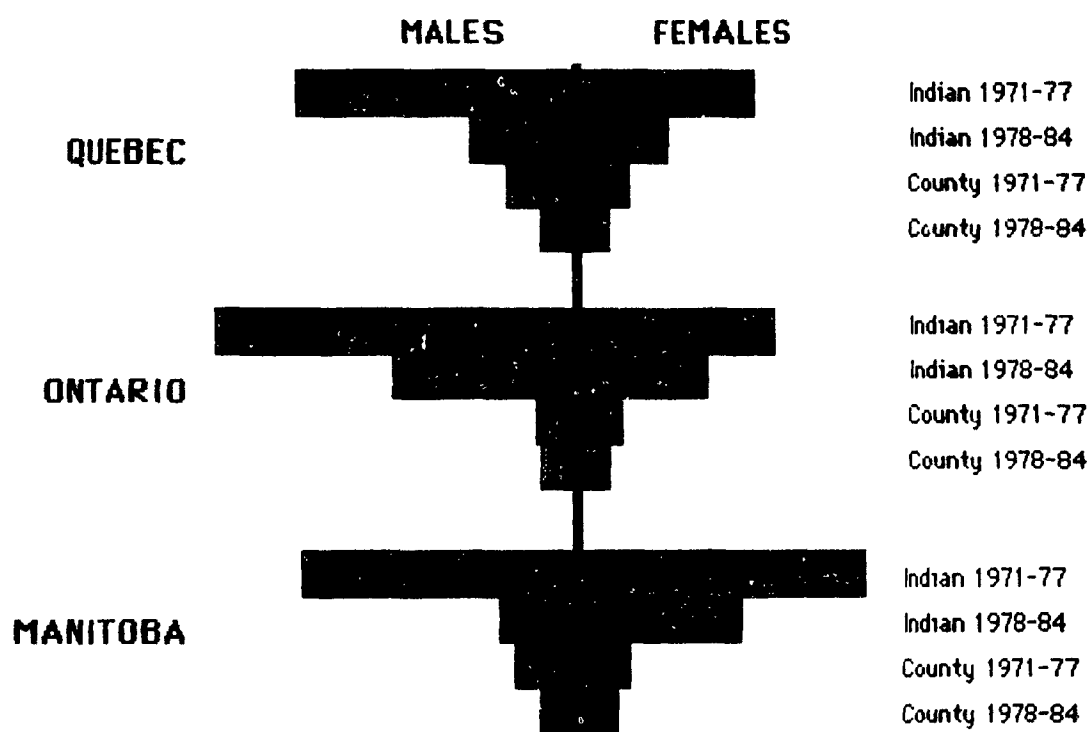




Figure 7: Age-standardized mortality rates (ASMR per 100,000) for accidents, poisonings, and violence among 0-4 year olds in the Indian and county populations, 1971-77 and 1978-84.



Scale 1cm=30/100,000

Figure 8 Age-standardized mortality rates (ASMP per 100,000) for infectious and parasitic diseases among 0-4 year olds in the Indian and county populations, 1971-77 and 1978-84

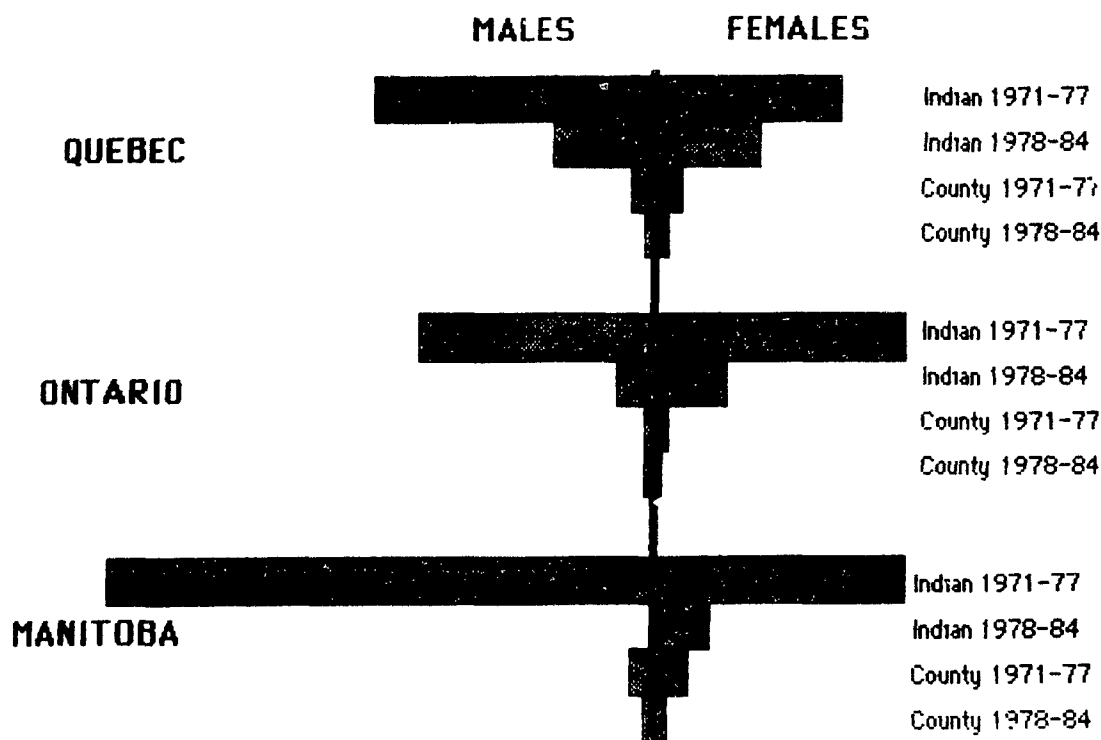
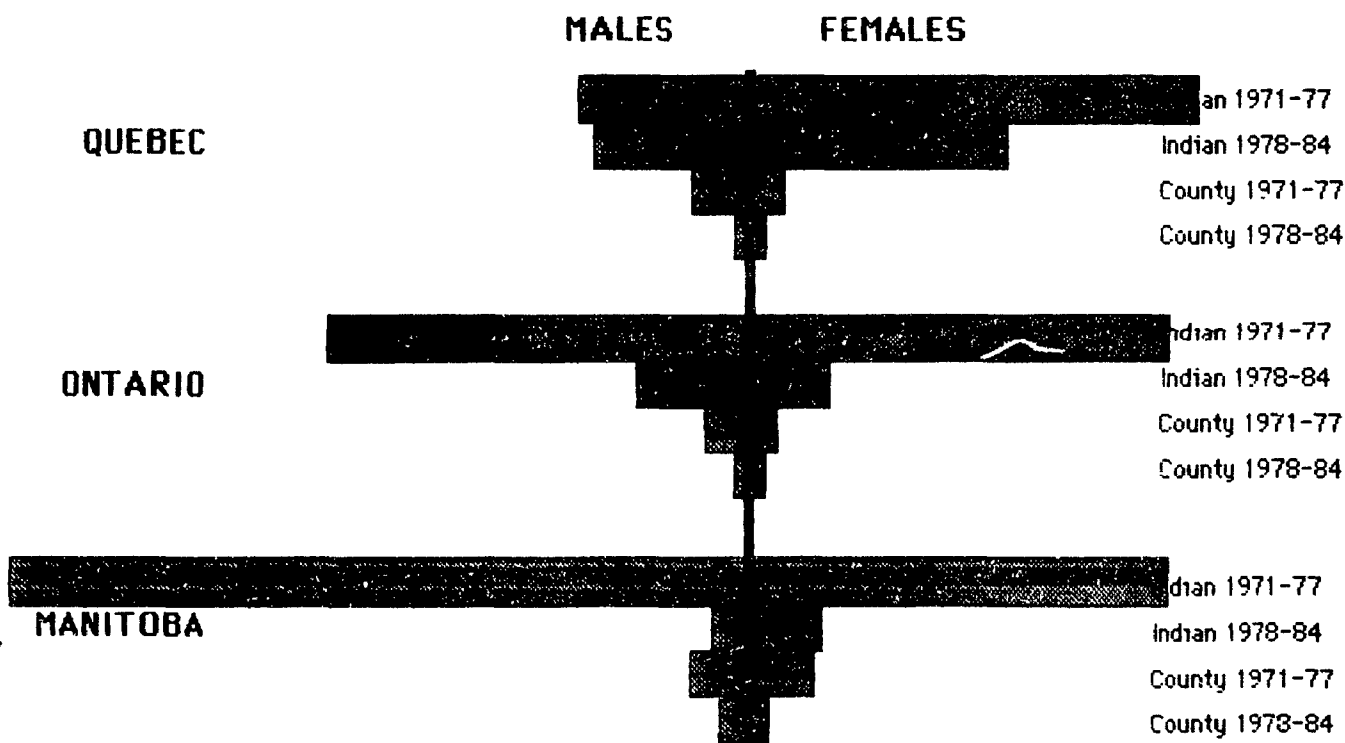


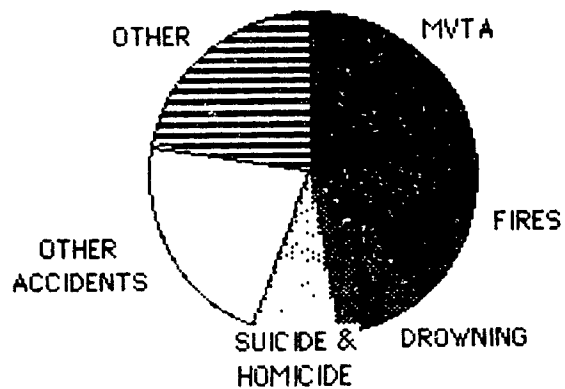
Figure 9 Age-standardized mortality rates (ASMR per 100,000) for pneumonia among 0-4 year olds in the Indian and county populations, 1971-77 and 1978-84



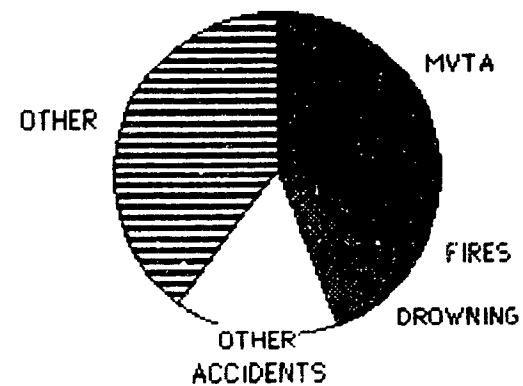
Scale 1 cm=30/100,000

Figure 10: Causes of death among 5-14 year olds.  
1971-77 and 1978-84

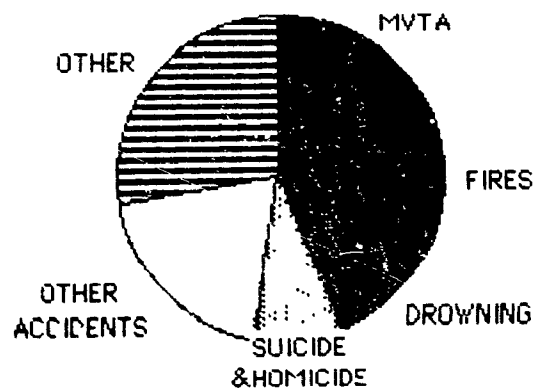
a) Indian reserves, 1971-77



b) Indian reserves, 1978-84,



c) county population, 1971-77



d) county population, 1978-84

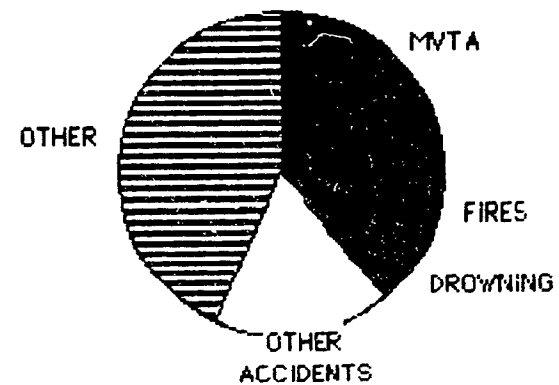
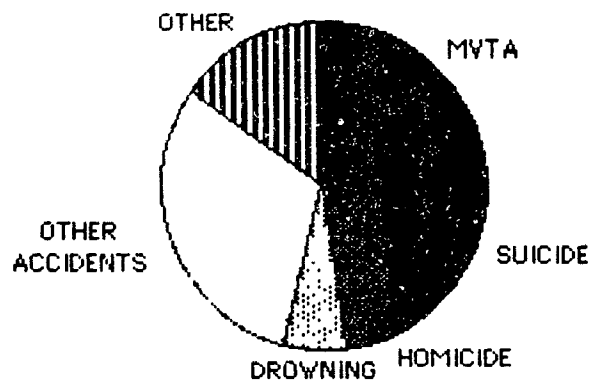
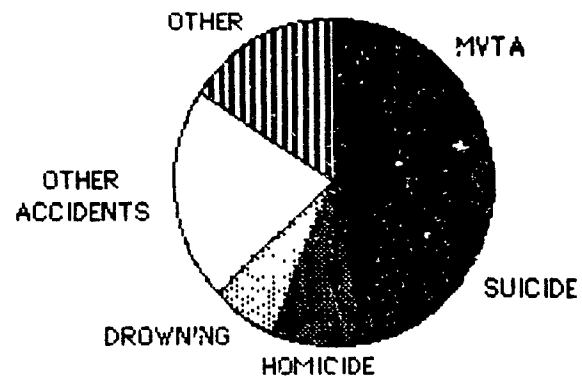


Figure 11 Causes of death among 15-34 year olds, 1971-77 and 1978-84

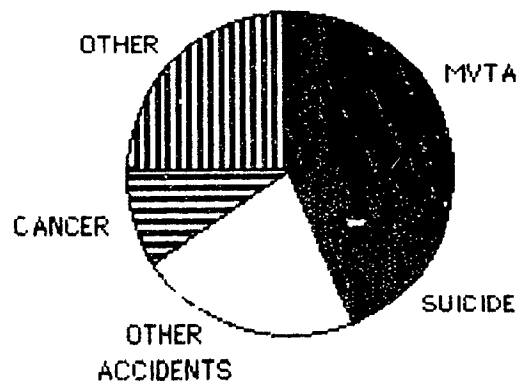
a) Indian reserves, 1971-77



b) Indian reserves, 1978-84



c) county population, 1971-77



d) county population, 1978-84

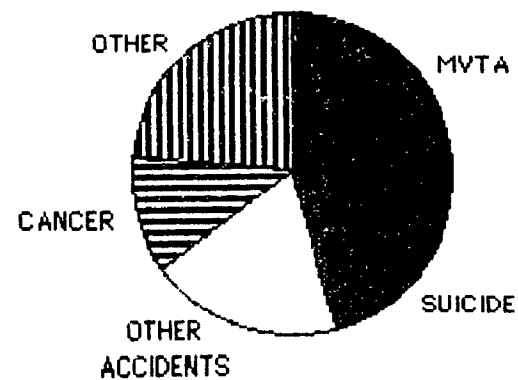


Figure 12. Age-standardized mortality rates (ASMR per 100,000) for accidents, poisonings, and violence among 15-34 year olds in the Indian and county populations, 1971-77 and 1978-84

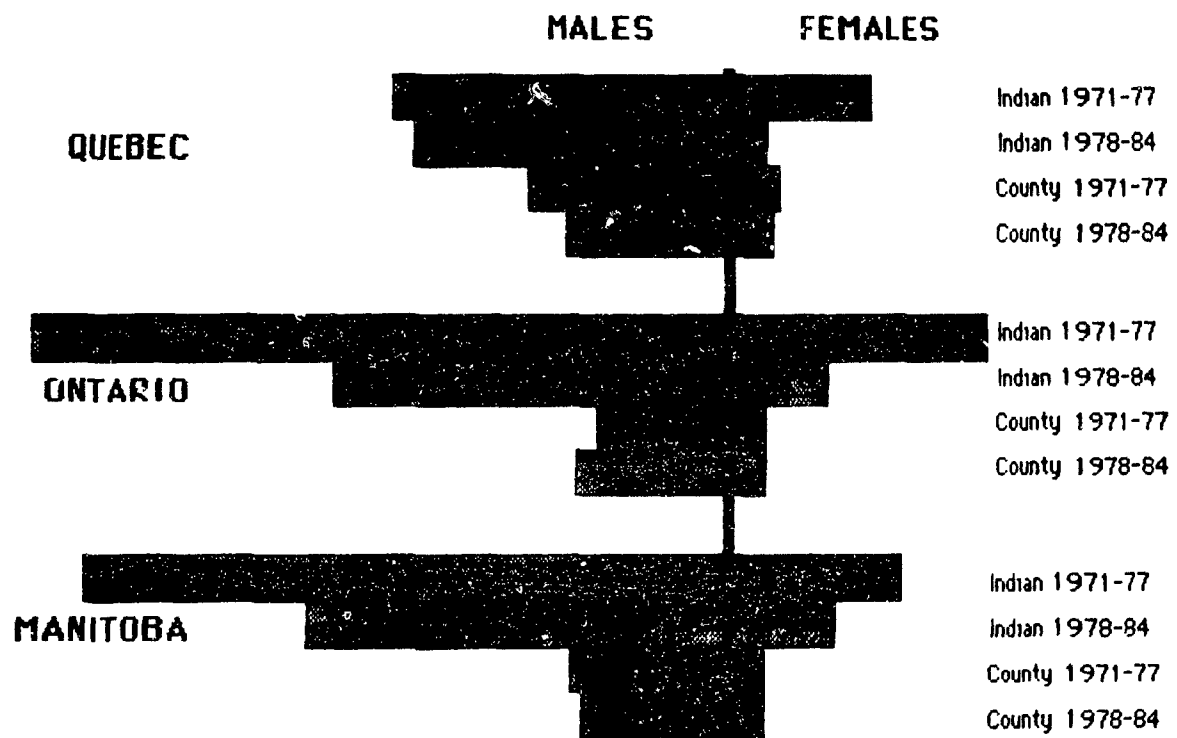
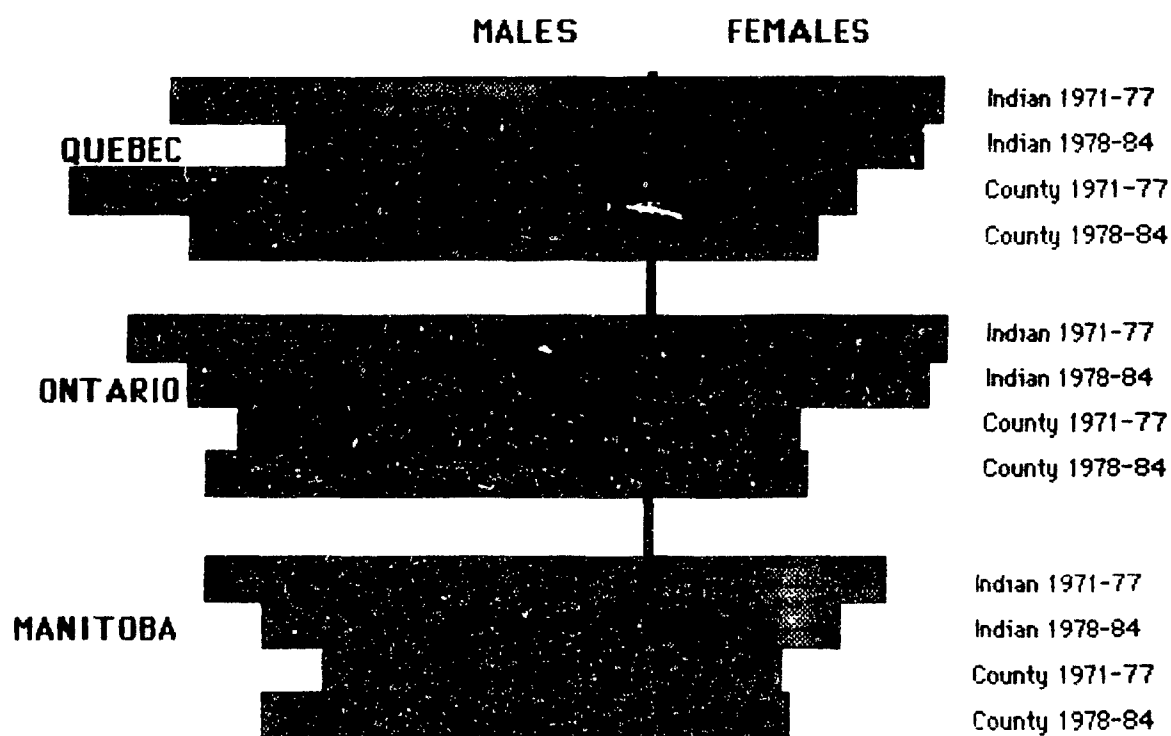


Figure 13 Age-standardized mortality rates (ASMR per 100,000) for circulatory disease among 35-64 year olds in the Indian and county population, 1971-77 and 1978-84



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## Appendix 1. Description of the Canadian Mortality Database.

The Canadian Mortality Database contains all the death registrations in Canada from 1950 to the present, a total of over 5,000,000 deaths. The special features of the Canadian Mortality Database are: (a) It contains, from each death registration, not only ample personal identifying information, but also the coded cause of death, (b) it exists both as machine-readable magnetic tape for computer searching and as compact microfiche and microfilm listings for manual searching, and (c) it is sequenced and consolidated (over all Canadian provinces and over spans of years) to facilitate such searching (Smith et al., 1982).

Deaths are also coded by place of residence. For instance, deaths to residents of Indian reserves can be identified and sorted by the geocodes for the different Indian reserves. The frequency of the different variables appearing on the death certificate, such as age, sex, and cause of death, can be obtained and tabulated for each Indian reserve.

Nothing comparable to this facility exists in any other major country. The recently established United States National Death Index, for example, goes back only to 1979. It also lacks the coded cause of death, so that manual-clerical checking of the death registration forms is required, normally at the various state registry offices (Smith, 1982).

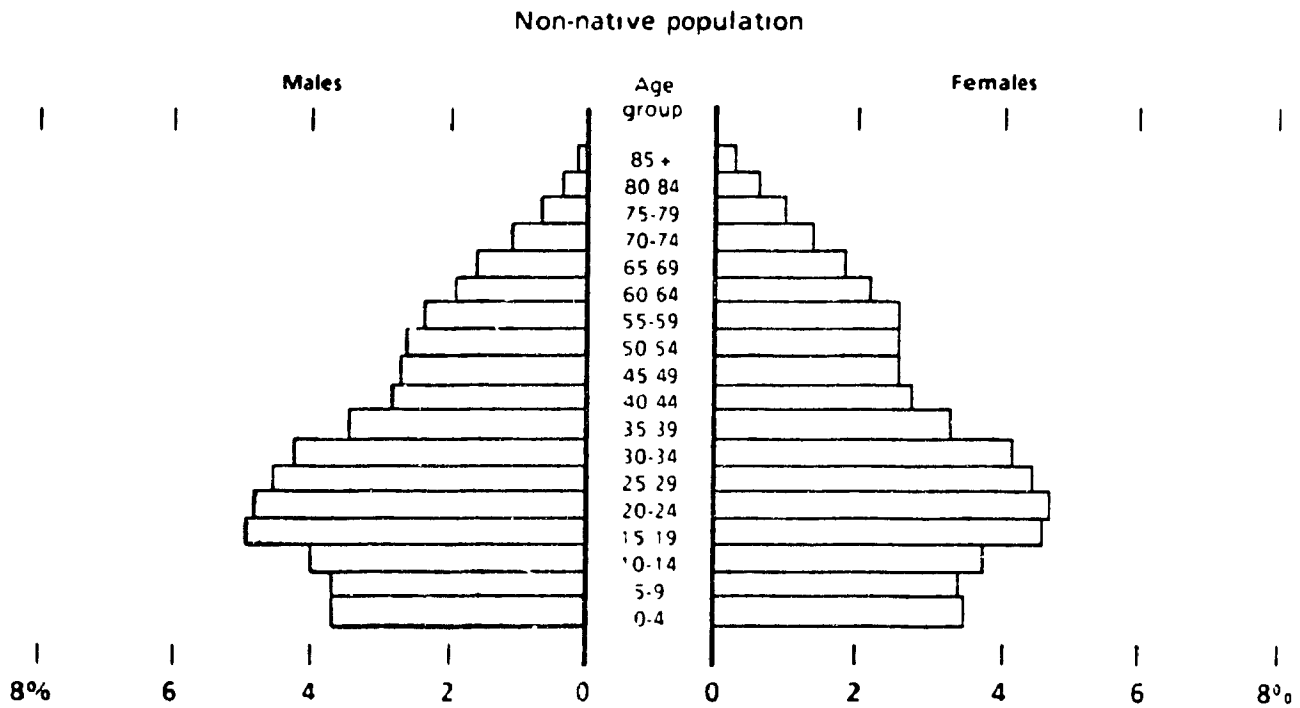
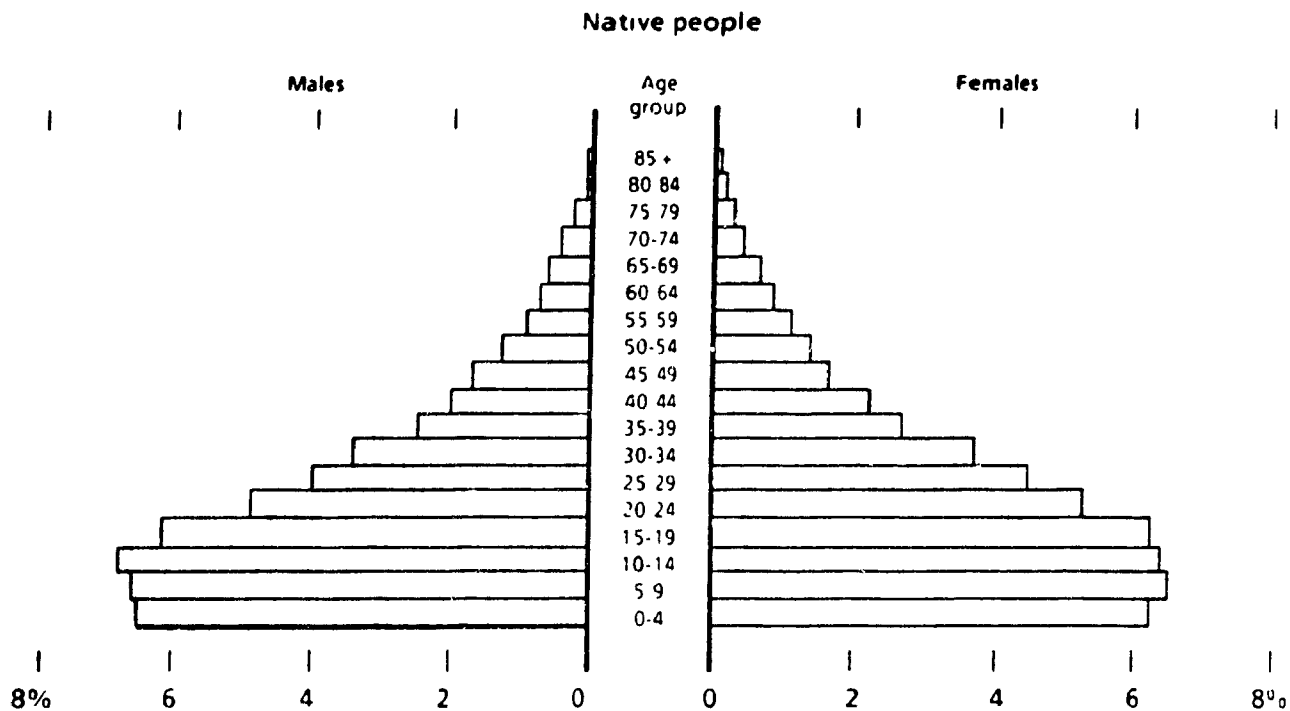


## Appendix 2: Description of the Indian Register.

The Indian Register is used by the Department of Indian and Northern Affairs (INAC) for administrative purposes. It was established in 1966 and files are available up to 1985 at the present moment. The INAC Indian Register reporting system provides data on two files, the membership file and the event file. The membership file contains a list of all registered Indians. The event file, divided into annual files, is used to record all vital events occurring to registered Indians. It is possible for an individual to be recorded several times on the event file in any given year if multiple events, such as a marriage and a birth, have occurred.

The birth and deaths in the INAC Indian Registry are only recorded once appropriate documentation, either the birth or death certificate is obtained (Allan, 1986). The documentation must be presented to the band office which then reports the information to the Register.

Appendix 3 Age-sex profile of native people and of the non-native population, Canada, 1981.



Appendix 4a: Distribution of deaths by age group for Indian reserves,  
1971-77 and 1978-84.

Province	1971-77		1978-84	
	Male	Female	Male	Female
<b>Quebec</b>				
All	670	479	600	372
0- 4	90	89	45	45
5- 14	20	12	18	12
15- 34	90	43	103	20
35- 64	201	90	166	103
<b>Ontario</b>				
All	1120	650	1081	662
0- 4	140	104	81	57
5- 14	31	15	27	17
15- 34	244	94	206	68
35- 64	299	180	311	193
<b>Manitoba</b>				
All	745	429	608	342
0- 4	164	117	49	65
5- 14	32	29	28	10
15- 34	173	56	147	47
35- 64	162	94	158	93
<b>Total</b>	<b>2535</b>	<b>1558</b>	<b>2289</b>	<b>1376</b>
<b>TOTAL (M+F)</b>	<b>4093</b>		<b>3665</b>	

Appendix 4b: Distribution of deaths by age group for the county population, 1971-77 and 1978-84.

Province	1971-77		1978-84	
	Male	Female	Male	Female
<b>Quebec</b>				
All	36927	23816	37997	25490
0- 4	1697	1233	1101	795
5- 14	603	393	409	206
15- 20	3324	1148	3040	1043
35- 64	12589	5943	12500	6069
<b>Ontario</b>				
All	79619	57668	81305	62323
0- 4	2659	2069	1908	1366
5- 14	831	445	538	335
15- 34	4767	1661	4481	1565
35- 64	23877	12106	22261	11960
<b>Manitoba</b>				
All	17375	11719	29696	22980
0- 4	691	537	722	566
5- 14	215	95	224	114
15- 34	1156	356	1486	558
35- 64	4377	2291	7097	3990
<b>Total</b>	<b>133921</b>	<b>93203</b>	<b>148998</b>	<b>110793</b>
<b>TOTAL (M+F)</b>	<b>227124</b>		<b>259791</b>	

Appendix 4c: Distribution of deaths by age group for the provincial population, 1971-77 and 1978-84.

Province	1971-77		1978-84	
	Male	Female	Male	Female
<b>Quebec</b>				
All	173332	124254	175520	129320
0- 4	6531	4850	4248	3164
5- 14	2385	1417	1427	798
15- 20	13190	4832	12180	4286
35- 64	58361	30290	55737	28624
<b>Ontario</b>				
All	236028	182538	241712	199317
0- 4	7924	6140	5462	4063
5- 14	2178	1359	1453	918
15- 34	13088	5112	12469	4778
35- 64	73149	38561	69067	38892
<b>Manitoba</b>				
All	33593	24104	33341	25527
0- 4	1360	1049	851	681
5- 14	368	198	270	135
15- 34	1984	739	1778	652
35- 64	8661	4749	7941	4419
<b>Total</b>	<b>442953</b>	<b>330896</b>	<b>450573</b>	<b>354164</b>
<b>TOTAL (M+F)</b>	<b>773849</b>		<b>804737</b>	

Appendix 5a: Age-standardized mortality rates<sup>1</sup> (ASMR per 100,000) for females in the Indian, county, and provincial populations, 1971-77.

Cause of Death	Indian Population	County Population	Provincial Population
All causes	693	446	531
Infectious and parasitic disease	27	4	4
Circulatory disease	229	216	256
Coronary heart disease	121	114	143
Cerebrovascular disease	47	54	61
Cancer	89	96	120
Digestive tract cancer	29	32	39
Bronchus and lung cancer	10	7	9
Breast cancer	14	20	25
Cervical cancer	10	3	4
Accidents, poisonings, and violence	130	33	39
Fires	20	2	3
Fires in private dwellings	19	2	2
Drownings	8	1	1
Suicide	14	15	7
Homicide	10	12	2
Motor vehicle traffic accidents	33	12	13
Accidental falls	5	2	2
Diabetes	29	13	13
Kidney disease	11	5	5
Influenza	2	2	2
Pneumonia	45	14	18
Alcoholism	6	1	1
Cirrhosis of the liver	14	6	7
Chronic obstructive lung disease	0	2	0

<sup>1</sup> The age-standardized mortality rates are a weighted average of the ASMR for Quebec, Ontario, and Manitoba.

Appendix 5b: Age-standardized mortality rates<sup>1</sup> (ASMR per 100,00) for females in the Indian, county, and provincial populations, 1978-84

Cause Death	Indian Population	County Population	Provincial Population
All causes	506	465	455
Infectious and parasitic disease	12	3	3
Circulatory disease	179	212	205
Coronary heart disease	92	114	113
Cerebrovascular disease	46	47	46
Cancer	90	118	118
Digestive tract cancer	25	36	36
Bronchus and lung cancer	11	15	15
Breast cancer	11	24	24
Cervical cancer	11	3	3
Accidents, poisonings, and violence	69	31	30
Fires	7	2	2
Fires in private dwellings	6	2	2
Drownings	5	1	1
Suicide	7	6	6
Homicide	7	2	2
Motor vehicle traffic accidents	15	10	9
Accidental falls	2	5	5
Diabetes	23	11	10
Kidney disease	10	5	5
Influenza	1	1	1
Pneumonia	26	14	13
Alcoholism	7	1	1
Cirrhosis of the liver	13	6	6
Chronic obstructive lung disease	10	7	7

1 The age-standardized mortality rates are a weighted average of the ASMR for Quebec, Ontario, and Manitoba.

Appendix 5c: Age-standardized mortality rates<sup>1</sup> (ASMR per 100,000) for males in the Indian, county, and provincial populations, 1971-77

Cause Death	Indian Population	County Population	Provincial Population
All causes	1053	792	912
Infectious and parasitic disease	34	5	6
Circulatory disease	346	379	440
Coronary heart disease	204	246	295
Cerebrovascular disease	65	67	73
Cancer	101	154	183
Digestive tract cancer	26	49	58
Bronchus and lung cancer	25	43	51
Breast cancer	0	0	0
Cervical cancer	0	0	0
Accidents, poisonings, and violence	296	94	98
Fires	27	3	4
Fires in private dwellings	24	3	3
Drownings	29	6	6
Suicide	36	16	18
Homicide	32	2	3
Motor vehicle traffic accidents	76	34	34
Accidental falls	10	8	9
Diabetes	16	12	13
Kidney disease	14	7	8
Influenza	2	2	2
Pneumonia	64	24	30
Alcoholism	15	3	4
Cirrhosis of the liver	21	14	17
Chronic obstructive lung disease	0	0	0

1 The age-standardized mortality rates are a weighted average of the ASMR for Quebec, Ontario, and Manitoba.



Appendix 5d: Age-standardized mortality rates<sup>1</sup> (ASMR per 100,000) for males in the Indian, county, and provincial populations, 1978-84.

Cause Death	Indian Population	County Population	Provincial Population
All causes	802	836	809
Infectious and parasitic disease	11	4	4
Circulatory disease	282	377	365
Coronary heart disease	179	243	239
Cerebrovascular disease	49	58	55
Cancer	103	193	189
Digestive tract cancer	33	57	56
Bronchus and lung cancer	28	63	61
Breast cancer	0	0	0
Cervical cancer	0	0	0
Accidents, poisonings, and violence	202	88	82
Fires	12	4	3
Fires in private dwellings	11	3	3
Drownings	21	5	4
Suicide	38	21	20
Homicide	19	3	3
Motor vehicle traffic accidents	44	28	25
Accidental falls	9	7	7
Diabetes	24	12	12
Kidney disease	9	8	8
Influenza	1	1	1
Pneumonia	32	24	24
Alcoholism	13	4	4
Cirrhosis of the liver	13	14	15
Chronic obstructive lung disease	23	30	7

1 The age-standardized mortality rates are a weighted average of the ASMR for Quebec, Ontario, and Manitoba.

Appendix 6a: Standardized mortality ratios (SMR) for specific causes of death for males on Indian reserves compared with the county population, 1971-77.

Cause of Death	Quebec	Ontario	Manitoba
Infectious, parasitic diseases	5.27**	7.57**	10.66**
Pneumonia	2.33**	2.34**	4.51**
Influenza	0.57	1.73	1.24
Cancer	0.78*	0.64**	0.50**
Digestive	0.58*	0.53**	0.43**
Bronchus and lung	0.84	0.52**	0.26**
Breast	-	-	-
Cervical	-	-	-
Circulatory disease	0.74**	1.01	1.09
Coronary heart disease	0.71**	0.96	0.84
Cerebrovascular dis.	0.67*	1.04	1.50*
Accidents, pois., violence	1.67**	4.83**	3.75**
Motor veh. traffic acc.	1.42*	2.91**	1.83**
Falls	1.13	1.93	1.67
Fires	4.00**	13.85**	5.58**
Drownings	2.78**	5.74**	5.18**
Suicide	0.69	3.49**	4.05**
Homicide	4.10**	22.29**	14.50**
Alcoholism	1.60	6.77**	9.16**
Cirrhosis of the liver	1.52	2.56**	0.39
Diabetes	1.04	1.92*	1.37
Kidney disease	2.18*	1.70	1.30
COPD	-	-	-
ALL CAUSES	1.10*	1.68**	1.85**

\*  $p < 0.05$ , \*\*  $p < 0.01$

Appendix 6b: Standardized mortality ratios (SMR) for specific causes of death for males on Indian reserves compared with the county population, 1978-84

Cause of Death	Quebec	Ontario	Manitoba
Infectious, parasitic diseases	2.24	2.03	2.87*
Pneumonia	1.31	1.45*	1.16
Influenza	1.11	1.41	.00
Cancer	0.62**	0.53**	0.40**
Digestive	0.54**	0.55**	0.58*
Bronchus and lung	0.50**	0.47**	0.34**
Breast	-	-	-
Cervical	-	-	-
Circulatory disease	0.67**	0.81**	0.74**
Coronary heart disease	0.77**	0.73**	0.67**
Cerebrovascular dis.	0.47**	1.13	0.94
Accidents, pois., violence	1.67**	2.80**	2.66**
Motor veh. traffic acc.	1.15	1.80**	1.71**
Falls	1.06	1.70	1.26
Fires	2.50*	5.29**	1.88**
Drownings	4.33**	4.23**	4.26**
Suicide	1.36	2.16**	3.09**
Homicide	0.78	10.83**	9.82**
Alcoholism	3.38**	3.61**	3.47
Cirrhosis of the liver	1.30	1.29	0.12**
Diabetes	1.19	2.44**	2.25**
Kidney disease	1.05	1.19	1.10
COPD	0.61*	0.92	0.74
ALL CAUSES	0.88**	1.13**	1.09**

\*  $p < 0.05$ , \*\*  $P < 0.01$

Appendix 6c: Standardized mortality ratios (SMR) for specific causes of death for females on Indian reserves compared with the county population, 1971-77.

Cause of Death	Quebec	Ontario	Manitoba
Infectious, parasitic diseases	5.15**	8.72**	6.94**
Pneumonia	3.72**	2.79**	4.68**
Influenza	1.74	1.73	0.00
Cancer	0.77	1.15	1.00
Digestive	0.76	1.08	0.97
Bronchus and lung	1.55	2.22*	0.63
Breast	0.70	0.65	0.76
Cervical	0.50	4.13**	6.56**
Circulatory disease	0.96	1.05	1.18
Coronary heart disease	1.18	1.00	0.92
Cerebrovascular dis.	0.69*	1.02	0.96
Accidents, pois., violence	2.29**	5.74**	4.80**
Motor veh. traffic acc.	2.06**	3.38**	2.31**
Falls	0.73	1.75	1.52
Fires	7.07**	13.89**	7.82**
Drownings	3.31*	0.42**	7.89**
Suicide	0.56	6.04**	4.24**
Homicide	8.38**	8.14**	5.51**
Alcoholism	3.98	16.17**	0.00
Cirrhosis of the liver	1.19	4.78**	3.16*
Diabetes	1.84*	1.84*	3.98**
Kidney disease	1.77	2.25	3.81**
COPD	-	-	-
ALL CAUSES	1.36**	1.78**	2.10**

\*  $p < 0.05$ , \*\*  $p < 0.01$

Appendix 6d: Standardized mortality ratios (SMR) for specific causes of death for females on Indian reserves compared with the county population, 1978-84.

Cause of Death	Quebec	Ontario	Manitoba
Infectious, parasitic diseases	3.19**	4.00**	4.42**
Pneumonia	2.16**	1.84**	1.69
Influenza	0.00	3.79**	.00
Cancer	0.64**	0.84	0.78
Digestive	0.58*	0.69	0.78
Bronchus and lung	0.82	0.51	0.87
Breast	0.43*	0.60*	0.32
Cervical	2.06	3.72**	5.24**
Circulatory disease	0.77**	0.84**	0.74**
Coronary heart disease	0.88	0.78**	0.63**
Cerebrovascular dis.	0.76	1.07	0.88
Accidents, pois., violence	1.14	2.97**	2.81**
Motor veh. traffic acc.	0.72	1.71**	1.56
Falls	.00**	0.43	1.20
Fires	2.13	3.71**	4.30
Drownings	4.38*	4.38**	5.06**
Suicide	0.17*	2.93**	1.67
Homicide	2.11	6.23**	7.29**
Alcoholism	5.67	14.98**	5.76*
Cirrhosis of the liver	1.37	2.97**	2.03
Diabetes	1.44	2.47**	1.95
Kidney disease	1.65	1.78	2.38
COPD	0.79	1.20	1.74
ALL CAUSES	0.93	1.18**	1.21**

\*  $p < 0.05$ , \*\*  $p < 0.01$

Appendix 6e: Standardized mortality ratios (SMR) for specific causes of death for males on Indian reserves 1978-84 compared with males on Indian reserves 1971-77.

Cause of Death	Quebec	Ontario	Manitoba
Infectious, parasitic diseases	0.23**	0.29**	0.22**
Pneumonia	0.56**	0.63**	0.28**
Influenza	0.73	0.43	.00
Cancer	0.87	1.15	1.06
Digestive	0.89	1.35	1.82*
Bronchus and lung	0.80	1.40	2.10*
Breast	-	-	-
Cervical	-	-	-
Circulatory disease	0.74**	0.86**	0.78**
Coronary heart disease	0.85	0.82**	0.92
Cerebrovascular dis.	0.51	1.04	0.67*
Accidents, pois., violence	0.83*	0.62**	0.65**
Motor veh. traffic acc.	0.56**	0.61**	0.77
Falls	0.66	1.02	0.71
Fires	0.55	0.51**	0.30**
Drownings	1.05	0.65**	0.60**
Suicide	2.89**	0.83	0.95
Homicide	0.18**	0.58**	0.71
Alcoholism	2.02	0.64	0.60
Cirrhosis of the liver	0.67	0.58**	0.46
Diabetes	0.84	1.66*	2.50**
Kidney disease	0.44*	0.80	0.97
COPD	-	-	-
ALL CAUSES	0.73**	0.77**	0.67**

\*  $p < 0.05$ , \*\*  $p < 0.01$

Appendix 6f: Standardized mortality ratios (SMR) for specific causes of death for females on Indian reserves 1978-84 compared with males on Indian reserves 1971-77.

Cause of Death	Quebec	Ontario	Manitoba
Infectious, parasitic diseases	0.32**	0.45**	0.34**
Pneumonia	0.81	0.68*	0.32**
Influenza	.00	0.99	1.00
Cancer	0.81	1.07	1.09
Digestive	0.70	0.82	1.07
Bronchus and lung	0.92	0.58	3.06*
Breast	0.60	1.33	0.57
Cervical	3.11	0.99	1.31
Circulatory disease	0.64**	0.89**	0.75**
Coronary heart disease	0.56**	0.86	0.86
Cerebrovascular dis.	0.80	1.06	1.02
Accidents, pois., violence	0.41**	0.52**	0.59**
Motor veh. traffic acc.	0.22**	0.50**	0.76
Falls	.00*	0.33*	1.43
Fires	0.32**	0.27**	0.49*
Drownings	0.80	0.53	0.53
Suicide	0.32	0.52**	0.41**
Homicide	0.23*	0.85	1.47
Alcoholism	1.62	0.90	999.99
Cirrhosis of the liver	0.93	0.66	1.16
Diabetes	0.47*	1.66*	0.72
Kidney disease	0.76	1.11	0.71
COPD	-	-	-
ALL CAUSES	0.60**	0.78**	0.69**

\*  $p < 0.05$ , \*\*  $p < 0.01$

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