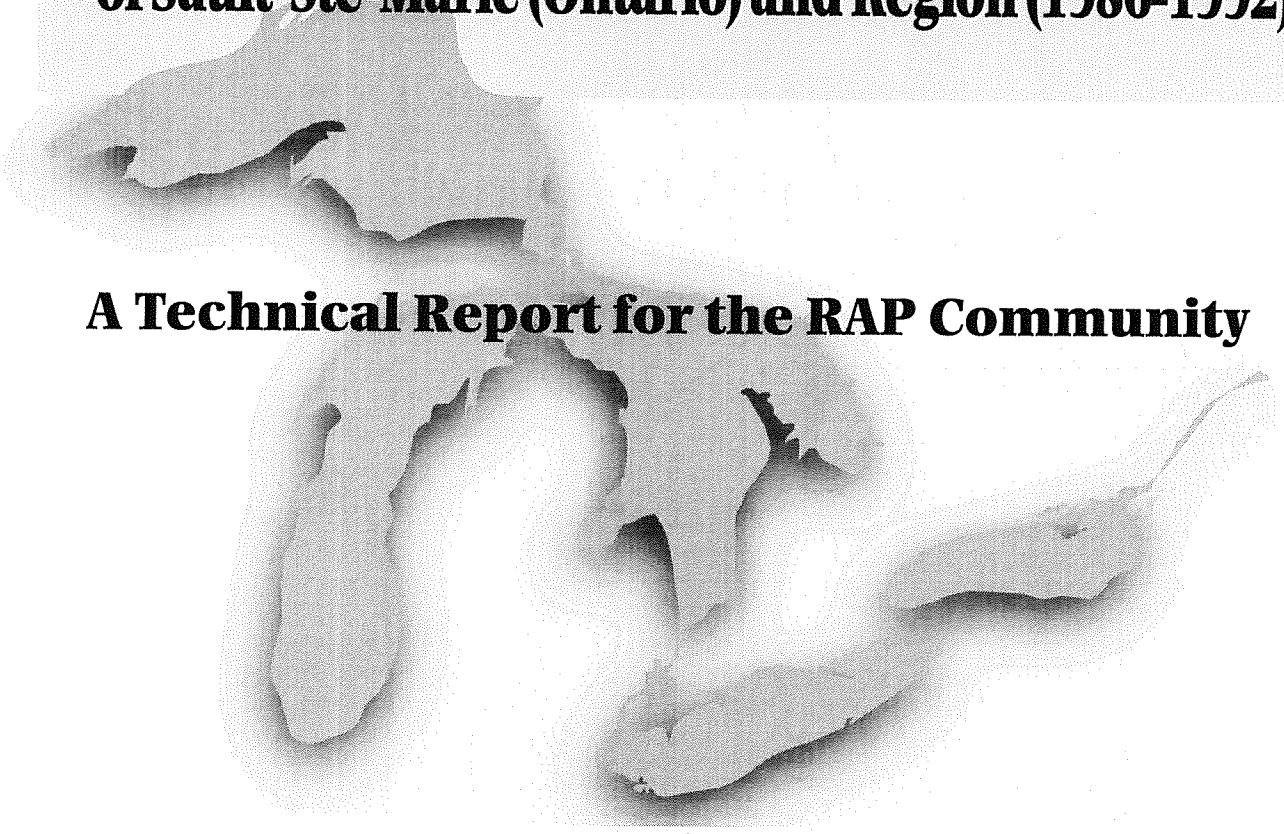
Great Lakes Health Effects Program

St. Mary's River Area of Concern:

Health Data and Statistics for the Population of Sault-Ste-Marie (Ontario) and Region (1986-1992)



A Technical Report for the RAP Community

FORWARD

This report provides information on the general health status and on selected health outcomes for populations residing in and around the St. Mary's River AOC. The compiled data compares the selected outcomes to the wider Ontario population. It is intended for the use of health investigators - e.g., public health assessors and epidemiologists, academic researchers, and others, who are or may be called upon to investigate health concerns in the community. This information can be used in conjunction with other empirical and epidemiological evidence as a reference to support studies assessing the health of these communities. The data could also be used as a baseline for future comparative analyses; or, as a hypothesis-generating tool in research aimed at determining risk factors associated with the selected health outcomes.

The data and statistics presented in this report are purely descriptive. The health outcomes chosen for investigation were those for which environmental factors have been postulated as a contributing factor. **NOTE that this report does not make any correlations between any health outcome and environmental factors found in the AOC. The data are presented as a general health status reference and a tool for further study.**

Statistically significant differences do not automatically imply that there is some protective or adverse environmental factor operating in the study area which is affecting the health of the population. A variety of factors could result in significantly higher or lower rates. For example, data collection methods, socioeconomic determinants (such as access to health care), life-style choices (such as smoking), or work conditions of a large percentage of the population - could all influence the results. Factors such as exposure, biologic plausibility, and other determinants must be taken into account as well. In addition (although this is unlikely), the rate could be different due to chance (1 and 5% possibility).

St. Mary's River is one in a series of 17 reports. Each pertains to an Area of Concern or, in the case of Collingwood Harbour, a former Area of Concern.

For a copy of this report, or any in the series, please contact:

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INTRODUCTION

Purpose of the reports

As part of its commitment under the federal/provincial *Canada-Ontario Agreement respecting the Great Lakes Basin Ecosystem*, the Great Lakes Health Effects Program collaborates with numerous partners to try to identify, assess, manage, and communicate health risks related to environmental pollution for the nine million Canadians living around the Great Lakes. Our partners include other federal departments and provincial ministries, Public Health Units and other health professionals, academics, community organizers, Remedial Action Plan[1] participants and Great Lakes communities.

In 1985, 17 geographical areas of Ontario were identified by the International Joint Commission as Areas of Concern (AOCs). The impairment of beneficial uses in these areas were, and in some cases still are, of concern due to problems such as contaminated sediments, degraded fish and wildlife habitat, restrictions on fish and wildlife consumption, and impaired beach quality. Remedial Action Plans (RAPs) have been set up and implemented to address these concerns.

While AOCs differ in their environmental status, the health and well-being of the people living in and around AOCs is an important consideration. Since an excellent health data base and statistical expertise are readily available, the Great Lakes Health Effects Program (GLHEP) in collaboration with statisticians from the Laboratory Centre for Disease Control (LCDC) has taken the initiative to gather health status information relevant to AOCs and to package and present this information in a comprehensive format.

We have over the years, received inquiries from concerned citizens living in and around the AOCs, regarding the health status of their communities. The public perception that pollution is affecting health is an important consideration for the GLHEP. We feel this initiative will provide an initial profile of human health within and around AOCs. It can also, in certain cases, help health assessors to allay concerns. Any new piece of the puzzle which supports research on human health, contributes to the overall picture of the AOC ecosystem.

The compilation of health data and statistics provided in this report and for the other AOCs (including Collingwood) was undertaken to begin answering the question - *What is the health status of people living in and around Areas of Concern?* Although originally 17 Canadian and bi-national AOCs were identified as environmentally degraded areas in the Great Lakes Basin, Collingwood Harbour was "delisted" in 1995 and today there are 16 remaining AOCs. Collingwood was included as a study area however, because the health data being considered span the period of time before it was delisted as an AOC.

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[1] For more information on Remedial Action Plans and descriptions of the Areas of Concern see www.cciw.ca/glimr/raps/

Content of the reports

These reports are technical documents, prepared for health assessors and those involved in health research. They provide a reference of morbidity and mortality data which may serve as one piece of the larger puzzle during evaluations of the health status of the populations residing within and around the designated AOCs. In order to facilitate further analysis with respect to possible causative factors, the health outcomes included in these reports were those for which, based on published research, environmental contaminants have been postulated as one contributing factor and for which routinely collected health data were available.

The study areas were delineated geographically so as to facilitate data collection and at the same time, to encompass the AOC. The nature of the data collection process resulted in study areas being, at times, larger or slightly different from the actual boundaries of the AOC. In addition there were some limitations regarding the inclusion or exclusion of Indian reserves. In the case of mortality data only, all reserves within the same census division had the same Standard Geographic Code (SGC) and therefore if one reserve was included, all others with that postal code had to be included. Situational decisions had to made based on issues such as availability of data, population levels, location and proximity to the AOC.

The data and statistics are purely descriptive in nature. They require interpretation, taking into consideration numerous factors, including the function and limits of statistical significance, and putative factors.

Uses of the reports

With interpretation, these reports may be useful as:

- a support to health assessors responding to public concerns;
- a reference to support any community-driven investigations assessing the health risks, if any, associated with residing in and around AOCs;
- a hypothesis-generating tool for research assessing risk factors associated with the various health outcomes; or as,
- a baseline for future comparative analyses.

These reports are hypothesis-generating tools which may eventually lead to inferences of possible causes for the health outcomes included. No conclusions can be drawn regarding the cause of statistically higher or lower health outcome rates for the study area population (compared to the population of Ontario), until much more information is gathered and research is undertaken. Factors such as biologic plausibility, lifestyle, exposure and other determinants must be taken into account. The information presented here, along with anecdotal, toxicological, and other empirical evidence, can provide some guidance when assessing and investigating community health concerns.

PART A: BACKGROUND INFORMATION

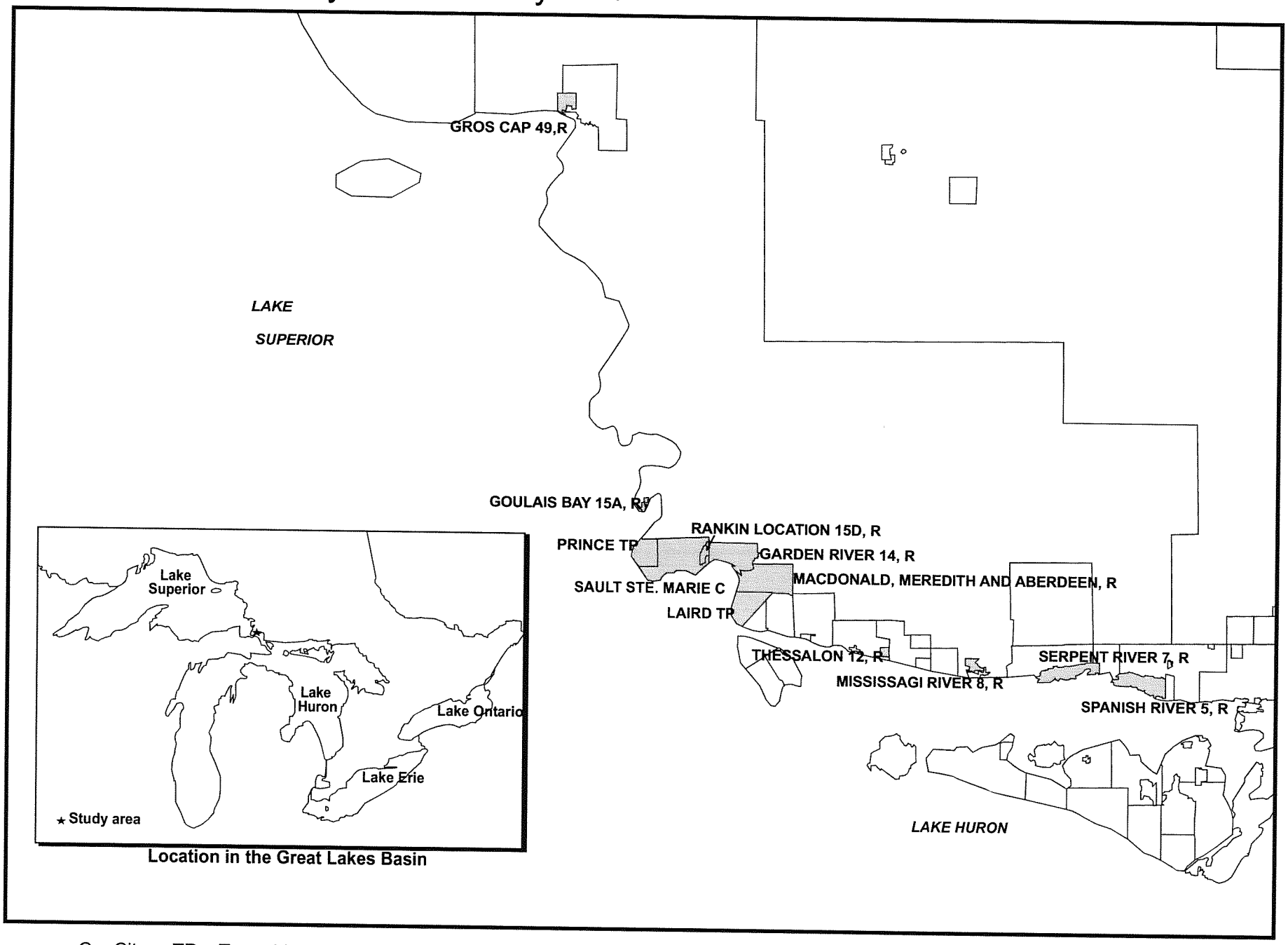
1 The study area and its population

The study area for the St.Mary's River Area of Concern was defined by Standard Geographic Codes (SGCs) as described in Part A, Section 2.1. It was comprised of the following municipalities, with SGCs for each municipality in brackets: the city of Sault-Ste-Marie (3557061), the townships of Laird (3557011), Prince (3557066), and MacDonald, Meredith and Aberdeen (3557051), and the Indian reserves of Serpent River 7 (3557072), Mississagi River 8 (3557073), Garden River 14 (3557074), Spanish River 5 (3557071), Rankin Location 15D (3557075), Goulais Bay 15A (3557077), Gros Cap 49 (3557078), and Thessalon 12 (3557026). Notably, data for the population of the reserves were included only for cancer incidence, morbidity and congenital anomalies. The study area is depicted in the main part of Figure 1 and positioned with respect to the Great Lakes basin in the insert.

According to the 1991 census, the populations of the study area and Ontario, as a whole were 86,580 and 10,104,317, respectively. Thus the area population represented 0.86% of the provincial population. Notably, these figures give a good indication of population sizes being considered between 1986 and 1992, the period covered by this report.

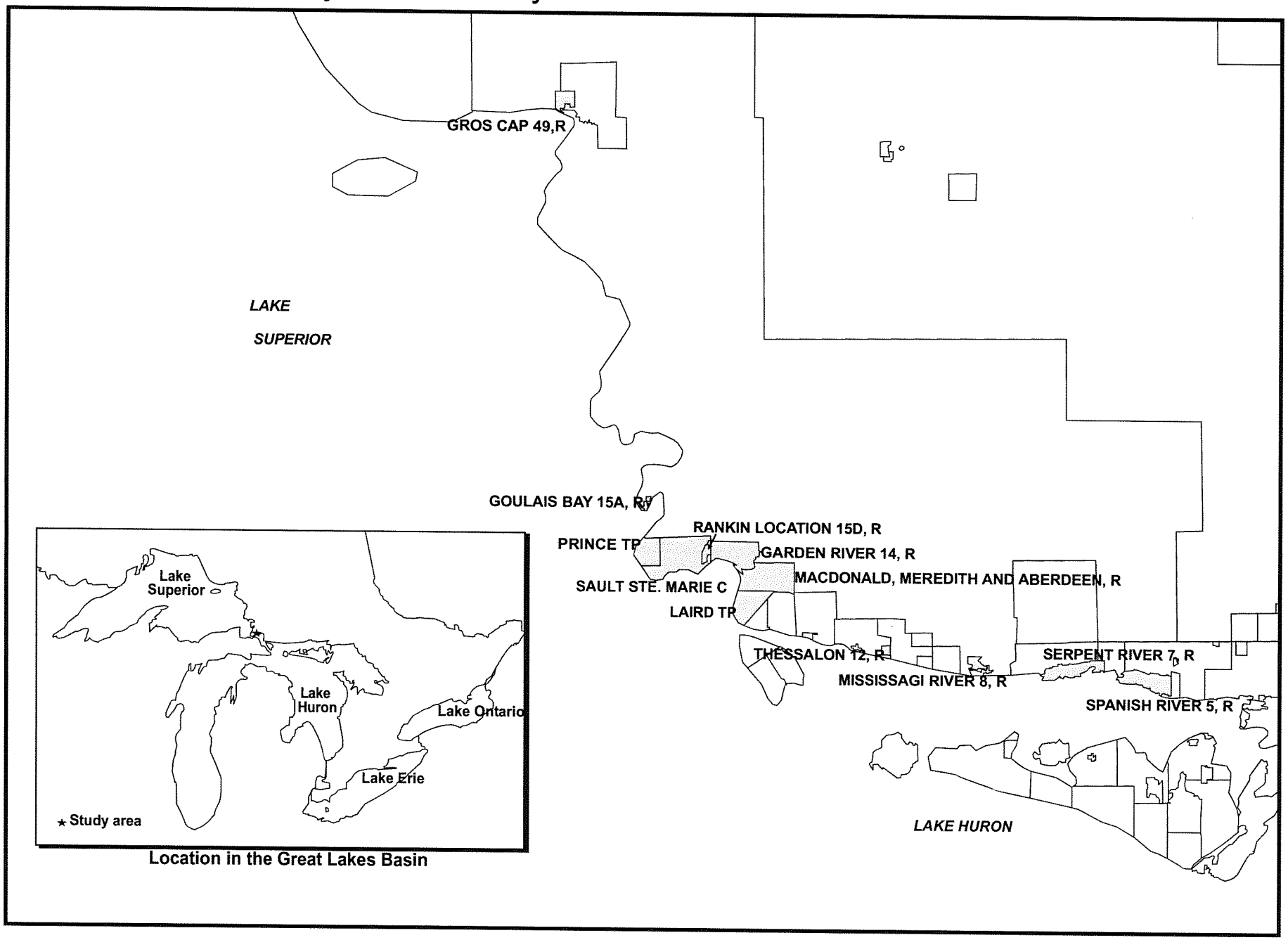
The age distributions of the populations for the study area and Ontario are presented in Figures 2 and 3, respectively. In order to avoid misinterpretation of the data due to differences in age composition, the age differences are taken into consideration through age-standardization. This is described in Part A, Section 2.4 of the report.

Figure 1 - St. Mary's River Study Area



C = City TP = Township R = Reserve

Figure 1 - St. Mary's River Study Area



C = City TP = Township R = Reserve

Figure 2. Population Distribution of the St. Mary's River Study Area, 1991

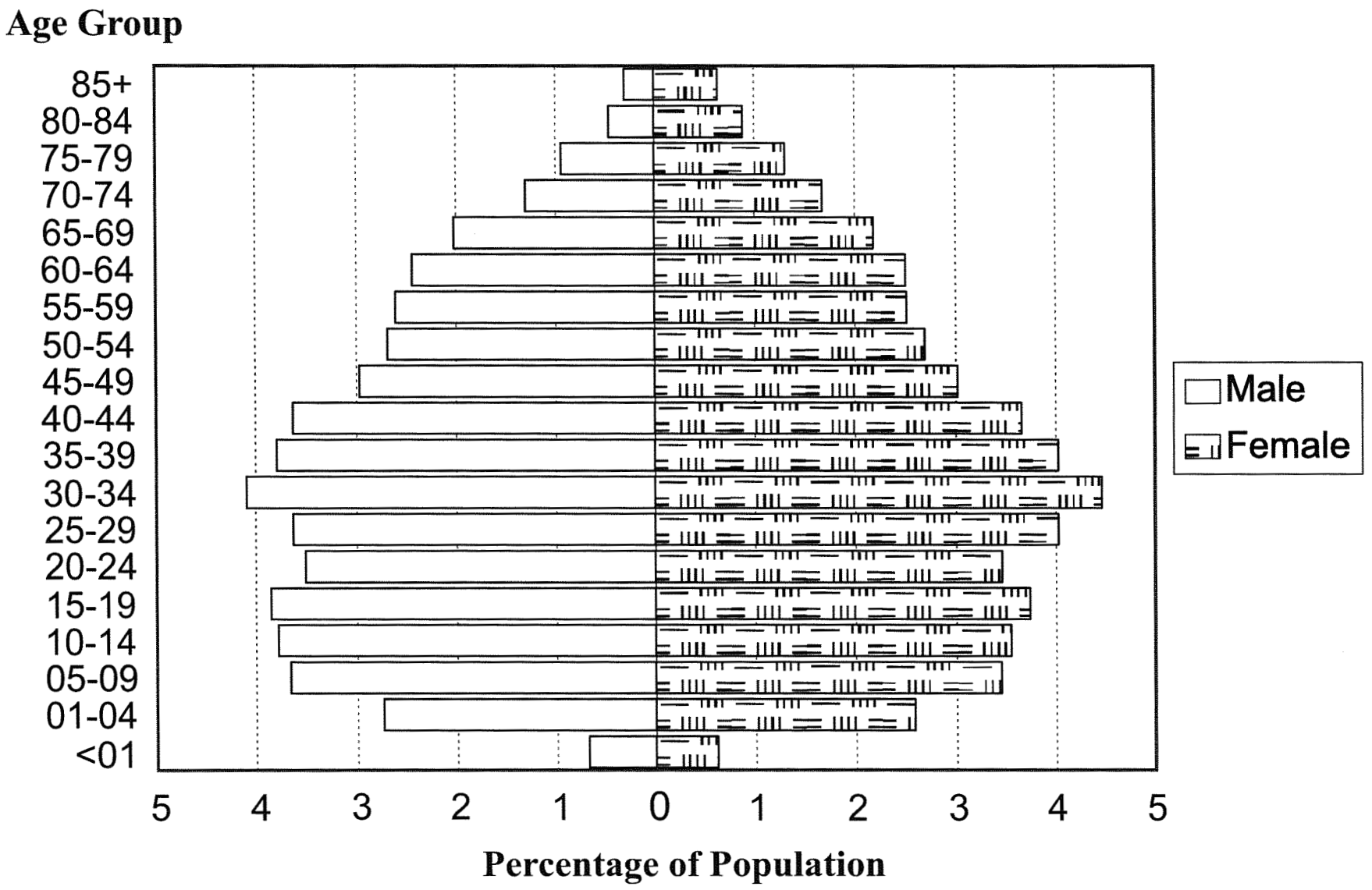
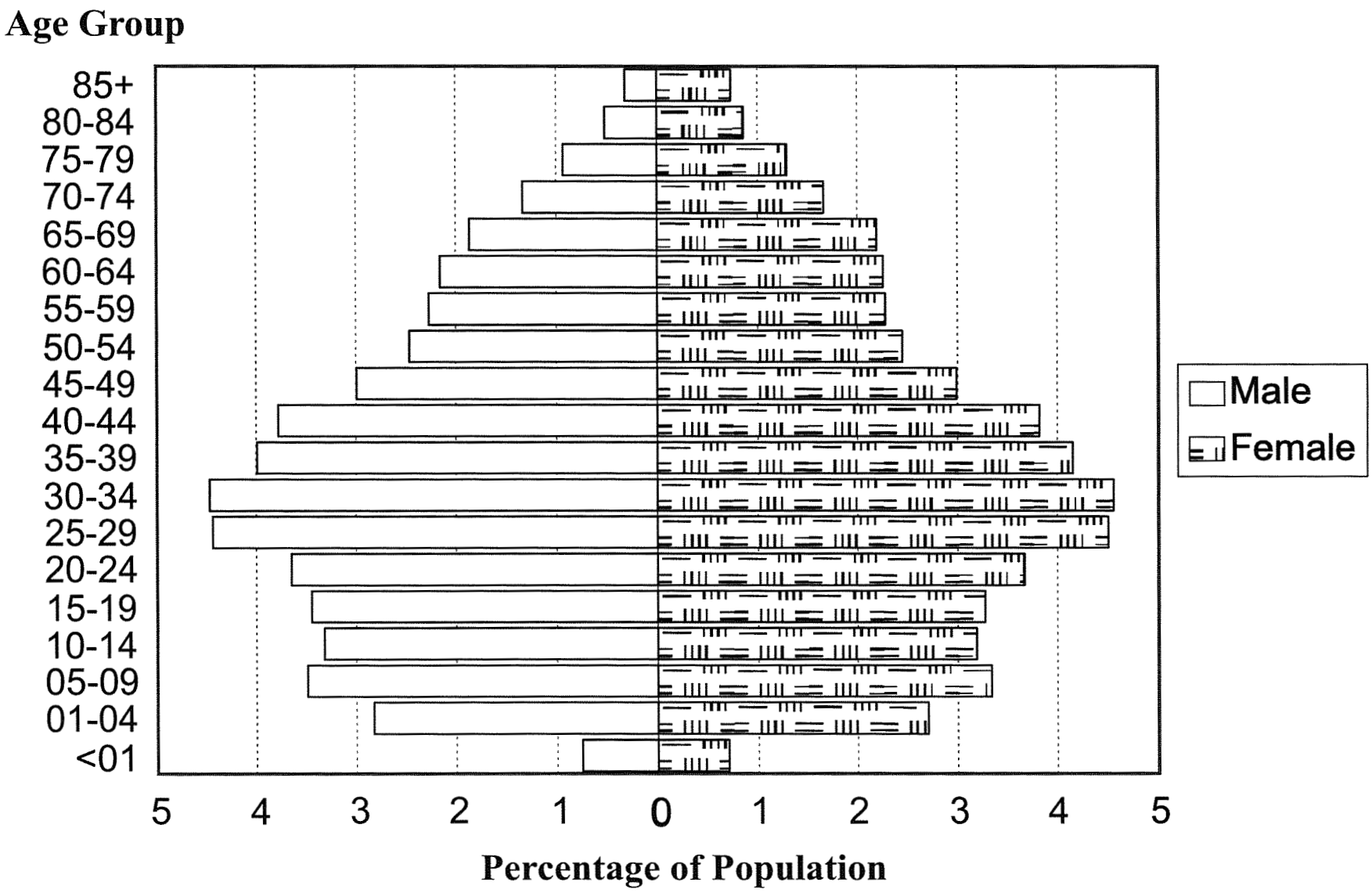


Figure 3. Population Distribution of Ontario, 1991



2 Methods used in the study

2.1 Assigning Standard Geographic Codes

Each one of the study areas in the project was defined by Standard Geographic Codes (SGCs) in such a way that it encompassed the Area of Concern (AOC), or former AOC, as defined by the Remedial Action Plan community. Generally, any SGC that intersected with the AOC, as defined in the Stage 1 RAP document, was included in the study area. Standard Geographic Codes contain provincial, Census Division (CD) and Census Sub-Division (CSD) information and are equivalent designations for legislatively-determined, provincial municipalities. In addition, SGCs coincide with the Canadian human-health data collection process.

Some criteria were set and, at times, decisions were made in the process of assigning SGCs to specific study areas. For example:

- For mortality data, all Indian Reserves located in a CD had one SGC. If all of the reserves were not included in a specific AOC, a decisions had to be made, based on the specific situation, of whether to include or exclude all of the reserves within the study area.

- When considering Census Metropolitan Areas (CMAs), because of the social and economic integration of the unit and because, at times, there was only unit-specific coding of data, municipalities designated as part of the CMA but not located directly in the AOC, were included in the study area.

- Since coding inaccuracies sometimes occurred between similarly designated urban and rural areas (i.e. a Collingwood T designation for a study area including both Collingwood Township or Collingwood Town), such rural areas not designated as part of the AOC but adjacent to defined urban areas, were at times included in the study area. The urban areas were included if their Standard Mortality Ratios (SMR) for All Causes and 'all ages', defined as the observed deaths in the population of the rural area divided by the expected deaths (those in the urban area) were less than 0.75 (*see* Part A, Section 2.4 for a discussion of Standard Mortality Ratios) since such low SMRs would not usually occur by chance. In addition to eliminating uncertainties due to coding inaccuracies, including these rural areas in the study area generally reduced the uncertainties associated with postal code conversions to SGCs (see: Part A, Section 2.3, Hospital separations data).

Notably, Ontario was also defined by SGCs. All provincial SGCs were considered to be part of Ontario, including those codes designating the study area.

2.2 Selecting health outcomes

The selection of health outcomes was based on the following considerations:

- The outcome could occur as a result of exposure to environmental contaminants,

plausibly within the Great Lakes basin. Supporting information for this consideration was taken from the current literature, and outcomes were selected even when the data were not fully conclusive.

- Data were available for the outcome.

The selected outcomes which were considered in this study and which have been classified by 1CD-9 code according to the *International Classification of Diseases*[2], are presented in Lists 1, 2, and 3. List 1 contains causes of death and hospitalization, List 2, cancers as causes of death and disease, and List 3, congenital anomalies as indicators of birth outcomes and as causes of death.

List 1 Selected Health Outcomes with ICD-9 code, as Causes of Death and Hospitalization

001-009	Intestinal Infectious Diseases
030-041	Other Bacterial Diseases
045-049	Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System
045	*Acute Poliomyelitis*
047	*Meningitis due to Enterovirus*
070-077	Other Diseases due to Viruses and Chlamydiae
070	*Viral Hepatitis*
074	*Specific Diseases due to Coxsackie Virus*
100-104	Other Spirochaetal Diseases
100	*Leptospirosis*
120-129	Helminthiases
240-246	Disorders of Thyroid Gland
250-259	Diseases of Other Endocrine Glands
250	*Diabetes Mellitus*
256	*Ovarian Dysfunction*
257	*Testicular Dysfunction*
270-279	Other Metabolic Disorders and Immunity Disorders
280-289	Diseases of Blood and Blood-Forming Organs
320-326	Inflammatory Diseases of the Central Nervous System
320	*Bacterial Meningitis*
322	*Meningitis of Unspecified Cause*
323	*Encephalitis, Myelitis and Encephalomyelitis*
330-337	Hereditary and Degenerative Diseases of the Central Nervous System
332	*Parkinson's Disease*
340-349	Other Disorders of the Central Nervous System
340	*Multiple Sclerosis*

[2] Practice Management Information Corporation. 1992. International Classification of Diseases, 9th Revision, 4th Edition, Clinical Modification, Volumes 1-2. , Los Angeles, CA. 834 pp.

List 1 continued...

343	Infantile Cerebral Palsy
350-359	Disorders of the Peripheral Nervous System
359	*Muscular Dystrophies and Other Myopathies*
360-379	Disorders of the Eye and Adnexa
369	*Blindness and Low Vision*
380-389	Diseases of the Ear and Mastoid Process
401-405	Hypertensive Disease
410-414	Ischaemic Heart Disease
415-417	Diseases of Pulmonary Circulation
420-429	Other Forms of Heart Disease
440-448	Diseases of Arteries, Arterioles and Capillaries
440	*Atherosclerosis*
460-466	Acute Respiratory Infections
470-478	Other Diseases of Upper Respiratory Tract
480-487	Pneumonia and Influenza
490-496	Chronic Obstructive Pulmonary Disease and Allied Conditions
491	*Chronic Bronchitis*
492	*Emphysema*
493	*Asthma*
500-508	Pneumoconioses and Other Lung Diseases due to External Agents
530-537	Diseases of Oesophagus, Stomach and Duodenum
555-558	Noninfective Enteritis and Colitis
560-569	Other Diseases of Intestines and Peritoneum
570-579	Other Diseases of Digestive System
580-589	Nephritis, Nephrotic Syndrome and Nephrosis
590-599	Other Diseases of Urinary System
600-608	Diseases of Male Genital Organs
606	*Infertility, Male*
610-611	Disorders of Breast
617-629	Other Disorders of Female Genital Tract
617	*Endometriosis*
628	*Infertility, Female*
630-639	Pregnancy with Abortive Outcome
634	*Spontaneous Abortion*
640-648	Complications Mainly Related to Pregnancy
642	*Hypertension Complicating Pregnancy, Childbirth and the Puerperium*
644	*Early or Threatened Labour*
680-686	Infections of Skin and Subcutaneous Tissue
690-698	Other Inflammatory Conditions of Skin and Subcutaneous Tissue
700-709	Other Diseases of Skin and Subcutaneous Tissue
710-719	Arthropathies and Related Disorders
720-724	Dorsopathies
725-729	Rheumatism, Excluding the Back
730-739	Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities
760-779	Certain Conditions Originating in the Perinatal Period

List 2 Selected Cancers with ICD-9 code, as Causes of Disease and Death

140-149	Malignant Neoplasm of Lip, Oral Cavity and Pharynx
146-148	*Malignant Neoplasm of the Pharynx*
150-159	Malignant Neoplasm of Digestive Organs and Peritoneum
150	*Malignant Neoplasm of Oesophagus*
151	*Malignant Neoplasm of Stomach*
153-154	*Malignant Neoplasm of Colon and Rectum*
155	*Malignant Neoplasm of Liver and Intrahepatic Bile Ducts*
156	*Malignant Neoplasm of Gallbladder and Extrahepatic Bile Ducts*
157	*Malignant Neoplasm of Pancreas*
160-165	Malignant Neoplasm of Respiratory and Intrathoracic Organs
162	*Malignant Neoplasm of the Trachea, Bronchus and Lung*
170-175	Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast
172	*Malignant Melanoma of Skin*
174	*Malignant Neoplasm of Female Breast*
179-189	Malignant Neoplasm of Genitourinary Organs
183	*Malignant Neoplasm of Ovary and Other Uterine Adnexa*
185	*Malignant Neoplasm of the Prostate*
186	*Malignant Neoplasm of Testis*
188	*Malignant Neoplasm of the Bladder*
189	*Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs*
190-199	Malignant Neoplasm of Other and Unspecified Sites
193	*Malignant Neoplasm of Thyroid Gland*
200-208	Malignant Neoplasm of Lymphatic and Haematopoietic Tissue
200,202	*Non-Hodgkin's Lymphoma*
201	*Hodgkin's Disease*
204-208	*Leukaemia*

List 3 Selected Congenital Anomalies with ICD-9 code, as Birth Outcomes and Causes of Death

740.0-742.9	Central Nervous System Anomalies
740.0-740.2	*Anencepahalus and Similar Anomalies*
741.0-741.9	*Spina Bifida*
742.1-742.2	*Microcephalus and Brain Reduction*
742.3	*Congenital Hydrocephalus*
743.0-743.9	Eye Anomalies
745.0-746.9	Congenital Heart Defects
745.4	*Ventricular Septal Defect*
745.5	*Atrial Septal Defect*
747.1-747.9	Circulatory System Anomalies
747.3	*Pulmonary Artery Anomalies*
748.0-748.6; 748.8-748.9	Respiratory System Anomalies
749.0-749.2	Cleft Lip and/or Palate
750.1-751.9	Digestive System Anomalies
752.6	Hypospadias and Epispadias
753.0-753.9	Urinary System Anomalies
753.0	*Renal Agnesis and Dysgenesis*
754.5-754.7	Clubfoot
755.0-755.1	Polydactyly and Syndactyly
755.2-755.3	Limb Reduction Anomalies
758.0	Down Syndrome

Although many health outcomes in the ICD-9 classification were selected, there were some that were not included in the study. Even though Mental Disorders and Neurobehavioural conditions could be linked to environmental contaminants, health outcome data were lacking for these classifications. Symptoms, Signs and Ill-Defined Conditions as well as Injury and Poisoning were left out because the conditions included in these classifications are unlikely to occur as a consequence of exposure to environmental contaminants.

In addition to the individual outcomes, 'all-inclusive' categories were also considered as general indicators of health within the study area. Notably, data from these categories can be used to determine the relative importance of individual health outcomes within the study area. The 'all-inclusive' category of All Causes included all selected ICD-9 coded health outcomes for either mortality or morbidity, as hospitalizations. Only this category, specifically All Causes, was considered for infant mortality since the small number of deaths precluded specifying individual causes of death. Similarly, categories termed 'All Malignant Neoplasms' and 'All Anomalies' included all of the selected cancers and all of the selected congenital anomalies, respectively.

Birth weights were also selected as health indicators in the study.

Notably, brief descriptions of the selected health outcomes as well as some of the possible

environmental and other causes and factors related to the occurrence of the outcomes appear in Appendix A.

2.3 Gathering data

Good quality data necessary for defining the health status of the population of this particular study area as well as the other areas studied in this project, were available from a variety of agencies for the years between 1986 and 1992 for both males and females. The origin, nature and limitations of the data are described below:

Population data

The age and sex-specific population data needed for rate and ratio calculations for mortality and morbidity came from the Demography Division of Statistics Canada. The data were given at the CSD level and were based on 1986 and 1991 census information. For non-census years 1987 to 1990, population data were interpolated whereas for 1992, data were extrapolated. When there were changes in CSD boundaries between 1986 and 1992, adjustments were made by Health Canada to ensure that only 1991 boundaries were reflected in the population data.

With this data, there was some uncertainty created by the process of interpolation and extrapolation. In addition:

Unadjusted census data were used and no accounting was done for error due to undercounting. Since undercounting for non-respondents is estimated at 3% of the actual population with somewhat larger percentage estimates for small age groups, the Census data slightly underestimate the true population values.

Some Indian reserves were not enumerated. For these, populations estimated from the Ministry of Indian and Northern Affairs were used.

Live births

Live births used for determining incidence rates for congenital anomalies were from the hospital separations records of the Canadian Institute for Health Information (CIHI). The records included both in-patient and out-patient information. Although SGCs were assigned to the data in a similar manner as described below in the *Hospital separations data* section, only Ontario Residence Codes (ORCs) were used in the process.

The live births data used for infant mortality rate calculations originated from Statistics Canada.

Mortality data

Mortality data were provided by Statistics Canada. The information included the cause of death (reported by ICD-9 code), the last location of residence (specified, as with the population data, at the CSD level), and the sex and age (or date of birth) of the deceased.

Possible limitations existed with this data since difficulties can be encountered in assigning an exact cause of death. The actual category assigned often depends on the diagnosis made by one individual and difficulties can be encountered when multiple underlying causes of death are encountered, particularly in older people.

Hospital separations data

The hospital separations data, which were used along with cancer data to define morbidity or disease in the area of study, were supplied by the CIHI. The data included sex, age and residence information, and the diagnosis, based on ICD-9 coding, considered to be the main cause of hospitalization for each departing individual. When there were multiple underlying causes of hospitalization, the diagnosis responsible for the largest percentage of the stay was reported. The data were not adjusted for either multiple visits or for transfers between and within hospitals nor did they include visits to clinics, doctor's offices and out-patient departments. In addition, residence information was given as an ORC, and/or a postal code. The ORCs, using available mappings, were translated into SGCs, the codes used in the definition of the study area. When ORCs were not available or when the derived SGCs were not valid, postal codes were inserted into a pre-existing conversion program[3]. In this way, the most probable SGCs were determined. Notably, some postal codes crossed SGC boundaries and probabilistic data assignments were made based on the number of households in each municipality. When neither an ORC or a postal code was available (less than 0.5% of the total records for all study areas), the observations were only included in the Ontario total.

In addition to the loss of records resulting from missing or unknown ORCs and postal codes, and the uncertainties introduced in the conversion of residence information to SGCs, other limitations could also have been associated with this data:

The data were not totally independent since multiple visits and transfers were not accounted for. Thus, the data may give a higher estimate of hospital separations than actually exists.

The reported cases do not include people residing in Ontario who were hospitalized in

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[3] Automated Geographic Coding based on the Statistics Canada Postal Code Conversion file written by Russel Wilkens, Health Statistics Division, Statistics Canada.

Manitoba, Quebec or outside of Canada. Therefore, there may be unaccounted hospital admissions for Ontario residents.

Ontario Residence Codes used to derive SGCs tended to group towards urban areas. Consequently, in relatively small study areas, this tendency could result in the observation being classified into a neighboring study area or into an area not belonging to any of the study areas.

Cancer data

Cancer data were from the Ontario Cancer Treatment and Research Foundation (OCTRF), now called Cancer Care Ontario, and each record consisted of sex, age, residence and a specification for the newly diagnosed cancer (incidence data) for each case. As with the hospital separations data, only ORC and postal codes were affiliated with the observation and SGCs had to be derived. For this data, however, ORCs were used when valid SGCs were not derived using postal code data or when such data were not available. Approximately 8.4% of all records did not have postal codes and 3.3% had neither ORCs nor postal codes. Furthermore, observations with missing residence were not distributed uniformly by cancer. For example, there were a large percentage of unknown residences in the observations for melanoma. In addition to the above limitations, the incidence of some cancers may be under estimated because of delays in reporting cases. Notably, when less than 5 observations were made for a specific cancer, data were suppressed in accordance with the OCTRF information release contract.

Birth weight data

Birth weight information was extracted from the hospital separations data provided by the CIHI (see *Hospital separations data*). Some uncertainty was associated with this information:

A number of records, specifically 0.07% for males and 0.06% for females, had live birth weights of less than 400 grams. These observations were not considered to be valid and were treated as unknowns. Notably, the frequency of similar errors within the 400 and above categories is not known.

Uncertainty was introduced as a result of missing or unknown ORCs and postal codes and aligning SGCs to the data, as described for the hospital separations data.

Congenital anomalies data

The congenital anomalies data, which included out-patient information, originated from CIHI and were modified, through record linkage, by the Canadian Congenital Anomaly

Surveillance System (CCASS). Standard Geographic Codes were assigned as described in the *Hospital separations data* section. However, only ORCs were used in the process.

The estimated incidence of congenital anomalies for infants less than 1 year old having been derived using a probabilistic melding process, could have been affected by the quality of the linking variables, as well as by coding, transcribing and misclassification errors[4].

Infant mortality data

Mortality data for infants less than one year old were from Statistics Canada. The main limitation associated with this data was previously described in the *Mortality data* section.

2.4 Analyzing the data

Statistical power, defined as the ability to demonstrate a statistically significant association if one exists, is a function of sample size. In order to increase the statistical power of the analyses and the confidence in the results obtained, data for the time period between 1986 and 1992 were considered together.

Mortality and morbidity:

The mortality, hospital separations and cancer data were used to calculate mortality, morbidity and incidence rates, respectively, for the study area and Ontario. Morbidity rather than incidence rates were determined for hospital separations because of the nature and limitations of the data (see *Hospital separations data*). Because the age-distributions were different for the two populations being considered (*see* Figure 2 and 3 in Part A, Section 1), rates were adjusted to reflect a standard age-distribution. This procedure, termed direct age-standardization, minimizes possible effects due to differences in age composition when comparing data from different populations[5].

The Canadian population for both males and females combined, as determined from the 1991 census, was the standard population used in the direct age-standardization process. Thus directly age-standardized rates (*see* Appendix B for an example of the formulae) are rates that would be observed if the population distributions were the same as the Canadian population.

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[4] Rouleau, J., Arbuckle T.E., Johnson K.C., Sherman G.J. 1995. Description of Limitations of the Canadian Congenital Anomalies Surveillance System (CCASS). Chronic Diseases in Canada, 16(1): 37-42.

[5] Last, J.M., Abramson, J.H., Friedman, G.D., Porta, M., Spasoff, R.A., Thuriaux, M. 1995. A Dictionary of Epidemiology, Third Edition. Oxford University Press. 180 p.

Standardization was done for populations divided into nineteen age *groups* consisting of one group of infants less than one year old, a group of preschoolers from 1 to 4 years old, 16 consecutive groups spanning 5- year age intervals, and a final group of elderly adults over the age of 85 years. For simplification in reporting, the data were combined into 5 age *categories*: all ages, 0-24 years, 25-44 years, 45-74 years, and 75+ years.

The directly age-standardized rates for the study area and Ontario as a whole, specifically, the age-standardized mortality rates (ASMRs), morbidity rates (ASmRs), and incidence rates (ASIRs), were then statistically compared using the Z-test (*see* Appendix B for an example of the formulae). Study area rates were deemed to be either not significantly different from Ontario rates or significantly different, either significantly higher or lower at the $p<0.01$ (or $p<0.05$) level of significance. Notably, a minimum of four observations were required for the study area to yield a valid approximation for the comparison test.

Difficulties arose with interpreting the results of ASmR comparisons. This was due to the nature of the data. As mentioned in the previous section, repeat admissions for the same cause and transfers between hospitals were not accounted for in the hospital separations data. Consequently, although the rates determined for hospitalizations for certain conditions may be higher in the study area compared to Ontario, this does not necessarily mean that there are higher rates of the condition in the study-area population.

When there were small numbers of deaths, cases or incidence within some of the age groups being considered, the directly age-standardized rates were based on small numbers, and thus were subject to substantial sampling variation[6]. Consequently, rates were also compared, as described below, using standardized ratios. This is an indirect method of comparison which indirectly adjusts for age differences in the study-area and Ontario populations. Although results are generally similar using both methods of comparison, standardized ratios yield more reliable results when age-group sample sizes are small[7].

Standardized ratios, specifically standardized mortality ratios (SMRs), morbidity ratios (SmRs), and incidence ratios (SIRs) (see Appendix B for an example of the formulae) were the *observed* mortality, morbidity or incidence in the study-area population, divided by the *expected* mortality, morbidity or incidence in the study-area population[8], given that the expected rates for the study area are the same as those for Ontario. The significance of the ratios were determined by the Poisson Ratio Test using 95% and 99% confidence intervals (*see* Appendix B for confidence interval formula). Depending on whether or not the confidence intervals spanned 1, study area

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6 Friedman, G.D. 1994. Primer of Epidemiology, 4th Edition. McGraw-Hill, Inc., New York, NY. 366 p.

7 Friedman, G.D. 1994. *As above.*

8 Hennekens, C.H., Buring, J.E. 1987. Epidemiology in Medicine. Little, Brown and Company. 383 pp.

rates were deemed to be either not significantly different from indirectly age-adjusted Ontario rates or significantly different (either higher or lower) at the $p<0.01$ (or $p<0.05$) significance level. The length of the confidence intervals provided information as to the reliability of the ratio point-estimates: the narrower the confidence intervals, the more stable the estimates. Notably, the significance test was too sensitive when observations exceeded 10,000.

Ninety-five percent confidence intervals are not given in Appendix C for hospital separations data. Results were overly sensitive, and reliable interpretations could not be made because of the nature of the data. In addition, for the cancer data, when fewer than 5 incidents were observed for a specific cancer, data had to be suppressed, as mentioned previously, and SIRs could only be reported as <1.00 or >1.00.

Examples and interpretations of age-standardized rates and standardized ratios are given at the end of this section in Boxes A and B, respectively.

Birth outcomes:

Age standardization was not required for birth outcomes data because only one age group was considered, specifically infants under one year of age.

Using infant mortality and congenital anomalies data as well as live-birth information from the sources previously indicted in this section, *age-specific* mortality and incidence rates were calculated for the study area population. Mortality rates were then compared to Ontario infant mortality rates in the two ways described above. Congenital anomalies incidence rates were compared using the Poisson Ratio Test by determining 95% incidence intervals (*see* Appendix B for formula). Only 95% confidence intervals were used because there are many rare anomalies and it was considered unlikely that significant differences would be detected using 99% confidence intervals, especially with small sample sizes.

Birth weight data were used to calculate birth weight distributions and mean birth weights for male and female infants in the study area. Mean values were statistically compared to Ontario means using the Z-test (*see* Appendix B for formula). Comparisons were also made of low birth weight percentages for the two populations.

Box A: Interpretation of age-standardized rates

Example 1:
The age-standardized mortality rate (ASMR) calculated for the study-area population for *Malignant Neoplasm of Colon and Rectum* for males of all ages is reported in Appendix C, Table C-1 as 30.90 deaths/100,000 population for the period between 1986 and 1992. This ASMR is the mortality rate that would be found in the study-area population if the area population had the same age distribution as the Canadian population. It can be compared to other mortality rates which have been similarly standardized using the age-distribution of the Canadian population. It can not be interpreted in absolute terms as 30.90 males of all ages from the study -area population dying from colon and rectal cancer/100,000 population between 1986 and 1992.

For this report, a statistical comparison of the above ASMR with the corresponding ASMR for the Ontario population, calculated for the same time period, revealed that the two rates were not significantly different. With age accounted for, the rate of death for males from this cause is apparently the same in the study-area and Ontario populations.

Example 2:
The age-standardized incidence rate (ASIR) for Malignant Neoplasm of Digestive Organs and Peritoneum for men between the ages of 45 and 74 years calculated for the study-area population is 326.36 new cases/100,000 population for the period between 1986 and 1992 (Appendix C, Table C-14). Again, as in example 1, because the rate was age-standardized, one would not necessarily find that this was the actual incidence rate in the population being considered. When this ASIR was compared to the corresponding ASIR for the Ontario population, the former rate was found to be significantly higher at the $p<0.01$ level of significance. With age accounted for, the incidence rate of this cancer for middle-aged men appears to be higher in the study-area population than in the Ontario population. Furthermore, there is less than a 1 in 100 probability that the rate in the study-area population is higher because of chance alone.

Example 3:
An age-standardized morbidity rate (ASmR) of 139.25 cases/100,000 population for *Diabetes Mellitus* for males of all ages was calculated for the study-area population for the period between 1986 to 1992 (Appendix C, Table C-6). When compared to the corresponding ASmR for the Ontario population, the study-area rate was found to be significantly lower at the $p<0.05$ level of significance. With age accounted for, the rate of *Diabetes Mellitus* for males is *possibly* lower in the study-area population than in the Ontario population. *The nature of the data precludes a more definitive conclusion (Part A, Section 2.3).* Furthermore, there is less than a 1 in 20 probability that the rate in the study-area population is lower because of chance alone.

Box B: Interpretation of standardized ratios

Example 1:
As reported in Table C-15 of Appendix C, the standardized incidence ratio (SIR) for Malignant Neoplasm of Digestive Organs and Peritoneum for males 75 years and older for the period between 1986 and 1992 was 0.83. The significance test for this ratio indicated that there was no significant difference between the rate in the study-area population and the indirectly age-adjusted rate for the Ontario population. With age accounted for, the incidence rate of this form of cancer for elderly men is apparently the same in the study-area and Ontario populations.

Example 2:
The standardized mortality ratio (SMR) for *Atherosclerosis* for females of all ages, for the period from 1986 to 1992, was 0.38 (Appendix C, Table C-1). The significance test of the ratio indicated that the mortality rate from *Atherosclerosis* for females in the study-area population was significantly lower than the corresponding, indirectly age-adjusted rate for the Ontario population, at the $p<0.01$ level of significance. With age accounted for, the rate of death for females from this cause appears to be lower in the study-area population than in the Ontario population. Furthermore, there is a less than a 1 in 100 probability that the rate is lower because of chance alone. Assigning a value to the rate difference, however, is difficult since the 95% confidence interval of 0.21 to 0.63 calculated for this SIR is wide. The point estimate of 0.38 meaning a 62% lower rate in the study-area population, is therefore not very reliable.

Example 3:
The SIR calculated for *Malignant Neoplasm of Colon and Rectum* for males aged 45 to 74 years is 1.21 for the period from 1986 to 1992 (Appendix C, Table C-14). The test of significance for the ratio indicated that the incidence rate for this form of cancer for males in the study-area population was higher than the corresponding indirectly age-adjusted rate for the Ontario population at the $p<0.05$ level of significance. With age accounted for, the incidence rate for this form of cancer for males appears to be higher in the study-area population than in the Ontario population. Furthermore, there is a less than a 1 in 20 probability that the rate is higher because of chance alone. Assigning a value to the rate difference is possible since the 95% confidence interval of 1.03 - 1.42 calculated for this SMR is fairly narrow. The point estimate of 1.21, meaning a 21% higher rate in the study-area population is, therefore relatively reliable.

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PART B: RESULTS OF STATISTICAL COMPARISONS OF HEALTH DATA FOR STUDY-AREA AND ONTARIO POPULATIONS

1 Mortality

1.1 Deaths from selected causes in the study-area population

The study area had only a moderate-sized population (Part A, Section 1) and for the time period under study, deaths were not observed for many of the individual causes. This was most evident for both males and females in the two younger age categories of the population (Appendix C, Tables C-2, C-3), the two categories were mortality is expected to be low. When deaths were observed, at times, and most frequently in the two younger age categories (Appendix C, Tables C-2, C-3), only one, two or three were attributed to specific causes.

1.2 Comparisons of mortality rates

As described in Part A, Section 2.4, mortality rates for the study-area and Ontario populations were compared in two different ways. The results are presented below:

Age-Standardized Mortality Rate (ASMR) *comparisons*

Statistical comparisons of ASMRs for the study-area and Ontario populations were possible only when there were more than three recorded deaths in the study-area population for a given cause of death. Consequently, most comparisons could be made in the 'all ages' and two older age categories (Appendix C, Tables C-1, C-4, C-5). For many of the comparisons, study-area and Ontario ASMRs were not significantly different. The causes of death for which ASMRs for the study-area population were significantly higher or lower than corresponding Ontario population rates are presented, by sex and age category, in Tables 1 and 2, respectively. When significance was at the $p<0.01$ level, the population is underlined and bolded in the tables. Otherwise, significance was only at the $p< 0.05$ level.

Rate comparisons using Standardized Mortality Ratios (SMRs)

The SMR significance results, interpreted in terms of rates, generally corroborated age-standardized mortality rate (ASMR) comparisons. However, there were some noteworthy exceptions:

- The SMR significance test indicated that some rates for the study-area population were significantly different than indirectly age-adjusted rates for the Ontario population although comparisons of ASMRs for the study-area and Ontario populations showed no significant differences.

- When both rate comparison methods indicated rate differences between the study-area and Ontario populations, the significance levels were not always the same. Significance

determined to be at the $p<0.01$ level by the SMR significance test was, at times, only at the $p<0.05$ level when ASMRs were compared.

- When there were fewer than 4 deaths recorded in the study-area population for a given cause of mortality, ASMR comparisons could not be made. This is indicated by the # flag in the mortality tables of Appendix C. Comparisons, however, were possible using the SMR significance test and results sometimes indicated a significant difference between rates for the study-area population and indirectly age-adjusted rates for the Ontario population.

For the above exceptions, the causes of death for which mortality rates for the study-area population were significantly higher or lower than the corresponding indirectly age-adjusted rates for the Ontario population are presented, by sex and age category, in Tables 3 and 4, respectively. When significance was at the $p<0.01$ level, the population is underlined and bolded in the tables. Otherwise, significance was only at the $p< 0.05$ level.

For mortality, all data for the study-area population as well as all comparative statistics are given in Appendix C: Tables C-1 to C-5.

Table 1. Selected Causes of Death for which Age-Standardized Mortality Rates for the Study-Area Population were *Significantly Higher* than Corresponding Rates for the Ontario Population, by Sex and Age Category, 1986 - 1992.

CAUSE OF DEATH	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
All causes	**M,F**			**M,F**	
Diseases of Other Endocrine Glands	F			F	
Diabetes Mellitus	F			F	
Muscular Dystrophies and Other Myopathies	**M**				
Ischaemic Heart Disease	**M,F**			**M,F**	**M,F**
Diseases of Pulmonary Circulation					**M**
Diseases of Arteries, Arterioles and Capillaries				F	
Chronic Obstructive Pulmonary Disease and Allied Conditions				F	
Chronic Bronchitis					M,F
Emphysema	**M,F**			**F**	**M**
Diseases of Oesophagus, Stomach and Duodenum				F	
Other Diseases of Intestines and Peritoneum	**F**				F
Other Diseases of Digestive System				M	
Central Nervous System Anomalies	F	**F**			
Malignant Neoplasm of Lip, Oral Cavity and Pharynx					F
Malignant Neoplasm of Digestive Organs and Peritoneum				**M**	
Malignant Neoplasm of Oesophagus				**M**	
Malignant Neoplasm of Pancreas				M	
Malignant Neoplasm of Respiratory and Intrathoracic Organs	**M**			**M**	
Malignant Neoplasm of the Trachea, Bronchus and Lung	M			**M**	
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs				M	

Note: Statistical significance was either at the p<0.05 or p<0.01 level. The latter is presented underlined and bolded in the table. M refers to males and F to females.

Table 2. Selected Causes of Death for which Age-Standardized Mortality Rates for the Study-Area Population were *Significantly Lower* than Corresponding Rates for the Ontario Population, by Sex and Age Category, 1986 - 1992.

CAUSE OF DEATH	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
Other Forms of Heart Disease					F
Diseases of Arteries, Arterioles and Capillaries					**F**
Atherosclerosis	M,**F**				M,**F**
Pneumonia and Influenza	**F**				**F**
Malignant Neoplasm of Other and Unspecified Sites	M				

Note: Statistical significance was either at the $p<0.05$ or $p<0.01$ level. The latter is presented underlined and bolded in the table. M refers to males and F to females.

Table 3. Selected Causes of Death for which Mortality Rates in the Study-Area Population were *Significantly Higher* than Indirectly Age-Adjusted Rates for the Ontario Population, by Sex and Age Category, 1986-1992. *

CAUSE OF DEATH	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
Meningitis due to Enterovirus				M	
Other Metabolic Disorders and Immunity Disorders	M				
Encephalitis, Myelitis and Encephalomyelitis			M		
Other Diseases of Digestive System	M				
Other Inflammatory Conditions of Skin and Subcutaneous Tissue			F		
Microcephalus and Brain Reduction			M		
Congenital Heart Defects				M	
Ventricular Septal Defect				F	
Atrial Septal Defects	**M**			M	M
Pulmonary Artery Anomalies				F	
Down Syndrome	**F**				
Malignant Neoplasm of the Trachea, Bronchus and Lung	**M**				

* *Comparisons of ASMRs for the study-area and Ontario populations were not possible, yielded non-significant differences, or resulted in significantly higher rates at the $p<0.05$ level for the study-area population.*

Note: Statistical significance was either at the $p<0.05$ or $p<0.01$ level. The latter is presented underlined and bolded in the table. M refers to males and F to females.

Table 4. Selected Causes of Death for which Mortality Rates in the Study-Area Population were *Significantly Lower*, at the $p<0.05$ Level of Significance, than Indirectly Age-Adjusted Rates for the Ontario Population, by Sex and Age Category, 1986-1992. *

CAUSE OF DEATH	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
Other Metabolic Disorders and Immunity Disorders	M				
Nephritis, Nephrotic Syndrome and Nephrosis					M

* *The comparison of ASMRs for the study-area and Ontario populations was either not possible or yielded a non-significant difference.*

Note: *M refers to males.*

2 Morbidity as Hospitalization Cases

2.1 Hospitalizations from selected causes in the study-area population

In the study-area population, for both males and females of all age categories, cases were reported for the majority of the selected causes of hospitalizations. However, sometimes, although not frequently, there were only one, two or three cases for a specific cause. This usually occurred for causes which were sub-categories according to the ICD-9 classification (*see* Part A, Section 2.2). In contrast, large number of cases were observed at times for specific causes, especially those from the broader and more inclusive classifications. For example, more than 10,000 hospitalizations were reported for All Causes and generally for both sexes in all but the oldest age category.

2.2 Comparisons of morbidity rates

As described in Part A, Section 2.4, morbidity rates, or more specifically, hospitalization rates, for the study-area and Ontario populations were compared in two different ways. The results are presented below:

Age-Standardized Morbidity Rate (ASmR) *comparisons*

Statistical comparisons of ASmRs for the study-area and Ontario populations were possible when there were more than three hospitalizations reported in the study-area population for a given cause. Thus comparisons could be made for the majority of the causes with observations. The results of comparisons indicated that frequently ASmRs were not significantly different. However, there were numerous causes for which ASmRs for the study-area population were found to be significantly higher than corresponding Ontario population rates. These are presented by sex and age category, in Table 5. The causes with significantly lower rates in the study-area population are presented in Table 6. When significance was at the $p<0.01$ level, the population is shown underlined and bolded in the tables. Otherwise, significance was only at the $p<0.05$ level.

Rate comparisons using Standardized Morbidity Ratios (SmRs)

The ratio significance test could not be performed for All Causes for either males or females in most of the age categories because the recorded hospitalizations exceeded the upper sample size limit for the test. However, the test could be performed in all other cases. The significance results, interpreted in terms of rates, generally corroborated age-standardized morbidity rate (ASmR) comparisons. However, there were some noteworthy exceptions:

- The SmR significance test indicated that the rate for Other Metabolic and Immunity Disorders for males of 'all ages' for the study-area population was significantly higher at the $p<0.05$ level than the corresponding indirectly age-adjusted rates for the Ontario population although comparisons of ASmRs for the study-area and Ontario populations showed no significant difference.

- When there were fewer than 4 hospitalizations recorded in the study-area population for a given cause, ASmR comparisons could not be made. This is indicated by the # flag in the morbidity (as hospitalization cases) tables of Appendix C. Comparisons, however, were possible using the SmR significance test. For *Viral Hepatitis* in young women, the test indicted that the rate for the study-area population was significantly lower, at the $p<0.05$ level of significance, than the corresponding indirectly age-adjusted rate for the Ontario population.

All hospitalization data for the study-area population as well as all comparative statistics are given in Appendix C: Tables C-6 to C-10.

Table 5. Selected Causes of Hospitalization for which Age-Standardized Morbidity Rates for the Study-Area Population were *Significantly Higher* than Corresponding Rates for the Ontario Population, by Sex and Age Category, 1986 - 1992.

CAUSE OF HOSPITALIZATION	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
All causes	**M**,**F**	**M**,**F**	**M**,**F**	**M**,**F**	**M**,**F**
Intestinal Infectious Diseases			**F**		
Other Bacterial Diseases	**M**,**F**		**F**	M,**F**	
Other Diseases due to Viruses and Chlamydiae	**M**,F	M		**M**	**M**,**F**
Disorders of Thyroid Gland	F		**F**		
Diseases of Other Endocrine Glands	**F**	**M**,**F**		**F**	F
Diabetes Mellitus	**F**	**M**,**F**		F	**F**
Ovarian Dysfunction	**F**		**F**		
Other Metabolic Disorders and Immunity Disorders	F	**M**,**F**			
Diseases of Blood and Blood-Forming Organs	**F**			F	
Inflammatory Diseases of the Central Nervous System	**F**	F	**M**		
Meningitis of Unspecified Cause	M		**M**		
Encephalitis, Myelitis and Encephalomyelitis	**M**,**F**		**M**		
Hereditary and Degenerative Diseases of the Central Nervous System	M,**F**	**M**,**F**			**F**
Other Disorders of the Central Nervous System	**F**		**F**		
Multiple Sclerosis		**M**			
Infantile Cerebral Palsy	**M**,**F**	**M**,**F**			
Disorders of the Peripheral Nervous System	**M**,F		**M**,**F**	**M**	M
Muscular Dystrophies and Other Myopathies	M			M	
Disorders of the Eye and Adnexa		**M**			
Blindness and Low Vision				**M**	
Diseases of the Ear and Mastoid Process	F			**M**,**F**	

Table 5 continued...

Ischaemic Heart Disease	**M**,**F**			**M**,**F**	**M**,**F**
Diseases of Pulmonary Circulation	**M**,**F**		**M**	M,**F**	**F**
Other Forms of Heart Disease	**M**,**F**		M,F	**M**,**F**	**F**
Diseases of Arteries, Arterioles and Capillaries	**M**,**F**			**M**,**F**	
Atherosclerosis					
Acute Respiratory Infections	**M**,**F**	**M**,**F**	**F**	**M**,**F**	**M**,**F**
Other Diseases of Upper Respiratory Tract	**M**,**F**	**M**,**F**			
Pneumonia and Influenza	M,F				**M**,**F**
Chronic Obstructive Pulmonary Disease and Allied Conditions	**M**,**F**	**M**,**F**	**M**,**F**	**M**,**F**	**M**,**F**
Chronic Bronchitis				F	
Emphysema	**F**		**M**	M,**F**	
Asthma	**M**,**F**	**M**,**F**	M,**F**	**M**,**F**	**M**,**F**
Diseases of Oesophagus, Stomach and Duodenum	**F**	**F**		F	
Noninfective Enteritis and Colitis	**M**,**F**	**M**,**F**	**M**,**F**	**M**,**F**	M,**F**
Other Diseases of Intestines and Peritoneum	**M**,**F**		**M**,**F**	**M**,**F**	
Other Diseases of Digestive System	**M**,**F**	M.F	**M**,**F**	**M**,F	M,**F**
Nephritis, Nephrotic Syndrome and Nephrosis				F	
Other Diseases of Urinary System	**M**			**M**	**M**
Diseases of Male Genital Organs	**M**	**M**			
Infertility, Male	**M**		**M**		
Other Disorders of Female Genital Tract	**F**	**F**	**F**	**F**	**F**
Infertility, Female	**F**	F	**F**		
Pregnancy with Abortive Outcome		**F**			
Early or Threatened Labour	**F**	**F**			
Infections of Skin and Subcutaneous Tissue	**M**			**M**	M

Table 5 continued...

Other Inflammatory Conditions of Skin and Subcutaneous Tissue	M,**F**	**M**,**F**			
Other Diseases of Skin and Subcutaneous Tissue		M			
Arthropathies and Related Disorders	**M**,**F**	**M**	**M**,**F**	**M**,**F**	
Dorsopathies	**M**,**F**	**M**,**F**	**M**,**F**	**M**,**F**	**F**
Rheumatism, Excluding the Back	**M**	**M**,**F**	**M**	**M**	

Note: Statistical significance was either at the $p<0.05$ or $p<0.01$ level of significance. The latter is presented underlined and bolded in the table. M refers to males and F to females.

Table 6. Selected Causes of Hospitalization for which Age-Standardized Morbidity Rates for the Study-Area Population were *Significantly Lower* than Corresponding Rates for the Ontario Population, by Sex and Age Category, 1986 - 1992.

CAUSE OF HOSPITALIZATION	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
Intestinal Infectious Diseases	**M**,F	**M**,**F**			
Diabetes Mellitus	M		M		M
Other Metabolic Disorders and Immunity Disorders					M,F
Diseases of Blood and Blood-Forming Organs			**M**		
Disorders of the Eye and Adnexa	F			**F**	
Diseases of the Ear and Mastoid Process		**M**			
Hypertensive Disease					M
Atherosclerosis	**M**,**F**			**M**,**F**	**M**,**F**
Other Diseases of Upper Respiratory Tract			**M**	F	
Pneumoconioses and Other Lung Diseases due to External Agents	M,F				M,F
Disorders of Breast	**F**	**F**		**F**	
Endometriosis	**F**		**F**	**F**	
Pregnancy with Abortive Outcome	**F**		**F**		
Spontaneous Abortion	**F**	**F**	**F**		
Complications Mainly Related to Pregnancy	**F**		**F**		
Hypertension Complicating Pregnancy, Childbirth and the Puerperium			F		
Early or Threatened Labour			**F**		
Other Diseases of Skin and Subcutaneous Tissue			**F**		
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	**F**	F	F	**F**	
Certain Conditions Originating in the Perinatal Period	**M**,**F**	**M**,**F**			

Note: Statistical significance was either at the p<0.05 or p<0.01 level of significance. The latter is presented underlined and bolded in the table. M refers to males and F to females.

3 Morbidity as Cancer Incidence

3.1 Incidence of selected cancers in the study-area population

The study area had a moderate population (Part A, Section 2) and, for the time period under study, incidence were reported for most, if not all of the selected cancers for males and females in all of the age categories except the youngest. Although the youngest age category comprised a relatively large portion of the population (Figure 2), the inherent nature of the category precluded as high a morbidity as in the other age categories. Fewer cancers had incidence and when incidence were reported for specific cancers, there were generally less than five (Appendix C, Tables C-12, C-13). As previously mentioned, actual numbers below five are not given because of the data suppression agreement .

3.2 Comparisons of incidence rates

As described in Part A, Section 2.4, cancer incidence rates for the study-area and Ontario populations were compared in two different ways. The results are presented below:

Age-Standardized Incidence Rate (ASIR) *comparisons*

Statistical comparisons of ASIRs for the study-area and Ontario populations were possible when there were more than three new cases in the study-area population for a given cause. Since nearly all of the suppressed numbers were either equal to or less than three, few comparisons could be made in the youngest age category. However, many comparisons were possible in the other age categories. Most comparisons indicated that ASIRs were not significantly different. Those cancers for which ASIRs for the study-area population were significantly higher or lower than corresponding Ontario population rates are presented, by sex and age category, in Tables 7 and 8, respectively. For one case, significance was at the $p<0.01$ level as indicated underlined and bolded in Table 7. Otherwise, significance was only at the $p<0.05$ level.

Rate comparisons using Standardized Incidence Ratios (SIRs)

The SIR significance results, interpreted in terms of rates, generally corroborated age-standardized incidence rate (ASIR) comparisons. However, there was a noteworthy exception:

The SIR significance test indicated that for Malignant Neoplasm of Digestive Organs and Peritoneum for males of 'all ages', the rate for the study-area population were significantly higher, at the $p<0.05$ level of significance, than the corresponding indirectly age-adjusted rate for the Ontario population. No significant difference was found when ASIRs were compared for the study-area and Ontario populations.

All cancer incidence data for the study-area population as well as all comparative statistics are given in Appendix C: Tables C-11 to C-15.

Table 7. Selected Cancers for which Age-Standardized Incidence Rates for the Study-Area Population were *Significantly Higher* than Corresponding Rates for the Ontario Population, by Sex and Age Category, 1986 - 1992.

CANCER	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
All Malignant Neoplasms				**M**	
Malignant Neoplasm of Digestive Organs and Peritoneum				**M**	
Malignant Neoplasm of Oesophagus				M	
Malignant Neoplasm of Stomach				F	
Malignant Neoplasm of Colon and Rectum				M	
Malignant Neoplasm of Pancreas				M	
Malignant Neoplasm of Respiratory and Intrathoracic Organs				M	
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs			M		
Malignant Neoplasm of Other and Unspecified Sites		F			
Leukaemia			M		

Note: Statistical significance was either at the p<0.05 or p<0.01 level. The latter is presented underlined and bolded in the table. M refers to males and F to females.

Table 8. Selected Cancers for which Age-Standardized Incidence Rates for the Study-Area Population were *Significantly Lower,* at the $p<0.05$ Level of Significance, than Corresponding Rates for the Ontario Population, by Sex and Age Category, 1986 - 1992.

CANCER	Age Categories (in years)				
	all	0-24	25-44	45-74	75+
All Malignant Neoplasms	F				**M**,F
Malignant Neoplasm of the Trachea, Bronchus and Lung	F				
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	F				
Malignant Neoplasm of Female Breast	F				

Note: F refers to females.

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4 Birth Outcomes

4.1 Comparisons of birth weights

Birth weight data for the study-area and Ontario populations are presented in Appendix C, Table C-16. Overall mean and median birth weights are given as well as the percent distribution of birth weights according to specific weight categories.

For the time period under study, there were 4,253 male births with known birth weights in the study-area population. Of these, 5.0% had weights in the low birth-weight category, that is less than or equal to 2,500 g. This percentage was found not to be significantly different ($p=0.05$) from the corresponding percentage for the Ontario population. The mean male birth weight for the study-area population, calculated considering only known birth weights, was 3,485 g. It was found to be significantly higher ($p<0.01$) than the mean weight of 3460 g determined for male births in Ontario.

For the same time period, there were 3,924 female births with known birth weights in the study-area population and 5.4% of these fell into the low birth-weight category. This percentage was not significantly different ($p=0.05$) from the corresponding percentage for female births in Ontario, whereas the mean female birth weight of 3369 g was significantly higher ($p<0.01$) than the Ontario mean female weight of 3335 g.

Notably, for both males and females, births with known birth weights comprised greater than 99% of total births determined as described in Part A, Section 2.3 (*Birth weight data*).

4.2 Comparisons of infant congenital anomalies incidence rates

Congenital anomalies incidence are relatively rare events. When considering the 4,277 male and 3,953 female births that occurred in the study-area population between 1986 and 1992, although incidence were observed for all but one (Limb Reduction Anomalies) of the selected anomalies, there were generally few (Appendix C, Table C-17). Ratio calculations indicated that rates for all but one of the selected anomalies for the study area infant population were not significantly different at the $p<0.05$ level, than those rates for the Ontario infant population. The incidence rate for Hypospadias and Epispadias in male infants was significantly lower. In addition, the incidence of All Anomalies for both male and female infants in the study-area population, were lower.

4.3 Comparisons of infant mortality rates

In the study-area population, 25 deaths were observed for male infants and 19 for female infants from All Causes for the time period under study (Appendix C, Table 18). The two methods of rate comparisons, specifically comparisons of *age-specific mortality rates* (*ASMR*s) and mortality ratio (MR) significance tests, indicated that for both male and female infants, rates for the study-area population were not significantly different than corresponding rates for the Ontario population.

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PART C: INTERPRETATION OF THE HEALTH DATA COMPARISONS

The results presented in Part B give information needed to define the general health status of the population of this study area. They are intended as a reference to support further investigations by health assessors and others examining factors which impact on human health.

Statistically significant differences do not automatically imply that there is some protective or adverse environmental factor operating in the study area which is affecting the health of the population. A variety of factors could result in significantly higher or lower rates. For example, data collection methods, socioeconomic determinants (such as access to health care), life-style choices (such as smoking), or work conditions of a large percentage of the population - could all influence the results. Factors such as exposure, biologic plausibility, and other determinants must be taken into account as well. In addition (although this is unlikely), the rate could be different due to chance (1 and 5% possibility).

1 Data issues

It is critical to ensure that the variable set out to be measured and compared by the data is actually being measured and compared. Age and sex are generally the main confounding factors when comparing data from two different populations. In this study, sex was removed as a variable by comparing data for males and females separately. Age distribution effects were eliminated through standardization. There are other factors which can affect data interpretation and comparisons. In this regard, the health data collection process as well as health-related factors operative within communities should be thoroughly investigated. Two examples follow:

When comparing mortality data for people living in a small, rural area with data collected for the Ontario population where the vast majority of the people reside in urban areas -

> Because the precision of clinical diagnosis in rural communities may be affected by the level of experience, knowledge and diagnostic equipment, the cause of death for those deaths diagnosed within the community, may be misclassified more frequently in rural areas. This may be more prevalent for causes of death which are hard to classify such as cardiovascular-renal diseases[9]. As a consequence, erroneous comparisons may result since the study-area mortality rates for some of the health outcomes may be higher or lower than those actually present in the population.
>
> For the same health-care reasons as above, misdiagnosis of certain diseases may occur in rural communities for those residents receiving health care within the community and may result in delayed treatment and possibly death[10]. As a consequence, significantly higher mortality rates may occur for certain causes of death

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9 Alderson, M.R. 1988. Mortality, Morbidity and Health Statistics. Stockton Press, New York, NY. 501 pp.

10 Alderson, M.R. *As above.*

for the study area population when compared to rates for the predominantly urban Ontario population.

When comparing health data collected for people living in urban areas with data collected for all the urban and rural populations of Ontario -

It is possible that lower rates of hospitalization occur in this urban area for certain health outcomes because of the availability of specialized health services, other than hospitals, in urban areas . Population of large urban areas may more readily access such facilities, thus avoiding hospitalization for certain conditions.

2 Statistical issues

Health outcomes for which significant differences were observed between study-area and Ontario populations are presented in Part B. The differences are at the $p<0.05$ or $p<0.01$ levels, signifying that the probabilities of the differences observed only being chance occurrences are less than 5% and less than 1%, respectively. Thus, there is a high probability, specifically a 95% and 99% chance, that the differences observed in health outcome measures between the two populations are real. However, even though a high significance can be ascribed to comparisons in which sample sizes are small, the precision of the comparison result depends on sample size, with precision directly related to sample size.

In addition to significance levels, sample size and the power of the statistical test must be considered in interpreting the statistical results of data comparisons. Statistical power, defined as the ability to demonstrate a statistically significant association if one exists, is a function of sample size, with accuracy directly related to sample size.

For small study areas, sample sizes remained relatively small even though an attempt was made to increase them by pooling results over a number of years. Thus, for comparisons carried out with such data, there was a large probability of assigning insignificance when in actual fact significant differences were present. In contrast, when sample sizes were large (data from large rural areas), the power of the statistical tests were high with only a small probability of assigning insignificance when in actual fact significant differences were present.

Thus, for study areas with small populations -

Significant differences at the $p<0.01$ are significant at this level but the results are not very precise because of the large random variation (a wide confidence interval);

Comparisons of health outcome data with Ontario data indicating no significant differences are not very accurate and can not be interpreted with high certainty as actually meaning no significant differences exist.

In contrast, for study areas with large populations -

Comparisons indicating a significant difference at the $p<0.01$ level mean that there is a high degree of confidence in the results and their precision;

No significant difference indicates that it is likely that the result is not significant and the probability of an accurate comparison is large.

3 Etiological factors

The significant differences in health outcome measures observed between the study-area and Ontario population data could be a result of etiological factors. Some of these have been outlined in Appendix A.

There can be differences in the prevalence of some diseases due to ethnicity and marital status. Occupation can have an effect on death from certain causes and numerous health outcomes have been associated with the socioeconomic status of people, as well as smoking and diet. Notably, the absence of an association with any of these or related factors strengthens the possibility that the significant differences observed may be a result of environmental factors, and possibly contaminants.

As already mentioned in this report, more detailed information on the approach to further research in the area of health and environmental contaminants are presented in the manuals *Health and Environment: A Handbook for Health Professionals* and *Investigating Human Exposure to Contaminants in the Environment: A Community Handbook,* both prepared by and available from the Great Lakes Health Effects Program, Bioregional Health Effects Programs Division.

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Appendix A: Brief descriptions of and some possible causes for the selected health outcomes

Category I: Infectious and Parasitic Diseases

Waters can be contaminated by pathogenic microbes through sewage, domestic refuse and urban and agricultural runoff. Subsequent drinking of such contaminated water or having direct contact with contaminated water or soil, through, for example recreational activities[1,3,4,5,6], can result in infectious and parasitic diseases in the population.

Intestinal Infectious Diseases (001-009)

Intestinal Infectious Diseases include cholera, typhoid and paratyphoid fever, salmonellosis, shigellosis and other bacterial food poisoning, amoebiasis and other protozoal intestinal diseases such as protozoal colitis, diarrhoea, dysentery, giardiasis and infectious colitis, enteritis, and gastroenteritis, as well as intestinal infections due to other organisms and ill-defined intestinal infections[1].

Some of these disease can result from exposure to contaminated drinking or recreational water[1,3,4,5,6]. Although microbiological data from the Great Lakes Basin is scarce[2], organisms causing intestinal infections have been detected in various bodies of fresh water. Pathogenic bacteria, viruses and protozoa which could possibly be found in the Great Lakes basin are listed and described below :

Aeromonas hydrophila cause acute diarrhoea[4,7] and gastroenteritis[6], and the bacteria are found in surface waters and sewage; *Campylobacter jejuni* cause acute gastroenteritis in humans[4]. Found in poultry, cattle, sheep, pigs and dogs[4,7], the bacteria could contaminate water through agricultural runoff. Certain species of the genus *Clostridium* can cause intestinal infections, and may be found in water as a result of contamination through sewage or runoff[4,7]. *Escherichiae*, mostly *E. coli*, can cause diarrhoea or gastroenteritis in humans[4,6,7] and are widely distributed in nature. *Salmonella* are usually associated with food poisoning[6,7] but certain species of the bacterium can cause enteric and typhoid fever in humans[4,6,7]. The bacteria are found in contaminated water. The *Shigella* genus can contaminate water through sewage and the bacteria can cause dysentery, diarrhoea and gastroenteritis in humans[4,6,7]. The genus *Yersinia* can cause intestinal infections and the bacteria have been found in contaminated water as a result of sewage disposal and runoff[4,7].

Viruses such as Echovirus (or Rhinovirus Type 1)[4], Norwalk virus, Rotavirus and Adenovirus can contaminate fresh waters and can cause intestinal infections[7]. Certain protozoans such as Cryptosporidium (a livestock parasite), Giardia lamblia (a parasite of beavers, muskrats and deer), and Entamoeba histolytic can be found in fresh water and result in intestinal infections such as gastroenteritis or dysentery in humans[6,7].

Other Bacterial Diseases (030-041)

Other Bacteria Diseases include leprosy, diseases due to other mycobacteria, diphtheria, whooping cough, streptococcal sore throat and scarlatina, erysipelas, meningococcal infection, tetanus, septicaemia, actinomycotic infections, and other bacterial diseases[1].

Most of these diseases are either not endemic to the Great Lakes Basin or the vast majority of the Canadian population has been immunized against them. However, some can be caused by infectious agents found in fresh water. For examples, bacteria such as *Aeromonas hydrophila, Acinetobacter baumanii, Escherichia coli, Staphylococcus aureus, Klebsiella spp., Enterobacter spp.*, and *Plesiomonas,* which can cause septicaemia[5,6,7] can be present as a result of faecal contamination [3,4,5,6], in drinking and recreational water.

Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of the Central Nervous System (045-049)

This classification includes diseases such as acute poliomyelitis, slow virus infection of central nervous system, meningitis due to enterovirus, and other enterovirus or non-arthropod-borne viral diseases of the central nervous system[1].

Some of these diseases can be transmitted by enteroviruses such as poliovirus, and Coxsackie viruses[3,4,5,7]. These organisms have been found in faecally-contaminated drinking and recreational water.

Acute Poliomyelitis (045)

Transmitted between humans by direct or indirect faecal-oral spread[6], *Acute Poliomyelitis* is caused by poliovirus[4], a virus which can be found in contaminated water[7].

Meningitis due to Enterovirus (047)

This Meningitis is caused by the Coxsackie virus type B which has been detected in contaminated water[3,4,7].

Other Diseases due to Viruses and Chlamydia (070-079)

Grouped under this classification are viral hepatitis, rabies, mumps, ornithosis, specific diseases due to Coxsackie virus, infectious mononucleosis, trachoma, and other diseases due to viruses and Chlamydiae[1].

Chlamydia, which cause sexually-transmitted diseases, have not been detected in the environment. However, the infectious hepatitis virus and enteroviruses such as Coxsackie virus can be present in drinking or recreational water[3,5,7]. Some chemical pollutants[8,9] found in the environment appear to exacerbate the latent Epstein-Barr virus infection, a disease caused by the same herpes virus that produces infectious mononucleosis[4].

To add precision to this grouping of diseases, *Viral Hepatitis* and *Specific Diseases due to Coxsackie Virus* are presented as sub-groups.

Viral Hepatitis (070)

Both the infectious hepatitis virus[5] which causes the Type A disease and is often transmitted by the faecal-oral route[4] via refuse and sewage[10] and the calicivirus which causes the Type E disease and is enterically transmitted[4], have been recovered from fresh water sources[6,7].

Specific Diseases due to Coxsackie Virus (074)

The Coxsackie virus, an enterovirus, can be present in drinking or recreational water[5,7].

Other Spirochaetal Diseases (100-104)

Other Spirochaetal Diseases include leptospirosis, Vincent's angina, yaws, pinta, and other spirochaetal infections[1]. Excluded from consideration in this project are Vincent's angina, a disease associated with a type of gingivitis[4], and the tropical diseases of yaws and pinta[4].

Spirochetes are large free-living organisms which have been found in hydrogen-sulphide-containing mud, sewage and polluted water[3]. *Leptospira*, have been isolated from fresh water[6,7].

Leptospirosis (100)

Leptospira is transmitted to humans from a variety of wild and domestic animals via urine[7]. The disease can be spread by direct contact with urine or contact with water, soil or vegetation contaminated with the urine of infected animals[3].

Helminthiases (120-129)

Helminthiases are health conditions brought on by intestinal vermiform parasites[4]. These conditions include schistosomiasis, other trematode infections, echinococcosis, other cestode infections, trichinosis, filarial infection and dracontiasis, anchylostomiasis and necatoriasis, and other or unspecified helminthiases and intestinal parasitism[1]. Both schistosomiasis and necatoriasis are tropical diseases [4,12].

Certain species of the tapeworm *Echinococcus* can be found in humans and are usually acquired from living in close proximity with infected dogs[4,12]; *Trichinella spiralis*[4] , the trichinosis agent, is generally acquired from the ingestion of raw or inadequately cooked pork containing the parasite. Some helminths however can be present in drinking or recreational water[5]: Schistosomal dermatitis, or swimmer's itch, a sensitization response, is caused from repeated cutaneous invasion by cercariae of bird, mammal or human schistosomes[4] present in fresh waters in Canada[11]; Dracontiasis, or dracunculiasis, results from accidental ingestion of infected *Cyclops* in drinking water[4]; Anchylostomiasis, generally a tropical condition[12], is acquired by humans through contact with water containing *Ancylostoma duodenale*, a species also widespread in temperate areas[4,5].

Category III: Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders

Some contaminants found in water, fish and waterfowl in the Great Lakes Basin, are suspected of having effects on the endocrine and immune systems. Although evidence for immunotoxic effects[13,14] is mounting, some epidemiological studies have shown that PCBs[15,16] and dioxins[17] can have immunosuppressive effects in humans. In addition, some inorganic chemicals have been shown to have adverse effects on the immune system at much lower dose levels than required for toxic effects[18]. In addition, if exposure occurs during prenatal and early post-natal life, many of the

chemicals found in the environment can disturb the development of the endocrine system and of the organs that respond to endocrine signals[19].

Disorders of Thyroid Gland (240-246)

Disorders of the thyroid gland include goitre, hypothyroidism, thyroiditis and others[1].

Although goitre can be hereditary, it can also result from an iodine deficiency, an iodine excess, thyrotoxicosis or exposure to environmental toxins[20]. Hypothyroidism can develop following an acquired thyroid disease or following the treatment of such a disease (surgery, drugs, or radioactive iodine or external radiation treatment). It can also be hereditary, or a result of congenital abnormalities, hypothalamic-pituitary disease or thyroiditis[20]. Both cadmium[21] and iodine[12] can have effects on thyroid function and radiation, lead, and halogenated aromatics such as hexachlorobenzene, polybrominated biphenyls, polychlorinated biphenyls and dioxins, have been associated with thyroid dysfunction[20,22]. In addition, evidence showing that organochlorines can affect the thyroid gland has been found in animal studies [23].

Diseases of Other Endocrine Glands (250-259)

This classification includes diabetes mellitus and other disorders of pancreatic internal secretion, disorders of the parathyroid gland, of the pituitary gland, of the thymus gland, and of the adrenal glands, ovarian and testicular dysfunction, and other endocrine disorders[1].

Pituitary dysfunction can be associated with exposure to lead and styrene[20]. The thymus gland can be affected by exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and long term effects on immune functions can result[17]. Furthermore, immunosuppression following exposure to similar levels of TCDD may be more pronounced in foetuses than in adults [17]. Adrenal gland function has been shown to be affected by carbon tetrachloride, glucocorticoids and the herbicide Paraquat[20].

Diabetes Mellitus (250)

Several factors may be involved in Type 1 diabetes mellitus. The condition can be a hereditary or immune-mediated [20,24]. Furthermore, It can be related to viruses such as mumps, rubella, cytomegalovirus, Coxsackie viruses, retroviruses, and reoviruses[20], linked to encephalomyocarditis, or a result of exposure to betacytotoxin chemicals such as Nitroso compounds and Vacor. Dioxins and furans have been associated with an increased risk of diabetes in males[2].

Ovarian Dysfunction (256)

Ovarian dysfunction such as hyperestrogenism, hyperandrogenism, ovarian failure, premature menopause, and polycystic ovaries, can be due to a variety of factors. Obesity, heredity, enzymatic defects, autoimmune disorders, congenital anomalies, radiation, chemotherapy, viruses, cigarette smoking, surgery, and other idiopathic conditions can result in ovarian dysfunction[25]. In animals, exposure to reproductive toxicants such as benzo(a)pyrene and hexachlorobenzene has been shown to affect ovarian follicle

development[25,26,27,28,29]. Also, the exposure of monkeys to lead resulted in the suppression of circulating luteinizing hormone, follicle stimulating hormone and estrogen levels[30].

Testicular Dysfunction (257)

Testicular dysfunction such as testicular hyperfunction or hypofunction, defective biosynthesis of testicular androgen, eunuchoidism, failure, hypogonadism, and testicular feminization can result from trauma, and chromosomal abnormalities[31]. Reports over the past decades have linked exposure to environmental contaminants with a decline in semen quality[32]. Also, changes in semen and testis have been reported after exposure to chemicals[33]. Animal studies have shown that exposure to contaminants such as dibromochloropropane[12,20], arsenic, benzene, cadmium, methyl chloride, nitrous oxide, trichloroethylene and triethyleneamine[20] may be linked to testicular dysfunction. In addition, lead has been associated with testicular dysfunction in rodents[34].

Other Metabolic Disorders and Immunity Disorders (270-279)

This classification includes disorders of amino-acid transport and metabolism, of carbohydrate transport and metabolism, of lipid metabolism, of plasma protein metabolism, of mineral metabolism, of fluid, electrolyte and acid-base balance, as well as gout, obesity and other hyperalimentation conditions, other and unspecified disorders of metabolism, and disorders involving the immune mechanism[1].

There have been reports of immunosuppression and immunodeficiencies[35] in humans resulting from exposure to halogenated aromatic hydrocarbons (HAHs), asbestos and benzene[36], as well as from exposure to polychorinated biphenyls (PCBs), chlorinated dibenzo-p-dioxins, organochlorine pesticides, hexachlorobenzene, mirex, dieldrin and DDT, and heavy metals such as cadmium, mercury and lead[14,35,37].

Category IV: Diseases of Blood and Blood-Forming Organs (280-289)

This category includes the iron deficiency anaemias, other deficiency anaemias, hereditary haemolytic anaemias, acquired haemolytic anaemias, aplastic anaemia, other and unspecified anaemias, coagulation defects, purpura and other haemorrhagic conditions, diseases of white blood cells, and other diseases of blood and blood-forming organs[1].

Anaemias can be caused by various factors such as leukaemia, some syndromes, chronic renal failure, endocrine disorders, congenital outcomes, nutritional deficiencies, thalassaemia, low oxygen affinity, membrane defects, enzyme deficiency and other abnormalities, chemical and physical agents, infections, blood loss, and low-level ionizing radiation[4,38]. Certain anaemias, such as acquired haemolytic anaemias, and other haematologic diseases, have been associated with exposure to environmental contaminants[4,35,38]. Coagulation defects can be congenital or acquired as a result of nutritional deficiencies, circulating anticoagulants, some diseases such as liver disease and some syndromes[38]. Platelet disorders can be heredity or acquired from, for example, ionizing radiation, viral infections, alcohol, nutritional deficiencies, drugs, pregnancy, cancer, trauma, surgery, exercise, prematurity and various diseases, syndromes and disorders[38]. Haemolytic

disorders can be caused by Lindane[5] and some hydrocarbons such as benzene, HEH, and pentachlorophenol (PCP)[12]. There is also evidence that low-level lead exposure can affect heme-containing enzymes[13]. Vascular disorders such as purpura can result from coughing, vomiting, childbirth, weight lifting, suction, high altitude, aging, chronic ultraviolet (UV) radiation, Vitamin C deficiency, abnormal connective tissue, glucocorticoid excess, various syndromes, hormones, trauma, infections, toxic chemicals, arthropod bites, and drugs[38]

Category VI: Diseases of the Nervous System and Sense Organs

Diseases of the nervous system and sense organs can be hereditary or can occur as a result of infectious agents, autoimmune or metabolic disorders, drugs, diseases, tumours, and toxic agents[39]. Exposure to low levels of lead can have a variety of effects on the nervous system[13]. In the central nervous system, chemicals can affect pre- and post-natal development[5], the pesticide Triphenyltin can increase cell excitability[40] while organochlorine pesticides can cause effects such as paraesthesia, repetitive tremors and electroencephalogram (EEG) pattern changes[41].

Inflammatory Diseases of the Central Nervous System (320-326)

This classification includes bacterial meningitis, meningitis due to other organisms, meningitis of unspecified cause, encephalitis, myelitis and encephalomyelitis, intracranial and intraspinal abscess, phlebitis and thrombophlebitis of intracranial venous sinuses, and late effects of intracranial abscess or pyogenic infection[1].

Some of these diseases are caused by exposure to infectious agents that can be present in contaminated water. Exposure may occur through drinking or recreational use of the water.

Bacterial Meningitis (320)

Enterobacteriaccae have been implicated in 30 to 50% of the cases of bacterial meningitis with *Eschericheae coli* specified in about 1/3 of the cases[6]. Both *E. coli* and *Streptococcus pneumoniae*, another causative agent of this disease, have been found in drinking and recreational water[6,7]. Transmission of bacterial meningitis can occur as a result of conditions such as hyposplenism, alcoholism, epidemic or cluster, endocarditis, penetrating or postoperative trauma, sinusitis, and immunosuppression[39].

Meningitis of Unspecified Cause (322)

(Some cases of bacterial meningitis could be included in this category.)

Encephalitis, Myelitis and Encephalomyelitis (323)

Certain types of encephalitis can be caused by enteroviruses such as the Coxsackie virus[4]. This virus has been found in contaminated drinking and recreational water[5,7].

Hereditary and Degenerative Diseases of the Central Nervous System (330-337)

Included in this designation are cerebral degenerations usually manifest in childhood, other cerebral degenerations (e.g. Alzheimer's disease), Parkinson's disease, other extrapyramidal diseases and abnormal movement disorders, spinocerebellar diseases, anterior horn cell diseases (e.g. amyotrophic lateral sclerosis), other diseases of the spinal cord, and disorders of the autonomic nervous system[1].

Some of these diseases are hereditary, while others can be caused by autoimmune disorders, central nervous system infections, metabolic disorders, drug intoxications, other diseases, and brain tumors[39]. Although the studies are, as yet, inconclusive, some pollutants have been suspected of playing a role in neurodegenerative disorders such as Parkinson's disease, dementia and amyotrophic lateral sclerosis (ALS or Lou Gehrig's disease)[39,42].

Parkinson's Disease (332)

Since N-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MTPT) was implicated in Parkinson's disease in young drug addicts, the possible role of similar environmental toxic agents in the disease has been studied[43]. Agricultural chemicals in contaminated drinking water have been implicated [43,44] although selective sensitivity to commonly present environmental toxins has also been postulated [43].

Other Disorders of the Central Nervous System (340-349)

Multiple sclerosis, other demyelinating diseases of the central nervous system, hemiplegia, infantile cerebral palsy, other paralytic syndromes, epilepsy, migraine, cataplexy and narcolepsy, other conditions of the brain, other and unspecified disorders of the nervous system[1] are included in this classification.

Demyelinating disorders may be heredity or may be caused by infectious agents, complications following vaccination, other diseases, chronic alcoholism, cerebral trauma, and tumors[39]. Organophosphorous insecticides [12] and certain other chemicals[45] may cause nerve demyelination.

Multiple Sclerosis (340)

Geographic factors appear to be involved in multiple sclerosis since the incidence and prevalence of the disease increases with increasing distance from the equator[39]. Socioeconomic factors, infectious agents (although that theory remains unproven), heredity and the immune system[39] maybe involved. Some studies indicate that nerve demyelination may be caused by certain chemicals[45].

Infantile Cerebral Palsy (343)

Infantile cerebral palsy can be a result of congenital hemiplegia or can be caused by birth injuries or cerebral anoxia in the perinatal period[39]. Prenatal exposure to methyl mercury may result in cerebral palsy[46,47,48,49].

Disorders of the Peripheral Nervous System (350-359)

Included in these disorders are trigeminal nerve disorders, facial nerve disorders, disorders of other cranial nerves, nerve root and plexus disorders, mononeuritis of upper limb and mononeuritis multiplex, mononeuritis of lower limb, hereditary and idiopathic peripheral neuropathy, inflammatory and toxic neuropathy, myoneural disorders, and muscular dystrophies and other myopathies[1].

Disorders of the peripheral nervous system are most often caused by metabolic disorders, predominantly diabetes mellitus, and heritable disorders. They can be immune-mediated or can result from complications of uraemia, antecedent or co-existing illnesses, respiratory infections, viral gastrointestinal disorders, herpes virus infections, or campylobacter infections[39]. Factors such as Hodgkin's disease, recent surgery, pregnancy, complication of vaccination, pharmacological immunosuppression, and toxic agents, for example triorthocresyl phosphate, might predispose an individual to these disorders[39]. Industrial and environmental neurotoxic agents such as hexacarbons, acrylamide, dimethylaminopropionitrile, organophosphorous compounds (especially insecticides), Vacor, lead, arsenic, and thallium salts may produce effects on the peripheral nervous[39]. Some pollutants can increase excitability of the nervous system[5] and dioxins may promote peripheral-sensory neuropathy[50].

Muscular Dystrophies and Other Myopathies (359)

Muscular dystrophies are hereditary; myopathic disorders may be hereditary, drug-induced, acquired in myxoedema or in hypokalaemic paralysis, or caused by alcoholism, high circulating levels of serotonin, raised blood magnesium levels, or vitamin E deficiency[51]. Also, myopathies may result from diseases such as Whipple's disease, endocrine diseases, typhoid fever, Legionella, diseases caused by mixed enteric organisms, toxic shock syndrome and other staphylococcal infections, as well as malignant neoplasms [51]. Environmental contaminants, by affecting mitochondrial function, may produce the neuromuscular symptoms[52] . Toxic myopathies have been related to poisonings with substances used in agricultural insecticides such as organophosphate and carbonate[53].

Disorders of the Eye and Adnexa (360-379)

This classification includes disorders of the globe, retinal detachments and defects, other retinal disorders, chorioretinal inflammations and scars and other disorders of choroid, disorders of iris and ciliary body, glaucoma, cataract, disorders of refraction and accommodation, visual disturbances, blindness and low vision, keratitis, corneal opacity and other disorders of cornea, disorders of conjunctiva, inflammation of eyelids, other disorders of eyelids, disorders of lachrymal system, disorders of the orbit, disorders of optic nerve and visual pathways, strabismus and other disorders of binocular eye movements, and other disorders of the eye[1].

The disorders may be hereditary or congenital or result from foreign bodies, accidental or surgical penetrating wounds, ulcers, infectious agents, radiant (e.g. ultraviolet or UV) energy, chemicals, ischaemic or immunogenic factors, diseases associated with ocular abnormalities, drugs, or allergies[54].

Some air pollutants have been shown to cause eye irritation[5]. Methyl mercury [55] and organochlorines[12] can result in deficits in visual function such as a constriction of the visual field[55] whereas alcohol, lead, arsenic, and carbon dioxide can cause toxic polyneuritis[54].

Blindness and Low Vision (369)

Blindness can be hereditary, or can result from diabetes mellitus, Leber disease, trauma, cardiac disease, atherosclerosis, drug abuse, and oral contraceptives[54]. In addition, ingestion of methanol and exposure to methyl mercury have produced blindness[56,57].

Diseases of the Ear and Mastoid Process (380-389)

These disease include disorders of the external ear, nonsupparative otitis media and Eustachian tube disorders, suppurative and unspecified otitis media, mastoiditis and related conditions, other disorders of tympanic membrane, other disorders of middle ear and mastoid, vertiginous syndromes and other disorders of vestibular system, otosclerosis, other disorders of ear, and deafness[1].

The external ear can be affected by trauma, frostbite, dermatitis, foreign bodies, infections, eczema, tumors, and cysts; the middle ear by acute respiratory tract infections, allergic rhinitis, adenoiditis or nasopharyngitis, sinusitis, nasopharyngeal scarring, posterior deviation of the nasal septum, stenosis of the Eustachian tube, cleft palate, paralysis of the palatal muscles, tumors of the nasoharynx, and acute inflammatory diseases such as otitis media[58]. Some of the conditions may be acquired while swimming in contaminated water. In addition, hearing loss may occur at certain blood lead levels [59] , and auditory disturbances[55], severe hearing impairment and deafness[57] can result from methylmercury poisoning.

Category VII: Diseases of the Circulatory System

There is little information on the effects of environmental contaminants on cardiovascular diseases[5]. However, clinical experiments have suggested that exposure to carbon monoxide exacerbates symptoms of angina[5] and studies have proposed a relationship between water hardness and cardiovascular disease (this still remains controversial) [5] as well as an association between the levels of trace metals in water and susceptibility to sudden death from arrhythmia[5]. In addition, many chemicals found in the workplace, some of which may end up in the environment, have been shown to be harmful to the cardiovascular system producing conditions such as atherosclerosis, hypertension, coronary heart disease, cardiomyopathy, arrhythmia[60].

Hypertensive Disease (401-405)

Hypertension is a complex disease. Several risk factors are involved and genetic factors, dietary sodium intake, abnormalities in renal sodium handling, low birth weight, encephalopathy, renal insufficiency, saturated fat and excess calories in diet, low calcium, magnesium and potassium intake, adiposity, rapid heart rate, high-normal hematocrit, elevated blood sugar, elevated fibrogen values, diabetes and others all play a role in the disease[61]. Hypertension is a known toxic outcome in the cardiovascular system[32,60] and lead poisoning [62] and high cadmium levels[63] have been associated with increased blood pressure.

Ischaemic Heart Disease (410-414)

Ischaemic heart disease includes myocardial infarction, angina pectoris, and other forms of ischaemic heart disease[1]. It may be caused by Atherosclerosis, a condition which may be associated with some contaminants [64]. Angina pectoris is believed to be exacerbated by exposure to carbon monoxide[5].

Diseases of Pulmonary Circulation (415-417)

Acute and chronic pulmonary heart disease, and other diseases of pulmonary circulation are included in this classifiction[1]. Pulmonary heart disease can occur as a consequence of radiation, upperairways obsturction or a massive pulmonary embolism or result from conditions such as pulmonary hypertension, chronic obstructive pulmonary disease, cystic fibrosis, congenital developmental defects, sarcoidosis, pneumoconiosis, high altitude disease, chronic liver disease and toxin-induced pulmonary hypertension [53]. Pulmonary embolism and infarction can follow cancer, obesity and the use of estrogen-containing compounds, as well as events such as major surgery, trauma, surgery of the pelvis and lower extremities, prolonged immobility, and pregnancy[53]. Pulmonary hypertension can be a consequence of massive obesity, hypoventilation, and upperairways obstruction as well as conditions such as chronic bronchitis, cystic fibrosis, bronchial asthma, thoracic cage disorders and emphysema[53].

Some of the conditions which may result in the diseases, such as for example chronic obstructive pulmonary disease, may be caused by exposure to contaminants through air pollution.

Other Forms of Heart Disease (420-429)

Other forms of heart disease include acute pericarditis, acute and subacute endocarditis, acute myocarditis, other diseases of the pericardium and endocardium, cardiomyopathy, conduction disorders, cardiac dysrhythmias, heart failure and ill-defined descriptions and complications of heart disease[1].

Pericarditis and myocarditis can be caused by the Coxsackie virus whereas infective endocarditis can be caused by organisms such as Streptococci and Staphylococci All of these agents can be found in contaminated water[4,5]. Cardiomyopathy may be hereditary or may be caused by alcohol abuse, hypertension, immunologic disorders, viral infections, nutritional deficiencies, or a number of chemical and physical factors that produce toxic effects on the myocardium[5,55,60,64]. Heart muscles may be adversely affected by radiation[64] and can suffer toxic effects due to acute arsenic poisoning. Cardiac dysrhythmias may be produced by mercury and lead poisoning[5,55,60,64], and morphologic abnormalities to the heart[64] can be caused by excessive fluoride and fluorinated hydrocarbons used in aerosol propellants.

Diseases of Arteries, Arterioles and Capillaries (440-448)

Included in these diseases are atherosclerosis, aortic aneurysm, other aneurysm, other peripheral vascular disease, arterial embolism and thrombosis, polyarteritis nodosa and allied conditions, other disorders of arteries and arterioles, and diseases of capillaries[1]. Arteries, arterioles and capillaries may be affected by certain chemicals.

Atherosclerosis (440)

There are numerous risk factors associated with atherosclerosis including cigarette smoking, hypertension, high serum cholesterol, a diet high in saturated fat and cholesterol, obesity, a sedentary lifestyle, diabetes mellitus, age, gender, a family history of premature atherosclerosis, oral contraceptives, menopause, oestrogen therapy, type A behaviour, stress, alcohol abuse and a genetic predisposition[64]. Other factors which have been studied but have not been substantiated include the mineral content in drinking water, trace elements, blood groups, coffee, climate, noise, air pollution, the urban environment, a low socioeconomic status and education[64].

Category VIII: Diseases of the Respiratory System

The respiratory system can be exposed to contaminants in polluted air, as well as sometimes to those present in polluted water and soil.

Acute Respiratory Infections (460-466)

Acute Respiratory Infections include acute nasopharyngitis (termed the common cold), acute sinusitis, acute pharyngitis, acute tonsillitis, acute laryngitis and tracheitis, acute upper respiratory infections of multiple or unspecified sites, and acute bronchitis and bronchiolitis[1].

Nasopharyngitis is caused by viruses such as rhinovirus, coronavirus, parainfluenza virus, and respiratory syncytial virus[53], pharyngitis is caused by group A streptococci and various respiratory viruses, and may result from Epstein-Barr virus-associated infectious mononucleosis[53], and sinusitis can result from viral upper respiratory tract infections, as well as from nasal polyps, allergic rhinitis, foreign bodies, nasal septal pathology, and dental infections[53]. Both tonsillitis, and laryngitis may be caused by viruses and bacteria and tonsillitis, as well as laryngitis, may be promoted by certain toxic agents[65] . Finally, acute bronchitis can be caused by viruses, mycoplasms, bacteria, and parasites[53] or can result from tobacco, cannabis, ammonia, trace metals (vanadium and cadmium), air pollutants (sulfur dioxide and nitrogen dioxide), and vegetable substances (cotton, flax, hemp and paprika).

Some of the infectious agents can be present in drinking and recreational water[5].

Other Diseases of Upper Respiratory Tract (470-478)

These diseases include deflected nasal septum, nasal polyps, chronic pharyngitis and nasopharyngitis, chronic sinusitis, chronic disease of tonsils and ademoids, peritonsillar abscess, chronic laryngitis and laryngotracheitis, allergic rhinitis, and other disease of the upper respiratory tract[1].

Histopathologic changes in nasal mucosa may be caused by high levels of ozone and other contaminants in the atmosphere[66], sinusitis and laryngitis may be promoted by certain toxic agents [65], and the sense of smell may be affected by air pollutants such as sulphur dioxide, and organic solvents[58].

Pneumonia and Influenza (480-487)

Pneumonia and influenza includes viral pneumonia, pneumococcal pneumonia, other bacterial pneumonia, pneumonia due to other specified organisms, pneumonia in infectious diseases classified elsewhere, bronchopneumonia, pneumonia of unspecified organisms and influenza[1].

Influenza, caused by more than 200 serologically distinct viruses, and viral pneumonia, caused by adenovirus, respiratory syncytial virus and rubeola, are primarily transmitted by direct contact with infected specimens or through aerosols[53]. Viral pneumonia, however, can also be caused by some enteroviruses, such as the Coxsackie virus and echovirus[53]. These have been found in contaminated water. Following a period of control with penicillin, the incidence of pneumococcal pneumonia, caused by *Streptococcus pyogenes*, has recently increased. Although generally spread by aspirating infected mucus or inhaling organisms that have colonized in the nasopharynx, the disease has also been traced to contaminated water. In addition, some of the other pneumonia-causing agents such as *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Hemophilus influenzae*, *Neisseria meningitidis*, *Escherichia coli*, *Legionella pneumophila*, and *Chlamydia pneumoniae*[5,53] may be present in contaminated drinking and other water[5].

Chronic Obstructive Pulmonary Disease and Allied Conditions (490-496)

This category includes bronchitis that is not classified as acute or chronic, chronic bronchitis, emphysema, asthma, bronchiectasis, extrinsic allergic alveolitis, and chronic airways obstruction not classified elsewhere[1].

Although the main risk factor for these diseases is cigarette smoking[53], air pollution, specifically high concentrations of particulate matter and sulfur dioxide, are clearly a cause of illness and death from these diseases[5,53]. However, the full impact of existing pollution levels is unclear[53] and other factors such as heredity, socioeconomic level, race, occupational risks, allergies and/or bronchial hyperactivity may play a role in the development of these diseases[53]. To add precision to this grouping, the following sub-groups are also being considered:

Chronic bronchitis (491)

Emphysema (492)

Asthma (493)

Pneumoconioses and Other Lung Diseases due to External Agents (500-508)

This classification includes coalworker's pneumoconiosis, asbestosis, pneumoconiosis due to other silica or silicates, pneumoconiosis due to other inorganic dust, pneumopathy due to inhalation of other dust, unspecified pneumoconiosis, respiratory conditions due to chemical fumes and vapours, pneumonitis due to solids and liquids, and respiratory conditions due to other and unspecified external agents[1].

Coalworker's pneumoconiosis can result from long-term exposure to coal dust, generally in

occupational settings such as mining. Asbestosisis, along with lung cancer and mesothelioma, can develop from long-term exposure to asbestos. Asbestos, which has been used in a wide variety of ways, for example as sheating and insulation in building construction, as friction material in brakes, and as a binder and strengthener for cement pipes, is widely found in the environment.

Silicosis is a pneumoconiosis most often caused by inhalation of the free silica, quartz. Although silica is abundant in the natural environment, silicosis is generally an occupational risk, most importantly associated in Canada with sandblasting. Other pneumoconioses can result from exposure to substances such as antimony, aluminum, barytes, beryllium, plyvinyl chloride, magnetite, limonite, and tungsten carbide[53], which can be present in low doses in atmospheric air.

Category IX: Diseases of the Digestive System

The digestive system may be exposed to environmental pollutants through the consumption of contaminated drinking water and food.

Diseases of Oesophagus, Stomach and Duodenum (530-537)

This category includes diseases of the oesophagus, gastric ulcer, duodenal ulcer, peptic ulcer (site unspecified), gastrojejunal ulcer, gastritis and duodenitis, disorders of function of stomach, and other disorders of stomach and duodenum[1].

The oesophagus, as well as the stomach can be affected by congenital anomalies. The oesophagus can also be affected by corrosives, non-steroidal anti-inflammatory drugs, potassium chloride, and tetracycline and other related antibiotics[67]. Gastritis can result from alcohol abuse, analgesic drugs, non-steroidal anti-inflammatory drugs, cytotoxic drugs, radiation, ingestion of corrosive substances, staphylococcal food poisoning, and other bacterial (including *Escherichia coli)* infections[67]. Gastric ulcers, as well as disorders of the duodenum and peptic ulcers, have also been attributed to *Helicobacter pylori* infections[67]. Peptic ulcers can also be caused by factors such as low fibre or rice-based diets, coffee, alcohol, aspirin, and cigarette smoking[67] and gastric ulcers can occur as a result of conditions such as hypovolaemic shock, sepsis, renal, hepatic or pulmonary failure, severe injuries, neurologic injuries, major burns, severe bile reflux, as well as drugs[67]. A higher incidence of upper gastrointestinal tract ulcers been reported following exposure to dioxins and furans[68].

Noninfective Enteritis and Colitis (555-558)

Included in Noninfective Enteritis and Colitis are regional enteritis, idiopathic proctocolitis, vascular insufficiency of intestine, and other noninfective gastroenteritis and colitis[1].

Regional enteritis, also called Crohn's disease, is hereditary, but can also be associated with factors such as geographic location, urban living, diet, smoking, psychosocial factors, and possibly oral contraceptive use[69]. In addition, the disease can result from infectious agents. Proctocolitis although caused by various bacteria, is generally sexually transmitted[69]. Gastroenteritis can result from allergies, diet and radiation[70]; colitis and colonic injury from foreign bodies, enemas, laxatives, soap, radiation, chemotherapy, hydrogen peroxide,

vinegar, herbs, sodium diatrizoate, gold, mercury, bisacodyl, fluorouracil, non-steroidal anti-inflammatory drugs, vasculitis, connective tissue disease, amyloidosis, certain syndromes, leukaemia, lymphoma, immunodeficiency diseases, lipid proctitis, and allergic proctitis [67,69]. Colonic ulcers can be caused by vascular abnormalities, other diseases, the use of some drugs and oral contraceptives, foreign bodies, trauma, neurological stress, unknown toxins and bacterial or viral infections[70].

Other Diseases of Intestines and Peritoneum (560-569)

This category includes intestinal obstruction without mention of hernia, diverticula of intestine, functional digestive disorders not elsewhere classified, anal fissure and fistula, abscess of anal and rectal regions, peritonitis, other disorders of peritoneum, and other disorders of intestines[1].

Intestinal obstruction and pseudo-obstruction can result from foreign bodies, neoplasms, congenital anomalies, inflammatory and sometimes infectious diseases, surgery, abscesses, pregnancy, radiation therapy, drugs, cardiovascular disease, respiratory failure, diabetes mellitus, hypothyroidism, alcoholism, lead-poisoning, and burns[71]; diverticula can result from connective tissue disorders or retained flatus[71]; peritonitis can be caused by infectious agents, abscess, surgery, perforated peptic ulcer, appendicitis, gangrene of bowel or gallbladder, postoperative complications, severe acute or chronic liver disease, and candida[71].

Other Diseases of Digestive System (570-579)

These other diseases include acute and subacute necrosis of the liver, chronic liver disease and cirrhosis, liver abscess and sequelae of chronic liver disease, other disorders of the liver, cholelithiasis, other disorders of gallbladder, other disorders of biliary tract, diseases of pancreas, gastrointestinal haemorrhage, and intestinal malabsorption[1].

Liver disease can result from alcoholism, heredity, congenital anomalies, chronic haemodialysis, dietary iron overload, systemic diseases such as diabetes mellitus, obesity, amyloidosis, infections, drugs, foreign substances and other disorders[71]. Furthermore, it has been proposed, based on animal studies, that the liver is the primary organ affected by toxic chemicals[2,12]. The gallbladder can be affected by conditions such as parity, obesity, rapid weight loss, parenteral nutrition, a diet rich in simple sugars or high in fats, and oestrogen replacement therapy as well as diabetes mellitus, Crohn's disease, hypertriglyceridemia, and oral contraceptives[71]; diseases of the pancreas can be hereditary or caused by trauma, drugs, infections with mumps virus, enterovirus, Epstein-Barr virus, Hepatitis A virus, Coxsackie B virus, influenza A, measles, leptospirosis, mycoplasmosis, typhoid fever, ascariasis, and rubella, biliary tract disease, metabolic conditions, and congenital anomalies[71]. Some of the infectious agents mentioned may be present in contaminated surface water[5].

Category X: Diseases of the Genitourinary System

Nephritis, Nephrotic Syndrome and Nephrosis (580-589)

Nephritis can be caused by urinary tract infections, severe bacterial renal interstitial infection,

diabetes mellitus, chronic analgesic abuse, renal vascular diseases, hypertension, obstructive nephropathy, nephrolithiasis, sickle cell disease, potassium depletion, hypercalcemia, radiation injury, and lead nephropathy[72]. Nephrotic syndrome and nephrosis can result from metabolic, autoimmune, infectious and neoplastic diseases, as a reaction to drugs and toxic substances, and following exposure to heavy metals[72]. In animal studies, 1-1-dichloroethylene has been shown to cause renal failure[5]; in humans, environmental exposure to this compound, in some areas, has resulted in kidney damage which sometimes progressed to severe kidney failure[73]. Higher[74] and lower [75] proteinuria and aminoaciduria were reported in the population of an area contaminated with cadmium and lead.

Other Diseases of Urinary System (590-599)

These Other Diseases include infections of the kidney, hydronephrosis, calculus of the kidney and ureter, other disorders of the kidney and ureter, calculus of the lower urinary tract, cystitis, other disorders of the bladder, non- sexually transmitted urethritis and urethral syndrome, urethral stricture, and other disorders of the urethra and urinary tract[1]. Pyelonephritis can be caused by *E. Coli, Proteus, Klebsiella, staphylococci,* and *enterococci* infections as well as urinary tract infections[72] whereas hydronephrosis an result from obstruction or reflux in the renal pelvis[72]. Although the etiology of urinary stones or calculus remains speculative, rrethral diseases can result from factors such as urethral stones, tumours, tuberculosis and schistosomiasis[72].

Diseases of Male Genital Organs (600-608)

The classification includes hyperplasia of the prostate, inflammatory disease of the prostate, other disorders of the prostate, hydrocele, orchitis and epididymitis, redundant prepuce and phimosis, infertility, disorders of the penis, and other disorders of the male genital organs[1].

Prostatitis can be caused by coliform bacteria such as *E. Coli, Pseudomonas, enterococci* and *staphylococci*, and in some cases by vasculitis[72], hydrocele can result from local injury, radiotherapy, epididymitis, or orchitis[72], orchitis can be a consequence of mumps, tuberculosis, syphilis, and autoimmune diseases[72], and epididymitis, caused by *Enterobacteriaceae* or *Pseudomonas*, can result from trauma, reflux of sterile urine, or sexual activity[72]. Phimosis is a chronic infection due to poor local hygiene[72], disorders of the penis when not idiopathic, can be associated with leukaemia, sickle cell disease, pelvic tumours, pelvic infections, penile trauma, spinal cord injury, use of medications, intracavernous injection therapy for impotence, severe vasculitis, and chronic inflammation[72]. Pesticides have been linked to reproductive failure in animals[5] and infertility in humans.

Infertility, Male (606)

Infertility in males can result from varicocele, acquired or congenital obstructions, infections, ejaculatory dysfunction, hypogonadotropic hypogonadism, immunological problems, sexual dysfunction, hyperprolactinemia, cryptorchidism, vasal agenesis, gonadotoxins such as drugs and radiation, bilateral anorchia, germinal cell aplasia, primary testicular failure, chromosomal anomalies, immotile cilia syndrome, disorders of sperm transport, disorders of sperm motility or function, congenital defects of sperm tail, and maturation defects[72]. Reduced fertility can occur in men working in pesticide manufacturing plants[77] and men occupationally exposed to lead[78].

In addition, fertility may be affected by pollutants such as organochlorines [76].

Disorders of Breast (610-611)

Benign mammary dysplasias, and other disorders of the breast are included in this classification[1]. Risk factors associated with benign mammary dysplasias include nulliparity, early menarche, late menopause, and irregular or anovulotary cycles[25]. Other disorders of the breast can result from congenital anomalies due to musculoskeletal defects or ovarian function deficiencies, developmental anomalies due to ovarian tumours, adrenal tumours, brain tumours, ingestion of oestrogen, or constitutional precocity, inflammatory conditions due to staphylococcal bacteria, breast trauma, lactation, oestrogen hyperstimulation, type 1 diabetes, tuberculosis, syphilis, and fungal infections[25].

Other Disorders of Female Genital Tract (617-629)

These disorders include endometriosis, genital prolapse, fistulae involving the female genital tract, noninflammatory disorders of the ovary, fallopian tube and broad ligament, disorders of the uterus not classified elsewhere, noninflammatory disorders of the cervix, vagina, vulva and peritoneum, pain and other symptoms associated with the female genital organs, disorders of menstruation and other abnormal bleeding from the female genital tract, menopausal and postmenopausal disorders, infertility, and other disorders of female genital organs[1].

The disorders can be hereditary or caused by several factors including herniation, delivery, a significant alteration in pelvic support, injury, complications of surgery, an abnormal release of anterior pituitary gonadotropins, intracystic haemorrhage, hypothyroidism, sexual precocity, in utero exposure to diethylstilboestrol, habitual abortion, and congenital anomalies[25]. Hexachlorobenzene, found in Great Lakes waters, may be associated with damage to the structure of the ovary[25] and pesticides have been linked with reproductive failure in animals[5].

Endometriosis (617)

Although Endometriosis is very common in women of reproductive age and may be a genetic condition[25], its etiology remains unclear. It has also been associated with müllerian anomalies and uterine outflow obstruction[25] and in animal studies, with organochlorines[79].

Infertility, Female (628)

Infertility in women has been associated with previous surgery of the lower abdomen causing damage to the reproductive organs, repeated abortions, ectopic pregnancy, history of sexually transmitted diseases, lesions of the uterus, tubes or peritoneum, ovarian dysfunction, immunologic factors, infective agents, and endometriosis[25]. Pollutants, specifically organochlorines and heavy metals, are suspected of affecting fertility, specifically ovulation, by inducing hormonal disorders[21].

Category XI Complications of Pregnancy, Childbirth and the Puerperium

Pregnancy complications may be brought on by exposure to some heavy metals during gestation[80]. In addition, the outcome of pregnancy may be affected by environmental contaminants. For example, teratogens can produce congenital malformations and spontaneous abortions[5].

Pregnancy with Abortive Outcome (630-639)

Hydatidiform mole, other abnormal products of conception, missed abortion, ectopic pregnancy, spontaneous abortion, legally induced abortion, illegally induced abortion, unspecified abortion, failed attempted abortion, and complications following abortion and ectopic and molar pregnancies are included in this classification[1].

Hydatidiform mole and other abnormal product of conception are benign or malignant tumours in the uterus resulting from causes such as stress and diet[81]. Ectopic pregnancies can occur as a result of abnormal tubes due to infectious damage, developmental defects, or tubal surgery, intrauterine contraceptive device, transmigration of an ovum, delayed ovulation and/or tubal transport, ovum regurgitation and chromosomally abnormal blastocysts[81]. The conditions of missed abortion, legally or illegally induced abortion, and failed attempted abortion are all a consequence of successful or unsuccessful attempts at terminating pregnancy.

Spontaneous Abortion (634)

Spontaneous abortions can result from chromosomal anomalies of the foetus, uterine factors such as congenital anomalies, cervical impotence, adhesions, and fibroids, endocrine factors such as luteal phase deficiency, as well as endometriosis, immunologic factors, cigarette smoking, and advanced maternal age[25,82]. In addition, spontaneous abortions from exposure to lead, methylmercury, and organochlorine compounds such as vinyl chloride, chloroprene, and dibromochloropropane[25,82 21], spontaneous abortions as a result of accidental and occupational exposures to high levels of chemical contaminants[86,87] and increased incidence of spontaneous abortions in pregnant women following exposure to PCBs [83], dioxins[84], and DDT[85] have been reported.

Complications Mainly Related to Pregnancy (640-648)

This classification of complications includes haemorrhage in early pregnancy, antepartum haemorrhage, abrupt placentae and placenta praevia, hypertension complicating pregnancy, childbirth and the puerperium, excessive vomiting in pregnancy, early or threatened labour, prolonged pregnancy, other complications of pregnancy not elsewhere classified, infective and parasitic conditions in the mother, and other current conditions in the mother complicating pregnancy, childbirth and the puerperium[1]. Some of he complications can have associated genetic factors, can result from drug abuse, or can be caused by conditions such as hypertension, diabetes mellitus, cardiovascular disease, thyroid disease, diseases and disorders of other glands, renal diseases, genetic factors, gastrointestinal factors, liver diseases, infections, sexually transmitted diseases, and pulmonary diseases[82]. Complications of pregnancy may result from carbon monoxide poisoning. Poisoning results in foetal hypoxia which may cause foetal distress or maternal central nervous system symptoms[82].

Hypertension Complicating Pregnancy, Childbirth and the Puerperium (642)

Hypertension during pregnancy can be gestational hypertension, pre-eclampsia chronic hypertension or hypertension resulting from renal disease. Increased blood pressure can be a consequence of the toxic effect of lead on cardiovascular function[62].

Early or Threatened Labour (644)

Early or threatened labour can be a consequence of genitourinary *malformations, infections, an unaccountable increase in prostaglandin* , multifetal gestation, hydramnios, and retroplacental bleeding[82]. Gestation may be affected by PCBs[2] and accidental or occupational exposure to high levels of chemical contaminants[86,87]. The maternal DDT body burden may be associated with premature delivery[85] and studies have shown a significant association between prenatal lead exposure and premature birth[88,89].

Category XII Diseases of the Skin and Subcutaneous Tissue (680-686, 690-698, 700-709)

Dermatological conditions such as chloracne, hyperpigmentation, hyperkeratosis, and conjunctivitis may result from exposure to high levels of PCBs, dioxins, and furans[2].

Infections of Skin and Subcutaneous Tissue (680-686)

This category includes carbuncle and furuncle, cellulitis and abscess of finger and toe, other cellulitis and abscess, acute lymphadenitis, impetigo, pilonidal cyst, and other local infections of skin and subcutaneous tissue[1].

Although the cause of some of the infections is not known, carbuncle and furuncle can result from friction, obesity, carrying staphlococcal organisms, or bactericidal defects[90], cellulitis, abscess, and impetigo infections are due to infectious agents such as *Steptococcus pyogenes*, *Staphylococcus aureus, Haemophilus influenzae, Escherichia coli,* and Enterobacter[90] and acute lymphadenitis results from cat scratches, bites and licks[90].

Some of the infectious organisms, which could enter the body via a break in the skin, nasal fissures, the middle ear or the nasal mucosa[90], have been isolated from Great Lakes basin surface waters[5].

Other Inflammatory Conditions of Skin and Subcutaneous Tissue (690-698)

These conditions include erythematosquamous dermatosis, atopic dermatitis and related conditions, contact dermatitis and other eczema, dermatitis due to ingested substances, bullous dermatoses, erythematous conditions, psoriasis and similar disorders lichen, and pruritus and related conditions[1].

Erythematosquamous dermatos can result from infection with organisms such as *Erysipelothrix rhusiopathiae*, which are transmitted by handling dead animal matter, and

Neisseria gonorrhoeae, which are sexually transmitted [90]. Various causes have been attributed to Atopic dermatitis and related conditions. For example the condition can be caused by diabetes, heat, obesity, occupation where hands are immersed in water, hyperidrosis, maceration, immunologic defects, polyendocrinopathies, pregnancy, oral contraceptives, systemic antibacterial agents, corticosteroids, chronic debilitation, chemotherapy, frequent bathing in hot, soapy baths or showers, parental herpes labialis, allergic rhinitis, hay fever and asthma[90]. Notably, some of these factors can be aggravated by air pollution. Contact dermatitis and other eczema, as well as dermatitis due to ingested substances, can result from toxic or allergic reactions to numerous agents such as detergents, oils and greases, solvents, drugs, chemical products such as acids, adhesive plaster, alkalis, caustics, dichromat, insecticides, nylon, plastic, rubber, certain foods, plants, solar radiation, cosmetics, cold weather, hot weather, dyes, furs, infrared rays, jewelry, metals, preservatives, and x-rays[1,90]. Bullous dermatoses, erythematous conditions, psoriasis and similar disorders lichen, and pruritus and related conditions can be hereditary, as well as caused by drugs, autoimmune disorders, mycoplasma infections, sarcoidosis, ulcerative colitis, and emotional stress[90]. Chloracne, hyperpigmentation, hyperkeratosis, and conjunctivitis may be a consequence of exposure to high levels of PCBs, dioxins, and furans[2].

Other Diseases of Skin and Subcutaneous Tissue (700-709)

Conditions such as corns and callosities, other hypertrophic and atrophic conditions of skin, other dermatoses, diseases of nail, diseases of hair and hair follicles, disorders of sweat glands, diseases of sebaceous glands, chronic ulcer of skin, urticaria, and other disorders of skin and subcutaneous tissue are included in this classification[1].

These diseases can be caused by a variety of factors such as repeated injury, heredity, endocrine disorders, obesity, drugs, malignancy, underlying systemic disease, autoimmune disease, emotional problems, pregnancy, discontinued or a change in oral contraceptive use, surgery, trauma, a significant weight loss over a short period of time, secondary bacterial infections, herpes simplex virus, cold, sweat, pressure, as well as chemicals[90]. Chloracne, hyperpigmentation, hyperkeratosis, and conjunctivitis may be a consequence of exposure to high levels of PCBs, dioxins, and furans[2].

Category XII Diseases of the Musculoskeletal System and Connective Tissue

Cadmium is suspected of playing a role in skeletal disease[5]. In some areas, kidney damage which sometimes progressed to skeletal disease, has been observed in populations following environmental exposure to cadmium[73].

Arthropathies and Related Disorders (710-719)

This classification includes diffuse diseases of connective tissue, arthropathy associated with infections, crystal arthropathies, arthropathy associated with other disorders classified elsewhere, rheumatoid arthritis and other inflammatory polyarthropathies, osteoarthrosis and allied disorders, other and unspecified arthropathies, internal derangement of knee, other derangement of joint, and other and unspecified disorder of joint[1].

Diffuse diseases of connective tissue may be caused by viral infections such as myxovirus, tumour virus, reovirus, Coxsackie virus, echovirus, and enterovirus, autoimmune disorders, inflammatory disorders, other diseases, protozoal and metazoal infestations, chemotherapy and chemical agents such as vinyl chloride[91]. In addition, there may be an hereditary predisposition factor to an unidentified virus or to the action of sensitizing drugs or chemicals operative in the disease. Arthropathies may be caused by paratyphoid fever, typhoid fever, helminthiases and infections due to coliforms such as *Escherichia coli*, as well as *Haemophilus influenzae, Pneumococci, Pseudomonas, Staphylococci,* and *Steptococci* infections[91]. Arthropathies can also result from endocrine and metabolic disorders, gastrointestinal conditions, haematological disorders, dermatological disorders, respiratory disorders, neurological disorders, and hypersensitivity reaction[1]. Several hypotheses exist regarding the etiology of rheumatoid arthritis and numerous determinants such as sex, nulliparity, and heredity, as well as causative agents such as Epstein-Barr virus, parvovirus, lentevirus, and retrovirus, have been proposed [92] Osteoarthrosis can result from numerous predisposing factors. Malformations, diabetes mellitus, hypothyroidism, metabolic disorders, coal mining, ballet dancing, sports such as football, water skiing, jogging, and parachuting, injuries, bone necrosis, surgical procedures, blood diseases, inflammatory diseases and drug use or abuse have been implicated in the disease[91].

Dorsopathies (720-724)

Included in Dorsopathies are ankylosing spondylitis and other inflammatory spondylopathies, spondylosis and allied disorders, intervertebral disc disorders, other disorders of cervical region, and other and unspecified disorders of the back[1].

Although the exact cause of ankylosing spondylitis is not known, the disease may be hereditary or may result from a high faecal carriage of *Klebsiella pneumoniae* during inflammatory bowel disease[93]. Genetic predisposition and inflammatory bowel disease, as well as psoriasis, may also be related to other spondylopathies[93]. Intervertebral disc disorders are associated with aging, physical stress, injuries and heredity[93] whereas congenital anomalies, developmental anomalies, degenerative disease, sequelae of fractures, infections, and systemic bone disease may all cause disorders of the cervical region[93]. Back problems may arise from causes such as congenital anomalies, infections caused by *M. tuberculosis, Brucella, Staphylococcus, Streptococcus, Escherichia coli,* and *Pseudomonas*, neoplasia, inflammatory conditions, degenerative conditions, metabolic disorders, fractures, aortic aneurysms, digestive system diseases, genitourinary disorders, and psychological problems[93].

Rheumatism, Excluding the Back (725-729)

This classification includes polymyalgia rheumatica, peripheral enthesopathies and allied syndromes, other disorders of synovium, tendon, and bursa, disorders of muscle, ligament and fascia, and other disorders of soft tissue[1].

Polymyalgia rheumatica may be a genetic disorder, related to ageing, and possibly associated with the immune system[92]. Peripheral enthesopathies can result from capsulitis, tendinitis, periathritis, epicondylitis, and bursitis[92] whereas capsulitis can be due to tendinitis, arthritis, neoplasms, and postmyocardial infarction[92]. Tendinitis results from wear and tear[92], periarthritis is an inflammation of the joint[4], epicondylitis results from injuries due to direct trauma or repetitive activities[92], and bursitis can occur as a result of a direct blow to the joint,

or from prolonged or repeated activity[92]. Finally, disorders of muscle, ligament and fascia can be hereditary or can be caused by injuries, repetitive activities, viral infections such as influenza, bacterial infections, and surgery[92,94].

Osteopathies, Chondropathies and Acquires Musculoskeletal Deformities (730-739)

This classification includes osteomyelitis, periostitis and other infections involving bone, osteitis deformans and osteopathies associated with other disorders classified elsewhere, osteochondropathies, other disorders of bone and cartilage, flat foot, acquired deformities of the toe, other acquired deformities of the limbs, curvature of the spine, other acquired deformities, and nonallopathic lesions not elsewhere classified[1].

Category XV Certain Conditions Originating in the Perinatal Period (760-779)

This category applies to the foetus or newborn and includes conditions such as slow foetal growth and foetal malnutrition, disorders relating to short gestation and unspecified low birth weight, disorders relating to long gestation and high birth weight, birth trauma, intrauterine hypoxia and birth asphyxia, respiratory distress syndrome, other respiratory conditions of the foetus and newborn, infections specific to the perinatal period, foetal and neonatal haemorrhage, haemolytic disease of the foetus or newborn due to isoimmunization, other perinatal jaundice, endocrine and metabolic disturbances specific to the digestive system, conditions involving the integument and temperature regulation of the foetus and newborn, and other and ill-defined conditions originating in the perinatal period[1].

Some of the conditions can be caused by the placenta, cord and membranes, other complications of labour and delivery , maternal complications of the pregnancy and maternal conditions which may be unrelated to the current pregnancy such as inadequate maternal nutrition, cigarette smoking, and alcohol and drug abuse[81]. Birth weight can be affected by PCBs[2,83], blood methylmercury[95], and exposure to high levels of other chemical contaminants[86,87]

Cancer

Many environmental pollutants have been identified as potential carcinogens, probable carcingens and carcinogens. Some are found in drinking water, others bioaccumulate in fish and waterfowl, and others are present in the air. Although it is estimated that only about 5% of cancers are due to environmental factors[96] and geophysical properties appear to play a greater role than manmade pollutants[96], some studies do reveal an increasing frequency of cancer in polluted areas[97]. Much of the data relating environmental pollutants to cancer come from occupational studies.

Malignant Neoplasm of Lip, Oral Cavity and Pharynx (140-149)

Malignant Neoplasm of the Pharynx (146-148)

Cancer of the pharynx has been associated with tobacco consumption, marijuana, alcohol, diet, occupational factors, virus infections, genetic instability and aryl hydrocarbon hydroxylase[98]. In addition, air pollution may be a factor in this cancer.

Malignant Neoplasm of Digestive Organs and Peritoneum (150-159)

Malignant Neoplasm of Oesophagus (150)

Oesophageal cancer may be caused by alcohol and tobacco consumption, diets deficient in vitamins and other required nutrients, consumption of milled foods containing silica fragments, preserved foods with a high nitrosamine content, a low socioeconomic status, sex, race, drinking whiskey, and heavy industrial exposure to harmful agents[99].

Malignant Neoplasm of Stomach (151)

Stomach cancer appears to be linked to the low consumption of fresh vegetables and fruits, the high intakes of salts and nitrates, the high intakes of grains and relatively low intakes of animal fats and protein, the high consumption of rice and pickled vegetables, N-nitroso compounds, and nitrites used to preserve meat products. Genetic factors for example factors found in group A blood type, certain surgical interventions such as gastric resection for peptic ulceration, and pernicious anaemia due to atrophic gastritis and achlorhydria may also be involved in this disease. In addition, occupational exposure to certain substances may lead to a higher incidence of stomach cancer as seen in coal miners, people involved in nickel refining and rubber and timber processing, and asbestos workers[99]. Social class and standard of living may also be linked to this cancer.

Malignant Neoplasm of Colon and Rectum (153-154)

Economic and social risk factors are implicated in colorectal cancer since the highest incidence of this cancer are found, with the exception of Japan, in the most industrialized countries. Genetic and anatomical factors have been shown to play a role and being male, subsiding on a western diet, consuming alcohol and tobacco, migrating to high risk countries, possessing a higher income and education, and consuming highly refined foods, sugar and caffeine along with nulliparity and previous diseases of the bowel have all been shown to increase colorectal cancer risk[99]. Some studies have found that exposure to radiation can result in a significantly higher risk of colon and rectal cancer[100] and that long-term consumption of chlorinated surface water[101] can increase the risk of colon cancer.

Malignant Neoplasm of the Liver and Intrahepatic Bile Ducts (155)

Infection, specifically with the Hepatitis B virus and the Hepatitis C virus, has been identified as the most important etiologic factor in liver cancer. Other factors such as diseases, for example cirrhosis, haemochromatosis and diabetes, and the ingestion of oestrogen, oral contraceptives and androgens, have been associated with the cancer. One study found an association between liver cancer and cigarette smoking. Chemical carcinogens such as aflatoxins may be involved in the disease and laboratory studies have found

that liver cancer increases following exposure to pesticides, herbicides, pyrralizidine alkaloids, and industrial chemicals, specifically cycasin and nitrosamines[99].

Malignant Neoplasm of the Gallbladder and Extrahepatic Bile Ducts (156)

Diseases such as cholelithiasis, inflammatory bowel disease, and chronic cholecystitis, have been associated with gallbladder cancer[99] . Genetic factors, the typhoid-carrier state, and chemical carcinogens may also be related to the cancer [99].

Malignant Neoplasm of the Pancreas (157)

Cigarette smoking is the most clearly implicated etiologic factor in pancreatic cancer[99] and carcinogens such as n-nitroso and related compounds, found in cigarette smoke, as well as in meat products, may be the causative agents[99]. Some studies have shown significantly higher incidence of pancreatic cancer following exposure to radiation from nuclear fall-out[100] or as a result of therapy for ankylosing spondylitis[99]. Occupational exposure to solvents, petroleum compounds and β-naphthylamine has been associated with pancreatic cancer in chemical and coke plant workers, sawmill workers, miners and metal workers [99].

Malignant Neoplasm of Respiratory and Intrathoracic Organs (160-165)

Malignant neoplasm of the Trachea, Bronchus and Lung (162)

Exposure to main-stream tobacco smoke, indoor air pollution caused by secondary-stream tobacco smoke, radon, asbestos, formaldehyde and end-products of uncontrolled combustion, and atmospheric air pollution, as well as exposure to a variety of substances found in occupational settings has been shown to result in lung cancer[102]. In addition, some studies have found a significantly higher incidence of lung cancer following exposure to radiation[100].

Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast (170-175)

Malignant Melanoma of Skin (172)

Skin cancer has been associated with factors such as solar radiation, ionizing radiation, arsenicals used in industrial and agricultural applications, chronic exposure to tar, pitch coal, soot, and mineral oil products, heredity, infection with human papilloma virus and scars[100,105].

Malignant Neoplasm of Female Breast (174)

There are numerous possible etiological factors in breast cancer. There may be a genetic predisposition to the cancer and family tendencies; the cancer could be caused by viruses and a disturbed hormone metabolism such as excessive oestrogen production, subnormal androgen production and prolactin abnormalities. Oral contraceptives, hormone replacement therapy

for menopause, diet, obesity, trauma, alcohol consumption, exposure to low frequency radiation and electromagnetic fields as well as environmental toxins may be involved. High incidences of breast cancer have been associated with exposure to radiation[100].

Malignant Neoplasm of Genitourinary Organs (179-189)

Malignant Neoplasm of Ovary and Other Uterine Adnexa (183)

Ovary cancer can be hereditary and has been associated with genetic diseases, obesity, nulliparity, low parity, older age at first pregnancy, relative infertility and a history of endometrial, breast or colon cancer [106]. The effects of contaminants with oestrogenic properties on the development and function of reproductive organs are currently being studied.

Malignant Neoplasm of the Prostate (185)

Although no risk factors for prostate cancer have been confirmed, both genetic and environmental factors are currently being studied[107].

Malignant Neoplasm of Testis (186)

Although the risk factors associated with cancer of the testis are not well known, the cancer has been associated with undescended testis, persistent cryptorchidism, postpubertal orchiopexy subfertile men, and atrophic testis[108]. The effects of environmental contaminants, specifically those with oestrogenic properties, on the development and function of reproductive organs are currently being studied.

Malignant Neoplasm of the Bladder (188)

Bladder cancer has been associated with occupational exposure to certain chemicals, some habits, diet, chronic bladder infections, and smoking. In addition, long-tern consumption of chlorinated surface water has been associated with an increased risk of bladder cancer[101].

Malignant Neoplasm of Kidney, and Other and Unspecified Urinary Organs (189)

The risk factors for kidney cancer are as yet unknown. However, kidney cancer may be associated with tobacco use, obesity, and a diet rich in animal fats and cholesterol[108]. Although lead has been associated with renal adenocarcinoma, it is not clear whether lead itself is a carcinogen or whether its association with the cancer is a consequence of cystic nephropathy[62].

Malignant Neoplasm of Other and Unspecified Sites (190-199)

Malignant Neoplasm of Thyroid Gland (193)

Controversy exists as to whether thyroid cancer is associated with goitre or Hashimoto's thyroiditis[109] .The only environmental factor which has been

related to this cancer is ionizing radiation from nuclear fall-out or from therapy[100,109].

Malignant Neoplasm of Lymphatic and Haematopoietic Tissue (200-208)

Non-Hodgkin's Lymphoma (200, 202)

Although the risk factors for Non-Hodgkin's Lymphoma are largely unknown, some factors such as history of certain diseases, immunoregulatory deficiencies, therapeutic immunosuppression or immunosuppression due to HIV, and the Epstein-Barr virus among the immunodeficient, seem to increase the risk for this disease. In addition, risk of the lymphoma has been shown to increase after exposure to pesticides, electromagnetic fields, benzene and radiation[35].

Hodgkin's Disease (201)

This cancer may be hereditary, or it may be associated with procedures such as tonsillectomy and appendectomy and diseases such as infectious mononucleosis[108]. Risk is also increased after exposure to pesticides, electromagnetic fields, benzene and radiation[35].

Leukaemia (204-208)

Leukaemia can be hereditary or caused by viruses, radiation, chemical and other occupational exposures, and drugs[108]. Some studies show significantly higher incidence of leukaemia following exposure to radiation[35,100], pesticides, electromagnetic fields and benzene[35].

Category XVI Congenital Anomalies

Congenital anomalies can result from advanced maternal age[82], mutant genes, chromosome abnormalities, infectious diseases, therapeutic drugs, radiation and environmental contaminants[110] and accidental and occupational exposure to high levels of chemical contaminants [86,87] Teratogens can produce congenitally malformed variants as well as spontaneous abortions[5]; certain chemicals are embryopathic and are suspected of affecting human prenatal development[5]; heavy metals and organochlorine compounds can result in foetal malformations[21].

The congenital anomalies being considered and their respective ICD-9 codes are listed in Part A, Section 2.2 of the report.

Birth Weight

Birth weights may be affected by PCBs[2,83] and by methylmercury blood-levels[95]. The risk of low birth weight increases with advanced maternal age, caffeine intake, maternal asthma and iron-deficiency anaemia, maternal work conditions (standing), alcohol and drug abuse, and cigarette smoking[81,82]. In addition, low birth weights have been associated with accidental and occupational exposure to high levels of chemical contaminants[86,87].

Infant Mortality

Infant mortality rates increase with conditions such as low birth weight, breech delivery, prolonged pregnancy, pre-term births, infections, and congenital anomalies[112]. Increased concentrations of exotoxins in air and soil result in increased infant mortality rates[97].

Because of the small number of cases, only All Causes were considered for infant mortality.

References:

1 International Classification of Diseases. 1992. Ninth Revision, Fourth Edition, Clinical Modification, Volumes 1 and 2, Practice Management Information Corporation, Los Angeles, CA. 834 pp.

2 Health Canada. 1997. State of Knowledge Report on Environmental Contaminants and Human Health in the Great Lakes Basin. Great Lakes Health Effects Program, Health Canada, Ottawa. ISBN 0-662-26-169-0.

3 Dorland's Illustrated Medical Dictionary. 1994. Twenty eighth Edition, WB Saunders Company, Philadelphia, PA. 1940 pp.

4 Stedman's Medical Dictionary. 1995. Twenty sixth Edition, Williams & Wilkins, Baltimore, MD. 2030 pp.

5 Handbook of Environmental Health and Safety: Principles and Practices. 1991. Volumes 1 and 2, Second Edition, Lewis Publishers, Chelsea, MI.

6 Hoeprich PD, Jordan MC and Ronald, A.R. 1994. Infectious Diseases: A Treatise of Infectious Processes. Fifth Edition, JB Lippincott Company, Philadelphia, PA. 1532 pp.

7 Xu B-L, Tudose G and Seyfried PL. 1994. Microbial Water Quality and Associated Health Risks in the Great Lakes Basin. Department of Microbiology, University of Toronto, Toronto, Ontario.

8 Stancek D, Kosecka G, Oltman M et al. 1995. Links between prolonged exposure to xenobiotics, increased incidence of hepatopathies, immunological disturbances and exacerbation of latent Epstein-Barr virus infections. International Journal of Immunopharmacology 17(4): 321-328.

9 Hilgers A and Frank J. 1994. [Chronic fatigue syndrome: immune dysfunction, role of pathogens and toxic agents and neurological and cardial changes]. Wiener Medizinische Wochenschrift 144(16): 399-406.

10 Cameron SO, Carrington D and Patterson W. 1993. Concern about immunity to poliomyelitis following an outbreak of hepatitis A in Glasgow. Journal of Infection 26(1): 71-4.

11 Lévesque B, Dewailly E and Boulianne N. 1990. Étude descriptive de la dermatite cercarienne au Québec. Canadian Journal of Public Health 81: 329-330.

12 Riedel, D. 1996. Bioregional Health Effects Programs Division, Environmenral Health Directorate, Health Canada. Personal communication in May 1996.

13 Apostoli P and Alessio L. 1992. [Lead in the 90's: "New" rules for the "oldest" of environmental toxins]. Medicina del Lavoro 83(6): 539-56.

14 Bernier J, Brousseau P, Krzystyniak K et al. 1995. Great Lakes Health Effects: Immunotoxicity of Heavy Metals. Montreal, Quebec: TOXEN, Université du Québec à Montréal. Prepared under contract for the Great Lakes Health Effects Program, Environmental Health Directorate, Health Canada, Ottawa.

15 Smith BJ. 1984. PCB Levels in Human Fluids: Sheboygan Case Study. Sea Grant Institute, University of Wisconsin, Madison, Wisconsin. Technical Report WIS-SG-83-240.

16 Humphrey HEB. 1983. Evaluation of Humans Exposed to Water-Borne Chemicals in the Great Lakes. Department of Public Health, Center for Environmental Health Sciences, Lansing, Michigan. Final Report to the Environmental Protection Agency under Cooperative Agreement CR-807192.

17 Kerkvliet Nl. 1995. Immunilogical Effects of Chlorinated Dibenzo-p-dioxins. Department of Agricultural Chemistry, Oregon State University, Corvallis, Oregon. Prepared under contract for the Great Lakes Health Effects Programs, Environmental Health Directorate, Health Canada, Ottawa.

18 Exon JH. 1984. The immunotoxicity of selected environmental chemicals, pesticides and heavy metals. In: Chemical Regulation in Veterinary Medicine, Alan Liss Inc., New York, NY. pp 355-368.

19 Colborn T, von Saal FS and Soto AM. 1993. Developmental effects of endocrine-disrupting chemicals in wildlife and humans. Environmental Health Perspectives 101(5): 378-384.

20 Becker KL (Ed). 1995. Principals and Practice of Endocrinology and Metabolism, Second Edition, J.B. Lippincott Company, Philadelphia, PA. 2161 pp.

21 Gerhard I and Runnebaum B. 1992. [The limits of hormone substitution in pollutant exposure and fertility disorders]. Zentralblatt fur Gynakologie 114(12): 593-602.

22 Birnbaum LS. 1994. Endocrine effects of prenatal exposure to PCBs, dioxins, and other xenobiotics: Implications for policy and future research. Environmental Health Perspectives 102(8): 676-679.

23 Cole, D. 1996. Department of Clinical Epidemiology and Biostatistics, MacMaster University. Personal communication in June 1996.

24 Wilson ID and Foster DW (Eds.). 1992. Williams Textbook of Endocrinology, Eighth Edition, W.B. Saunders Company, Philadelphia, PA. 1712 pp.

25 Copeland LJ. 1993. Textbook of Gynecology. W.B. Saunders Company, Philadelphia, PA. 1251 pp.

26 Siracusa G, Bastone A, Sbraccia M et al. 1992. Effects of 2,5-hexanedione on the ovary and fertility: An experimental study in mice. Toxicology 75: 39-50.

27 Miller MM, Plowchalk DR, Weitzman GA et al. 1992. The effect of benzo(a)pyrene on murine ovarian and corpora lutea volumes. Am J Osbtet Gynecol 166: 1535-1541.

28 Weitzman GA, Miller MM, London SN et al. 1992. Morphometric assessment of the murine ovarian toxicity of dimethylbenz(a)anthracene (DMBA). Reprod Toxicol 6: 137-141.

29 Jarrell JF, McMahon A, Villeneuve D et al. 1993. Ovarian germ cell destruction in the monkey with hexachlorobenzene in the absence of induced porphyria. Reprod Toxicol 7: 41-47.

30 Foster WG. 1992. Reproductive toxicity of chronic lead exposure in the female cynomolgus monkey. Reprod Toxicol 6: 123-131.

31 De Groot LJ. 1989. Endocrinology. Second Edition, Volumes 1 to 3, WB Saunders Company, Philadelphia, PA. 2776 pp.

32 Tomatis L. 1995. How much of the human disease burden is attributable to environmental chemicals? Toxicology Letters 77(1-3): 1-8.

33 Skakkebaek NE and Keiding N. 1994. Changes in semen and the testis. BMJ 309(6965): 1316-1317.

34 Singh A, Cullen C, Dykeman A et al. 1993. Ultrastructural changes in the testis of the chronically lead-exposed male cynomolgus monkey *(Macaca fascicularis)*. J Submicrosc Cytol Pathol 25(4): 479- 486.

35 Lisiewicz J. 1993. Immunotoxic and hematotoxic effects of occupational exposures. Folia Medica Cracoviensia 34(1-4): 29-47.

36 Luster MI and Rosenthal GJ. 1993. Chemical agents and the immune response. Environmental Health Perspectives 100: 219-226.

37 Yoshida S and Gershwin ME. 1993. Autoimmunity and selected environmental factors of disease induction. Seminars in Arthritis and Rheumatism 22(6): 399-419.

38 Beutler E, Lichtman MA, Coller BS et al. 1995. Williams Hematology. Fifth Edition, McGraw-Hill Inc., New York, NY. 1668 pp.

39 Rosenberg RN (Ed.). 1991. Comprehensive Neurology. Raven Press, New York, NY. 920 pp.

40 Oyama Y. 1992. Modification of voltage-dependent Na+ current by triphenyltin, an environmental pollutant, in isolated mammalian brain neurons. Brain Research 583(1-2): 93-99.

41 Ecobichon DJ, Davies JE, Doull J et al. 1990. Neurotoxic effects of pesticides. In: Adv Mod Environ Tosicol - Eff Pestic Jum Health 18: 131-199.

42 Spencer PS, Ludolph AC and Kisby GE. 1992. Are human neurodegenerative disorders linked to environmental chemicals with excitotoxic properties? Annals of the New York Academy of Sciences 648: 154-160.

43 Marsden CD. 1992. Parkinson's disease. Postgraduate Medical Journal 68(801): 538-543.

44 Goldsmith JR, Herishanu Y, Abarbanel JM et al. 1990. Clustering of Parkinson's Disease points to environmental etiology. Archives of Environmental Health 45(2): 88-94.

45 Verity MA. 1993. Environmental neurotoxicity of chemicals and radiation. Current Opinion in Neurology & Neurosurgery 6(3): 437-442.

46 Woods JS, Bowers MA and Davis HA. 1991. Urinary porphyrin profiles as biomarkers of trace metal exposure and toxicity: Studies on urinary porpyrin excretion patterns in rats during prolonged exposure to methyl mercury. Toxicol Appl Pharm 110(3): 464-476.

47 Marsh DO, Myers GJ, Clarkson TW et al. 1987. Fetal methylmercury poisoning: New data on clinical and toxicological aspects. Trans Am Neurol Assoc 102: 69-71.

48 Choi BH. 1989. The effects of methylmercury on the developing brain. Progr Neurobiol 32(6): 447-470.

49 WHO (World Health Organization). 1990. International Program for Chemical Safety Environmental Health Criteria 101: Methylmercury. WHO, Geneva.

50 WHO (World Health Organization). 1989. International Program for Chemical Safety Environmental Health Criteria 86: Methylmercury - Environmental Aspects. WHO, Geneva.

51 Swash M and Schwartz MS. 1988. Neuromuscular Diseases: A Practical Approach to Diagnosis and Management. Second Edition, Springer-Verlag, London. 456 pp.

52 Grossman LI. 1995. Mitochondrial mutations and human disease. Environmental and Molecular Mutagenesis 25 (Suppl 26): 30-37.

53 Baum GL and Wolinsky E. 1994. Textbook of Pulmonary Diseases. Fifth Edition, Volumes 1 and 2, Little, Brown and Company, Boston, MA. 1875 pp.

54 Newell FW. 1992. Phthalmology: principles and concepts, Seventh Edition, Mosby Year Book, St. Louis, MO. 587 pp.

55 Harada M. 1995. Minamata disease: methylmercury poisoning in Japan caused by environmental pollution. Critical Reviews in Toxicology 25(1): 1-24.

56 Landrigan PJ, Graham DG and Thomas RD. 1993. Strategies for the prevention of environmental neurotoxic illness. Environmental Research 61(1): 157-163.

57 Marsh DO, Myers GJ, Clarkson TW et al. 1980. Fetal methylmercury poisoning: clinical and toxicological data on 29 cases. Ann Neurol 7(4): 348-353.

58 Ballenger JJ. 1991. Diseases of the Nose, Throat, Ear, Head, and Neck. Fourteenth Edition, Lea & Febiger, Philadelphia, PA. 1376 pp.

59 Koren G, Chang N, Gonen R et al. 1990. Lead exposure among mothers and their newborns in Toronto. Can Med Assoc J 142: 1241-1244.

60 Maschewsky W. 1993. [Do workplace chemicals harm the heart?]. Sozial- und Praventivmedizin 38(2): 71-76.

61 Laragh JH and Brenner BM. 1995. Hypertension: Pathophysiology, Diagnosis, and Management. Volumes 1 and 2, Second Edition, Raven Press, New York, NY. 3219 pp.

62 Goyer RA, Epstein S, Bhattacharyya M et al. 1994. Environmental risk factors for osteoporosis. Environmental Health Perspectives 102(4): 390-394.

63 Luoma PV, Nayha S, Pyy L et al. 1995. Association of blood cadmium to the area of residence and hypertensive disease in Arctic Finland. Science of the Total Environment 160-161: 571-575.

64 Hurst JW, Schlant RC, Rackky CE et al. 1990. The Heart, Arteries and Veins. Seventh Edition, McGraw-Hill Information Services Company, New York, NY. 2274 pp.

65 Holt GR. 1992. Toxicology of upper aerodigestive tract pollutants. Otolaryngology - Head & Neck Surgery 106(6): 655-659.

66 Calderon-Garciduenas L, Osorno-Velazquez A, Bravo-Alvarez H et al. 1992. Histopathologic changes of the nasal mucosa in southwest Metropolitan Mexico City inhabitants. American Journal of Pathology 140(1): 225-232.

67 Bouchier IAD, Allan RN, Hodgson HJF et al. 1993. Gastroenterology: Clinical Science and Practice. Volumes 1 and 2, Second Edition, W.B. Saunders Company Ltd., London. 1845 pp.

68 Moses M, Lilis R, Crow KD et al. 1984. Health status of workers with past exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin in the manufacture of 2,4,5-trichlorophenoxyacetic acid: Comparison of findings with and without chloracne. Am J Indust Med 5: 161-182.

69 Sleisenger MH and Fordtran JS. 1993. Gastrointestinal Disease: Pathophysiology, Diagnosis, Management. Fifth Edition, Volumes 1 and 2, W.B. Saunders Company, Philadelphia, PA. 2136 pp.

70 Yamada T. 1995. Textbook of Gastroenterology. Second Edition, J.P. Lippincott Company, Philadelphia, PA. 3065 pp.

71 Kaplowitz N. 1992. Liver and Biliary Diseases. Williams & Wilkins, Baltimore, MD. 732 pp.

72 Tanagho EA and McAninch JW. 1995. Smith's General Urology. Fourteenth Edition, Appleton & Lange, Norwalk, CT. 823 pp.

73 Elinder CG. 1992. Cadmium as an environmental hazard. IARC Scientific Publications 118: 123-132.

74 Cikrt M, Tichy M, Blaha K et al. 1992. The study of exposure to cadmium in the general population. II. Morbidity studies. Polish Journal of Occupational Medicine and Environmental Health 5(4): 345-356.

75 Herber RF. 1992. The World Health Organization study on health effects of exposure to cadmium: morbidity studies. IARC Scientific Publications (118): 347-358.

76 Lamb EJ and Bennett S. 1994. Epidemiologic studies of male factors in infertility. Annals of the New York Academy of Sciences 709: 165-178.

77 Whorton D, Krauss RM, Marshall S et al. 1977. Infertility in male pesticide workers. Lancet 197:1259-1261.

78 Jockenh`vel F, Bals-Pratsch M, Bertram HP et al. 1990. Seminal lead and copper in fertile and infertile men. Androl 22(6): 503-511.

79 Rier SE, Martin DC, Bowman RE et al. 1993. Endometriosis in rhesus monkeys. Fund Appl Toxicol 21: 433-441.

80 Tabacova S, Little RE, Balabaeva L et al. 1994. Complications of pregnancy in relation to maternal lipid peroxides,glutathione, and exposure to metals. Reproductive Toxicology 8(3): 217-224.

81 Creasy RK and Resnik R. 1994. Maternal-Fetal Medicine: Principles and Practice. W.B. Saunders Company, Philadelphia, PA. 1237 pp.

82 Burrow GN and Ferris TF. 1995. Medical Complications During Pregnancy. Fourth Edition, W.B. Saunders Company, Philadelphia, PA. 633 pp.

83 Lione A. 1988. Polychlorinated biphenyls and reproduction. Reprod Toxicol 2: 83-89.

84 Silbergeld EK and Mattison DR. 1987. Experimental and clinical studies on the reproductive toxicology of 2,3,7,8-tetrachlorodibenzo-p-dioxin. Am J Ind Med 11: 131-144.

85 Sharp DS, Eskenazi B, Harrison R et al. 1986. Delayed health hazards of pesticide exposure. Ann Rev Publ Health 7: 441-471.

86 Foster WG and Rousseaux CG. 1995. The Reproductive Toxicology of Great Lakes Contaminants. Environmental Health Directorate, Health Canada, Ottawa.

87 Jordan-Simpson D, Walsh P and Sherman G. 1995. Reproductive Outcomes - A Background Paper for State of the Lakes Ecosystem Conference. Laboratory Centre for Disease Control, Health Canada, Ottawa.

88 Baghurst PA, Robertson EF, McMichael AJ et al. 1987. The Port Pirie cohort study: Lead effects on pregnancy outcome and early childhood development. Neurotoxicol 8(3): 395-402.

89 Dietrich KN, Kraft KM, Bornschein RL et al. 1987. Low-level fetal lead exposure: Effects on neurobehavioural development in early infancy. Pediat 80: 721-730.

90 Fitzpatrick TB, Johnson RA, Polano MK et al. 1992. Color Atlas and Synopsis of Clinical Dermatology: Common and Serious Diseases. Second Edition, McGraw-Hill Inc., New York, NY. 824 pp.

91 Gardner DL. 1992. Pathological Basis of Connective Tissue Diseases. Lea & Febiger, Philadelphia, PA. 1050 pp.

92 Kelley WN, Harris ED, Ruddy S et al. 1993. Textbook of Rheumatology. Fourth Edition, Volumes 1 and 2, W.B. Saunders Company, Philadelphia, PA. 1942 pp.

93 Weinstein JN and Wiesel SW. 1990. The Lumbar Spine. W.B. Saunders Company. Philadelphia, PA. 1035 pp.

94 Kakulas BA and Adams RD. 1985. Diseases of Muscle: Pathological Foundations of Clinical Myology. Fourth Edition, Harper & Row Publishers, Philadelphia, PA. 853 pp.

95 Foldspang A and Hansen JC. 1990. Dietary intake of methylmercury as a correlate of gestational lenght and birth weight among newborns in Greenland. Am J Epidemiol 132(2): 310-317.

96 Inskip H. 1994. Cancer and the environment. Journal of the Royal Society of Health 114(3): 157-161.

97 Norska-Borowka I. 1994. Pediatric problems in upper Silesia-region of ecological disaster. Toxicology Letters 72(1-3): 219-225.

98 Biörklund A and Wennersberg J. 1994. Epidemiology of cancer of the oral cavity and oropharynx. In: Carcinoma of the Oral Cavity and Oropharynx, Pape H-D, Ganzer U, Schmitt G (Eds.), Springer-Verlag, Berlin. pp 1-8.

99 Ahlgren J and Macdonald J. 1992. Gastrointestinal Oncology. J.P. Lippincott Company, Philadelphia, PA. 659 pp.

100 Black RJ, Sharp L, Finlayson AR. et al. 1994. Cancer incidence in a population potentially exposed to radium-226 at Dalgety Bay, Scotland. British Journal of Cancer 69(1): 140-143.

101 Health Canada. 1995. Great Lakes Water and Your Health: A Summary of Great Lakes Basin Cancer Risk Assessment: A Case-Control Study of Cancers of the Bladder, Colon and Rectum. Great Lakes Health Effects Program, Health Canada, Ottawa.

102 Motta G and Grafica L.P. 1994. Lung Cancer: Frontiers in Science and Treatment. Genoa. 700 pp.

103 Spratt JS, Donnegan WL and Greenberg RA. 1988. Epidemiology and etiology. In: Cancer of the Breast, Donnegan WL, Spratt JS (Eds), Third Edition, W.B. Saunders Company, Philadelphia, PA. Pp 46-74.

104 Ministries of Health and Welfare, Social Affairs, Seniors and the Status of Women. 1992. Breast Cancer: Unanswered Questions. Report of the Standing on Health and Welfare, Social Affairs, Seniors and the Status of Women. House of Commons, Ottawa, June 1992.

105 Friedman RJ, Rigel DS and Kopf AW. 1991. Cancer of the Skin. W.B. Saunders Company, Philadelphia, PA. 620 pp.

106 Morrow CP and Townsend DE. 1987. Synopsis of Gynecologic Oncology. Third Edition, John Wiley & Sons, New York, NY. 584 pp.

107 Iversen P and Torp-Pedersen ST. 1993. Screening for carcinoma of the prostate: Epidemiological and methodological aspects. In: Malignancies of the Genitourinary Tract, R Ackermann and V Diehl (Eds), Springer-Verlag, Berlin. pp. 1-24.

108 Calabresi P and Schein PS. 1993. Medical Oncology. Second Edition, McGraw-Hill Inc., New York, NY. 1352 pp.

109 Volpé J and R. 1974. Etiology, epidemiology and hormonal aspects of thyroid carcinoma. In: Thyroid Cancer, JO Godden (Ed), Proceedings of the Eighteenth Clinical Conference of the Ontario Cancer Treatment and Research Foundation, Oct 4, 1974.

110 Wigglesworth JS and Singer DB. 1991. Textbook of Fetal and Perinatal Pathology. Volumes 1 and 2, Blackwell Scientific Publications, Oxford. 1308 pp.

111 Johnson K, Rouleau J and Stewart C. 1992. Atlas I. Birth Defects Atlas of Ontario: 1978-1988: Diseases of Infants and Poisonings Section. Bureau of Chronic Disease Epidemiology, Laboratory Centre for Disease Control, Health Canada, Ottawa.

112 Queenan JT. 1994. Management of High-Risk Pregnancy. Third Edition, Blackwell Scientific Publications, Boston, MA. 611 pp.

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Appendix B: Mathematical formulae and calculations

AGE-STANDARDIZED MORTALITY RATE (ASMR) [1]

$$ASMR = \sum w_i(d_i/n_i)$$

where:

$ASMR$	=	age-standardized mortality rate for a specified age category (as deaths per 100,000 population per year),
w_i	=	fraction of the standard population in the age interval falling within age group i (so that $\sum w_i = 1$),
d_i	=	number of deaths for the period under study in age group i,
n_i	=	person years at risk for the period under study in age group i,
d_i/n_i	=	age-specific mortality rate for age group i, *and*
i	=	one age group from the series defined by the age category,

with the summation being over all age groups within the specified age category.

And also where:

age category	=	one of the population age designations of all ages, 0 to 24 years, 25 to 44 years, 45 to 74 years or 75+ years,
age groups	=	population groupings by age, generally spanning 5 year intervals and ranging from <1 year to 85+ years ,
standard population	=	the Canadian population according to the 1991 census, and
period under study	=	1986 to 1992.

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[1] Age-standardized morbidity rates (ASmRs) and age-standardized incidence rates (ASIRs) were calculated in the same way. Standardized infant mortality rates were also calculated similarly. However, only one age group, infants < 1 year old, was considered.

Z-TEST COMPARING AGE-STANDARDIZED MORTALITY RATES (ASMRs) [2,3]

The hypotheses defining the difference (d) between the ASMR for the study-area population and that for the Ontario population, specifically : Ho: d = 0 *vs* H_A: d ≠ 0, were tested using the test statistic Z(d). The calculation was done using log-transformed ASMRs (done to correct for skewness and improve the normal approximation) and standard errors calculated for the transformed rates.

$$Z(d) = \frac{[\log(ASMR_a) - \log(ASMR_b)]}{\sqrt{\frac{\hat{var}(ASMR_a)}{ASMR_a^2} + \frac{\hat{var}(ASMR_b)}{ASMR_b^2}}} \sim N(0,1)$$

where:

$Z(d)$	=	Z-variable comparing the difference (d) between ASMRs for the study area and Ontario populations for a specified age category,
$ASMR_a$	=	Age-standardized mortality rate for the study-area population for the specified age category,
$ASMR_b$	=	Age-standardized mortality rate for the Ontario population for the specified age category,
$\hat{var}(ASMR_a)$	=	estimated variance of the ASMR for the study-area population,
$\hat{var}(ASMR_b)$	=	estimated variance of the ASMR for the Ontario population,

and where:

$$\hat{var}(ASMR) = \sum [(N_i^2 p_i)/n_i] \; / \; [\sum N_i]^2$$

and:

$\hat{var}(ASMR)$	≡	estimated variance of the ASMR for either population a, the study-area population or b, the Ontario population,
N_i	≡	person years for the period under study in age group i of the standard population,
n_i	=	person years at risk for the period under study in age group i of the specified population,
p_i	=	age-specific mortality rate for the specified age group i,
i	=	one age group from the series defined by the age category,

with summations being over all age groups within the specified age category. This approximation works well when the number of deaths in the study-area population for the specified age category is ≥ 4.

The p-value derived from this test is the probability that the actual difference in ASMRs between the study-area and Ontario populations is ≥calculated difference of Z(d).

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[2] Breslow, Day. Statistical Methods in Cancer Research, Volume II. IARC Scientific Publication No. 82, 1987, pp. 61-64.

[3] The Z-Test was also use to compare age-standardized morbidity rates (ASmRs) and age-standardized incidence rates(ASIRs).

STANDARDIZED MORTALITY RATIO (SMR)[4]

$$SMR = \sum(p^a_i * n^a_i) / \sum(p^b_i * n^a_i)$$

where:

- SMR = standard mortality ratio calculated for a specified age category equivalent to the *observed number of deaths in the study-area population* divided by the *expected number of deaths in that population*,
- p^a_i = age-specific mortality rate in the study-area population for age group i,
- n^a_i = person years at risk in the study-area population for the period under study in age group i,
- p^b_i = age-specific morality rate in Ontario for age group i for the time period under study,
- i = one age group from the series ranging from <1 year to 85+ years

with summations being over all age groups within the specified age category.

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[4] Standardized morbidity ratios (SmRs) and standardized cancer incidence ratios (SIRs) were also calculated in this way. In addition, standardized incidence ratios for infant congenital anomalies and standardized infant mortality ratios were calculated similarly. However, only one age group, infants < 1 year old, was considered.

STANDARDIZED MORTALITY RATIO (SMR) SIGNIFICANCE TEST:

CONFIDENCE INTERVAL FOR THE POISON RATIO TEST[5]

When the observed number of deaths in the study-area population for a specified age category was > 10,000, the Poison Ratio Test was too sensitive.

When the observed number of deaths in the study-area population for a specified age category was > 50 and ≤ 10,000, the limits for the *(100)(1-α)%* confidence interval were:

$$\textit{Lower limit} = (D^a - Z_{\alpha/2}\ \sqrt{D^a + 1}) / \lambda_d$$

$$\textit{Upper limit} = (D^a + Z_{\alpha/2}\ \sqrt{D^a + 2}) / \lambda_d$$

where:

$Z \sim$ N (0,1),

$Z_{\alpha/2}$ is such that Prob $[Z \geq Z_{\alpha/2}] = \alpha/2$,
and for a 95% confidence interval, $\alpha = 0.05$ and $Z_{\alpha/2} = 1.96$,

D^a = observed number of deaths in the study-area population for the specified age category = numerator of the SMR, and

λ_d = expected number of deaths in the study-area population for the specified age category = denominator of SMR.

When the observed number of deaths in the study-area population for the specified age category was ≤ 50, a minor adjustment was made to the upper-limit of the confidence interval calculation resulting in the following limits for the *(100)(1-α)%* confidence interval:

$$\textit{Lower limit} = (D^a - Z_{\alpha/2}\ \sqrt{D^a + 1}) / \lambda_d$$

$$\textit{Upper limit} = (D^a + Z_{\alpha/2}\ \sqrt{D^a + 2.1}) / \lambda_d$$

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[5] Confidence intervals used for determining the significance of standardized morbidity ratios (SmRs) and standardized incidence ratios (SIRs), were calculated in the same way.

STANDARDIZED *CONGENITAL ANOMALIES INCIDENCE* RATIO (SIR) SIGNIFICANCE TEST[6]:

CONFIDENCE INTERVAL FOR THE POISON RATIO TEST

An approximate *(100) (1-α)%* confidence interval:

$$\textit{Lower limit} = a\left(1-\sqrt{\frac{1}{9a}}-\frac{Z_{\alpha/2}}{3a}\right)^3/\lambda_a$$

$$\textit{Upper limit} = (a+1)\left(1-\sqrt{\frac{1}{9(a+1)}}+\frac{Z_{\alpha/2}}{3(a+1)}\right)^3/\lambda_a$$

where:

$Z \sim$ N (0,1),

$Z_{\alpha/2}$ is such that Prob $[Z \geq Z_{\alpha/2}] = \alpha/2$,
and for a 95% confidence interval, $\alpha = 0.05$ and $Z_{\alpha/2} = 1.96$,

$a =$ number of observed incidence of congenital anomalies in the study-area population for infants < 1 year old = numerator of the SIR calculated for infant congenial anomalies, and

$\lambda_a =$ number of expected incidence of congenital anomalies in the study-area population for infants < 1 year old = denominator of SIR calculated for infant congenital anomalies.

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6 Rothman KJ, Boice JD. Epidemiologic Analysis with a Programmable Calculator, Epidemiology Resources Inc, Boston, 1982, pp. 29.

Z-TEST COMPARING MEAN INFANT BIRTH WEIGHTS

The hypotheses defining the difference (d) between the mean infant birth weight for the study-area population and that for the Ontario population, specifically : Ho: d = 0 *vs* H_A: d ≠ 0, were tested using the test statistic Z(d).

$$Z(d) = \frac{X_a - X_b}{\sqrt{\frac{\sigma_a^2}{B_a} + \frac{\sigma_b^2}{B_b}}} \sim N(0,1)$$

where:

X_a = mean birth weight for the study-area population,
X_b = mean birth weight for the Ontario population,
B_a = number of births in the study-area population for the period under study, and
B_b = number of births in the Ontario population for the period under study,
σ_a^2 = variance for the mean birth weight in the study-area population, and
σ_b^2 = variance for the mean birth weight in the Ontario population.

Since:

σ_b^2 is very small compared to σ_a^2, the equation was modified to:

$$Z(d) = \frac{X_a - X_b}{\sqrt{\frac{\sigma_a^2}{B_a}}} \sim N(0,1)$$

The p-value derived from this test is the probability that the actual difference in birth weights between the study-area and Ontario populations is ≥calculated difference of Z(d).

It should be noted that statistical power, defined as the ability to demonstrate a statistically significant association if one exists, is a function of sample size. Therefore, for those study areas with large sample sizes, there will be an increase in power for any statistical test. For this particular test, a statistical difference can still be shown between the study-area and Ontario means, even though a very small difference in birth weights actually exists, if the study area being compared to Ontario has a large number of live births.

The chi-square statistic was used to compare percentages of low birth weights for the study-area and Ontario populations.

Appendix C: Data and Statistics

1 Explanation of Abbreviations and Flags

Abbreviations

ASMR Age-Standardized Mortality Rate

ASMR *Age-Specific Mortality Rate for Infant Mortality*

SMR Standardized Mortality Ratio

ASmR Age-Standardized morbidity Rate

SmR Standardized morbidity Ratio

ASIR Age-Standardized Incidence Rate

ASIR *Age-Specific Incidence Rate for Congenital Anomalies*

SIR Standardized Incidence Ratio

Flags: Results of rate and ratio statistical tests

+	significantly higher at the p<0.05 level of significance
++	significantly higher at the p<0.01 level of significance
-	significantly lower at the p<0.05 level of significance
--	significantly lower at the p<0.01 level of significance
blank	*no significant difference*
#	insufficient observations (<4) to determine significance
##	too many observations (>10,000) to determine significance

Note: Data and statistics were not included in tables when there were no observation (n=0). At times, n was 0 for both males and females for a specific health outcome. In this case, the outcome was left out of the table. For a complete list of all health outcomes being considered in this report, see Part A, Section 2.2.

2 List of Tables

Table C-10 **Morbidity as Hospitalization Cases, in Males and Females 75+ years old, 1986-1992:** Cases of Hospitalizations in the study-area population from the selected causes, corresponding Age-Standardized Morbidity Rates (per100,000 population) and rate comparisons with Ontario data including Standardized Morbidity Ratios.

Table C-11 **Morbidity as Cancer Incidence, in Males and Females of all Ages, 1986-1992:** Incidence of selected Cancers in the study-area population, corresponding Age-Standardized Incidence Rates (per100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

Table C-12 **Morbidity as Cancer Incidence, in Males and Females 0 to 24 years old, 1986-1992:** Incidence of selected Cancers in the study-area population, corresponding Age-Standardized Incidence Rates (per100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

Table C-13 **Morbidity as Cancer Incidence, in Males and Females 25 to 44 years old, 1986-1992:** Incidence of selected Cancers in the study-area population, corresponding Age-Standardized Incidence Rates (per100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

Table C-14 **Morbidity as Cancer Incidence, in Males and Females 45 to 74 years old, 1986-1992:** Incidence of selected Cancers in the study-area population, corresponding Age-Standardized Incidence Rates (per100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

Table C-15 Morbidity as Cancer Incidence, **in Males and Females 75+ years old, 1986-1992:** Incidence of selected Cancers in the study-area population, corresponding Age-Standardized Incidence Rates (per100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

Table C-16 **Birth Weights for Male and Female Infants, 1986-1992:** Number and percentage of Births by Weight and Mean and Median birth weights, for both the study-area and Ontario populations.

Table C-17 **Birth Outcomes as Incidence of Congenital Anomalies, for Male and Female Infants <1 year old, 1986-1992:** Incidence of selected Anomalies in the study-area population, corresponding Age-Specific Incidence Rates (per10,000 births) and rate comparisons with Ontario data including Incidence Ratios.

Table C-18 **Birth Outcomes as Infant Mortality, for Males and Females <1 year old, 1986-1992:** Deaths in the study-area population from All Causes, corresponding Age-Specific Mortality Rates (per100,000 births) and rate comparisons with Ontario data including Mortality Ratios.

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Table C-1 **rtality for Males and Females of All Ages, 1986-1992:** Deaths in study area population from the selected causes, corresponding Age-Standardized Mortality Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Mortality Ratios.

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
All Causes	2418	1010.94	++	1.09	++	(1.05 - 1.13)	2002	610.70	++	1.08	++	(1.03 - 1.12)
Intestinal Infectious Diseases	1	0.53	#	1.40		(0.04 - 7.80)						
Other Bacterial Diseases	7	2.86		1.05		(0.42 - 2.15)	4	1.27		0.59		(0.16 - 1.49)
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System	1	0.30	#	1.62		(0.04 - 9.02)						
Meningitis due to Enterovirus	1	0.30	#	13.11		(0.33 - 73.04)						
Others Diseases due to Viruses and Chlamydiae	2	0.57	#	1.36		(0.16 - 4.90)	1	0.36	#	1.02		(0.03 - 5.66)
Viral Hepatitus	1	0.28	#	0.90		(0.02 - 5.01)						
Disorders of Thyroid Gland	1	0.70	#	2.38		(0.06 - 13.26)						
Diseases of Other Endocrine Glands	35	14.39		0.84		(0.58 - 1.16)	60	18.23	+	1.33	+	(1.01 - 1.71)
Diabetes Mellitus	35	14.39		0.85		(0.59 - 1.18)	58	17.60	+	1.31		(0.99 - 1.69)
Other Metabolic Disorders and Immunity Disorders	3	1.53	#	0.32	-	(0.06 - 0.90)	5	1.59		0.56		(0.18 - 1.29)
Diseases of Blood and Blood-Forming Organs	6	3.23		0.87		(0.32 - 1.87)	6	1.87		0.79		(0.29 - 1.70)
Inflammatory Diseases of the Central Nervous System	2	0.71	#	1.68		(0.20 - 6.06)	1	0.36	#	1.01		(0.03 - 5.60)
Meningitis of Unspecified Cause	1	0.34	#	5.08		(0.13 - 28.31)						
Encephalitis, Myelitis and Encephalomyelitis	1	0.38	#	4.95		(0.13 - 27.57)						
Hereditary and Degenerative Diseases of the Central Nervous System	30	13.92		0.88		(0.59 - 1.25)	39	11.74		1.01		(0.72 - 1.38)
Parkinson's Disease	12	6.02		1.25		(0.65 - 2.17)	7	2.10		0.95		(0.38 - 1.95)
Other Disorders of the Central Nervous System	5	1.82		0.50		(0.16 - 1.15)	8	2.65		0.82		(0.35 - 1.60)
Multiple Sclerosis	1	0.28	#	0.53		(0.01 - 2.95)	4	1.28		1.28		(0.34 - 3.20)
Infantile Cerebral Palsy							2	0.72	#	2.54		(0.31 - 9.18)
Disorders of the Peripheral Nervous System	6	2.25	+	2.26		(0.83 - 4.86)	1	0.31	#	0.66		(0.02 - 3.68)
Muscular Dystrophies and Other Myopathies	6	2.25	++	3.34	+	(1.23 - 7.19)						
Hypertensive Disease	10	4.98		1.00		(0.48 - 1.83)	11	3.32		0.81		(0.40 - 1.44)
Ischaemic Heart Disease	711	305.87	++	1.21	++	(1.12 - 1.30)	583	176.04	++	1.31	++	(1.21 - 1.42)
Diseases of Pulmonary Circulation	9	5.14		0.98		(0.45 - 1.86)	11	3.31		1.07		(0.54 - 1.91)
Other Forms of Heart Disease	83	36.09		1.13		(0.90 - 1.40)	57	17.37		0.80		(0.61 - 1.04)
Diseases of Arteries, Arterioles and Capillaries	74	32.77		1.24		(0.97 - 1.55)	47	14.15		0.77		(0.57 - 1.03)
Atherosclerosis	11	5.49	-	0.55	-	(0.27 - 0.98)	14	4.23	--	0.38	--	(0.21 - 0.63)
Acute Respiratory Infections							2	0.59	#	2.31		(0.28 - 8.36)
Pneumonia and Influenza	56	27.56		0.84		(0.64 - 1.09)	45	13.70	--	0.66	--	(0.48 - 0.88)
Chronic Obstructive Pulmonary Disease and Allied Conditions	109	51.39		1.15		(0.94 - 1.38)	60	18.27		1.15		(0.87 - 1.47)
Chronic Bronchitis	7	3.71		1.71		(0.69 - 3.50)	4	1.20		1.72		(0.46 - 4.30)
Emphysema	30	14.73	++	2.32	++	(1.57 - 3.32)	14	4.27	++	2.47	++	(1.35 - 4.14)
Asthma	4	1.38		0.84		(0.23 - 2.11)	3	0.96	#	0.50		(0.10 - 1.42)
Pneumoconioses and Other Lung Diseases due to External Agents	4	1.97		0.75		(0.20 - 1.87)	2	0.59	#	0.59		(0.07 - 2.15)
Diseases of Oesophagus, Stomach and Duodenum	14	5.80		1.32		(0.72 - 2.21)	13	3.95		1.42		(0.76 - 2.43)
Noninfective Enteritis and Colitis	10	4.34		1.53		(0.73 - 2.79)	14	4.19		1.31		(0.72 - 2.20)
Other Diseases of Intestines and Peritoneum	8	4.15		0.97		(0.42 - 1.89)	25	7.56	++	1.74	+	(1.13 - 2.57)
Other Diseases of Digestive System	71	26.02		1.29	+	(1.00 - 1.62)	39	11.90		1.18		(0.84 - 1.62)
Nephritis, Nephrotic Syndrome and Nephrosis	15	6.39		0.71		(0.40 - 1.17)	18	5.44		0.97		(0.58 - 1.53)
Other Diseases of Urinary System	4	2.03		0.62		(0.17 - 1.56)	6	1.77		0.73		(0.27 - 1.57)
Diseases of Male Genital Organs	3	1.43	#	1.55		(0.31 - 4.39)						
Other Inflammatory Conditions of Skin and Subcutaneous Tissue							1	0.37	#	2.30		(0.06 - 12.80)

Table C-1 (continued)

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
Other Diseases of Skin and Subcutaneous Tissue	1	0.70	#	1.36		(0.03 - 7.55)						
Arthropathies and Related Disorders	1	0.39	#	0.30		(0.01 - 1.68)	9	2.88		1.05		(0.48 - 1.98)
Rheumatism, excluding the Back	1	0.45	#	4.06		(0.10 - 22.63)						
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	2	0.82	#	2.32		(0.28 - 8.37)	2	0.59	#	1.05		(0.13 - 3.80)
Anencephalus and Similar Anomalies							2	0.77	#	4.33		(0.52 - 15.65)
Spina Bifida							1	0.38	#	3.03		(0.08 - 16.90)
Microcephalus and Brain Reduction	1	0.38	#	3.98		(0.10 - 22.15)	1	0.32	#	3.59		(0.09 - 19.99)
Congenital Hydrocephalus	1	0.32	#	2.18		(0.06 - 12.16)	1	0.36	#	2.62		(0.07 - 14.59)
Ventricular Septal Defect	1	0.35	#	2.00		(0.05 - 11.12)	2	0.62	#	3.33		(0.40 - 12.02)
Atrial Septal Defect	3	1.14	#	14.44	++	(2.91 - 40.88)						
Pulmonary Artery Anomalies							1	0.31	#	4.69		(0.12 - 26.15)
Renal Agenesis and Dysgenesis	1	0.36	#	2.02		(0.05 - 11.24)						
Down Syndrome							3	0.94	#	8.10	++	(1.63 - 22.94)
Central Nervous System Anomalies	3	1.22	#	1.42		(0.29 - 4.02)	6	2.21	+	2.78	+	(1.02 - 5.97)
Congenital Heart Defects	7	2.59		1.29		(0.52 - 2.63)	4	1.29		0.93		(0.25 - 2.32)
Circulatory System Anomalies	1	0.36	#	0.86		(0.02 - 4.80)	1	0.31	#	0.93		(0.02 - 5.20)
Respiratory System Anomalies	2	0.71	#	1.26		(0.15 - 4.57)	2	0.77	#	2.41		(0.29 - 8.72)
Digestive System Anomalies							1	0.31	#	2.86		(0.07 - 15.91)
Urinary System Anomalies	2	0.65	#	1.84		(0.22 - 6.65)						
Certain Conditions Originating in the Perinatal Period	9	3.21		0.72		(0.33 - 1.36)	8	3.07		0.85		(0.37 - 1.66)
Malignant Neoplam of Lip, Oral Cavity and Pharynx	18	6.47		1.09		(0.65 - 1.72)	10	3.01		1.52		(0.73 - 2.79)
Malignant Neoplasm of the Pharynx	4	1.27		0.82		(0.22 - 2.05)	3	0.90	#	2.01		(0.41 - 5.70)
Malignant Neoplasm of Digestive Organs and Peritoneum	191	72.20		1.10		(0.95 - 1.26)	145	43.74		1.05		(0.89 - 1.24)
Malignant Neoplasm of Oesophagus	26	9.24		1.44		(0.94 - 2.10)	6	1.80		0.89		(0.33 - 1.91)
Malignant Neoplasm of Stomach	27	9.67		1.01		(0.67 - 1.48)	19	5.87		1.19		(0.72 - 1.86)
Malignant Neoplasm of Colon and Rectum	78	30.90		1.13		(0.90 - 1.41)	72	21.62		1.20		(0.94 - 1.51)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	7	2.50		0.66		(0.26 - 1.34)	4	1.22		0.64		(0.17 - 1.61)
Malignant Neoplasm of Gallbladder and Extrahepatic Bile Ducts	1	0.35	#	0.24		(0.01 - 1.33)	6	1.79		0.90		(0.33 - 1.95)
Malignant Neoplasm of the Pancreas	39	14.49		1.34		(0.96 - 1.84)	23	6.94		0.87		(0.56 - 1.31)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	259	94.77	++	1.24	++	(1.09 - 1.40)	96	28.97		1.02		(0.83 - 1.25)
Malignant Neoplasm of the Trachea, Bronchus and Lung	241	88.27	+	1.22	++	(1.07 - 1.38)	95	28.67		1.05		(0.85 - 1.28)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	13	4.52		0.88		(0.47 - 1.49)	108	33.24		0.94		(0.77 - 1.14)
Malignant Melanoma of Skin	6	2.04		0.74		(0.27 - 1.58)	7	2.17		1.42		(0.57 - 2.90)
Malignant Neoplasm of Female Breast							97	29.83		0.92		(0.75 - 1.12)
Malignant Neoplasm of Genitourinary Organs	97	43.47		0.99		(0.80 - 1.21)	63	19.45		0.92		(0.71 - 1.17)
Malignant Neoplasm of Ovary and Other Uterine Adnexa							32	9.91		1.13		(0.77 - 1.59)
Malignant Neoplasm of the Prostate	60	29.14		0.94		(0.72 - 1.21)						
Malignant Neoplasm of the Bladder	18	7.65		0.99		(0.59 - 1.57)	3	0.89	#	0.42		(0.09 - 1.20)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	18	6.33		1.26		(0.75 - 1.99)	6	1.90		0.70		(0.26 - 1.50)
Malignant Neoplasm of Other and Unspecified Sites	38	13.93	-	0.72	-	(0.51 - 0.99)	33	10.06		0.72		(0.50 - 1.01)
Malignant Neoplasm of Thyroid Gland	2	0.73	#	2.12		(0.26 - 7.66)	1	0.28	#	0.64		(0.02 - 3.54)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	63	25.24		1.12		(0.86 - 1.43)	47	14.40		1.02		(0.75 - 1.36)
Non-Hodgkin's Lymphoma	26	9.42		1.25		(0.82 - 1.84)	16	4.88		0.90		(0.51 - 1.45)
Hodgkin's Disease	2	0.92	#	0.81		(0.10 - 2.92)	1	0.30	#	0.65		(0.02 - 3.59)
Leukaemia	22	9.43		0.96		(0.60 - 1.45)	18	5.63		1.01		(0.60 - 1.60)

Table C-2 **Mortality for Males and Females 0 to 24 years old, 1986-1992:** Deaths in the study area population from the selected causes, corresponding Age-Standardized Mortality Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Mortality Ratios.

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR per 100,000	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
All Causes	94	88.64		1.07		(0.87 , 1.31)	50	49.76		1.02		(0.76 , 1.34)
Other Bacterial Diseases	1	0.96	#	1.71		(0.04 , 9.55)						
Other Metabolic Disorders and Immunity Disorders							1	1.09	#	1.04		(0.03 , 5.78)
Inflammatory Diseases of the Central Nervous System	1	0.96	#	2.54		(0.06 , 14.14)						
Meningitis of Unspecified Cause	1	0.96	#	14.93		(0.38 , 83.21)						
Hereditary and Degenerative Diseases of the Central Nervous System	1	0.96	#	1.38		(0.03 , 7.67)						
Other Disorders of the Central Nervous System							1	1.02	#	0.92		(0.02 , 5.12)
Infantile Cerebral Palsy							1	1.02	#	2.19		(0.06 , 12.20)
Disorders of the Peripheral Nervous System	2	1.91	#	2.40		(0.29 , 8.67)						
Muscular Dystrophies and Other Myopathies	2	1.91	#	2.50		(0.30 , 9.03)						
Diseases of Arteries, Arterioles and Capillaries	1	0.96	#	8.80		(0.22 , 49.04)						
Pneumonia and Influenza	3	2.93	#	3.42		(0.69 , 9.67)	1	1.09	#	1.34		(0.03 , 7.45)
Noninfective Enteritis and Colitis	1	0.82	#	5.84		(0.15 , 32.54)						
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	1	0.82	#	36.63		(0.93 , 204.08)						
Anencephalus and Similar Anomalies							2	2.19	#	4.33		(0.52 , 15.65)
Spina Bifida							1	1.09	#	3.48		(0.09 , 19.41)
Microcephalus and Brain Reduction							1	0.90	#	3.81		(0.10 , 21.25)
Congenital Hydrocephalus	1	0.91	#	2.57		(0.07 , 14.33)	1	1.02	#	3.04		(0.08 , 16.92)
Renal Agenesis and Dysgenesis	1	1.02	#	2.05		(0.05 , 11.44)						
Down Syndrome							1	0.96	#	17.78		(0.45 , 99.08)
Central Nervous System Anomalies	1	0.91	#	0.63		(0.02 , 3.51)	6	6.29	++	3.51	+	(1.29 , 7.55)
Congenital Heart Defects	2	1.98	#	0.47		(0.06 , 1.71)	2	1.92	#	0.59		(0.07 , 2.14)
Circulatory System Anomalies	1	1.02	#	1.26		(0.03 , 7.04)						
Respiratory System Anomalies	2	2.03	#	1.26		(0.15 , 4.57)	2	2.19	#	2.49		(0.30 , 9.01)
Urinary System Anomalies	1	1.02	#	1.52		(0.04 , 8.45)						
Certain Conditions Originating in the Perinatal Period	9	9.15		0.72		(0.33 , 1.36)	8	8.75		0.85		(0.37 , 1.66)
Malignant Neoplasm of Other and Unspecified Sites	4	3.63		2.48		(0.67 , 6.21)	1	0.90	#	0.92		(0.02 , 5.15)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	1	0.96	#	0.42		(0.01 , 2.34)	3	2.67	#	1.93		(0.39 , 5.46)
Non-Hodgkin's Lymphoma	1	0.96	#	1.98		(0.05 , 11.05)	1	0.86	#	4.23		(0.11 , 23.58)
Leukaemia							2	1.82	#	1.71		(0.21 , 6.19)

Table C-3 **Mortality for Males and Females 25 to 44 years old, 1986-1992:** Deaths in the study area population from the selected causes, corresponding Age-Standardized Mortality Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Mortality Ratios.)

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
All Causes	140	157.34		1.08		(0.91 - 1.28)	65	69.21		0.98		(0.76 - 1.25)
Other Bacterial Diseases							1	1.08	#	2.80		(0.07 - 15.60)
Others Diseases due to Viruses and Chlamydiae							1	1.05	#	8.15		(0.21 - 45.38)
Diseases of Other Endocrine Glands	3	3.37	#	2.00		(0.40 - 5.67)	1	1.05	#	1.05		(0.03 - 5.88)
Diabetes Mellitus	3	3.37	#	2.09		(0.42 - 5.93)	1	1.05	#	1.10		(0.03 - 6.14)
Diseases of Blood and Blood-Forming Organs							1	1.05	#	2.88		(0.07 - 16.04)
Inflammatory Diseases of the Central Nervous System	1	1.10	#	5.91		(0.15 - 32.94)	1	1.07	#	9.39		(0.24 - 52.30)
Encephalitis, Myelitis and Encephalomyelitis	1	1.10	#	40.23	+	(1.02 - 224.12)						
Other Disorders of the Central Nervous System	2	2.35	#	1.09		(0.13 - 3.93)	2	2.13	#	1.33		(0.16 - 4.82)
Infantile Cerebral Palsy							1	1.05	#	7.57		(0.19 - 42.20)
Disorders of the Peripheral Nervous System	1	1.17	#	2.88		(0.07 - 16.03)						
Muscular Dystrophies and Other Myopathies	1	1.17	#	3.43		(0.09 - 19.13)						
Ischaemic Heart Disease	9	10.03		0.76		(0.35 - 1.44)	2	2.13	#	1.08		(0.13 - 3.90)
Diseases of Pulmonary Circulation	1	1.10	#	2.23		(0.06 - 12.42)						
Other Forms of Heart Disease	1	1.10	#	0.44		(0.01 - 2.47)	1	1.05	#	0.91		(0.02 - 5.05)
Pneumonia and Influenza	2	2.24	#	1.94		(0.24 - 7.02)						
Chronic Obstructive Pulmonary Disease and Allied Conditions	2	2.27	#	3.42		(0.41 - 12.36)						
Diseases of Oesophagus, Stomach and Duodenum	1	1.10	#	2.28		(0.06 - 12.72)						
Noninfective Enteritis and Colitis	1	1.10	#	7.40		(0.19 - 41.21)						
Other Diseases of Digestive System	6	6.66		1.54		(0.56 - 3.31)	1	1.08	#	0.54		(0.01 - 2.98)
Nephritis, Nephrotic Syndrome and Nephrosis	1	1.10	#	2.15		(0.05 - 12.00)	1	1.08	#	2.57		(0.06 - 14.30)
Other Inflammatory Conditions of Skin and Subcutaneous Tissue							1	1.08	#	39.91	+	(1.01 - 222.35)
Arthropathies and Related Disorders							2	2.13	#	2.93		(0.36 - 10.59)
Microcephalus and Brain Reduction	1	1.10	#	42.09	+	(1.06 - 234.51)						
Central Nervous System Anomalies	1	1.10	#	8.42		(0.21 - 46.89)						
Congenital Heart Defects	1	1.17	#	1.80		(0.05 - 10.01)						
Malignant Neoplasm of Digestive Organs and Peritoneum	1	1.10	#	0.23		(0.01 - 1.26)	3	3.23	#	0.94		(0.19 - 2.66)
Malignant Neoplasm of Stomach							2	2.15	#	3.48		(0.42 - 12.58)
Malignant Neoplasm of Colon and Rectum							1	1.08	#	0.76		(0.02 - 4.22)
Malignant Neoplasm of the Pancreas	1	1.10	#	1.33		(0.03 - 7.41)						
Malignant Neoplasm of Respiratory and Intrathoracic Organs	4	4.39		1.15		(0.31 - 2.87)	2	2.15	#	0.71		(0.09 - 2.57)
Malignant Neoplasm of the Trachea, Bronchus and Lung	2	2.20	#	0.63		(0.08 - 2.28)	2	2.15	#	0.74		(0.09 - 2.67)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	4	4.47		1.89		(0.51 - 4.72)	8	8.54		0.76		(0.33 - 1.48)
Malignant Melanoma of Skin	1	1.10	#	0.69		(0.02 - 3.85)	1	1.07	#	1.05		(0.03 - 5.87)
Malignant Neoplasm of Female Breast							6	6.42		0.65		(0.24 - 1.40)
Malignant Neoplasm of Genitourinary Organs							6	6.39		1.49		(0.55 - 3.20)
Malignant Neoplasm of Ovary and Other Uterine Adnexa							3	3.21	#	2.17		(0.44 - 6.13)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs							1	1.08	#	2.93		(0.07 - 16.32)
Malignant Neoplasm of Other and Unspecified Sites	3	3.34	#	0.85		(0.17 - 2.41)	2	2.14	#	0.79		(0.10 - 2.85)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	7	7.81		1.67		(0.67 - 3.40)	4	4.25		1.28		(0.34 - 3.20)
Non-Hodgkin's Lymphoma	3	3.37	#	1.91		(0.38 - 5.40)	1	1.07	#	0.93		(0.02 - 5.19)
Hodgkin's Disease	1	1.14	#	1.33		(0.03 - 7.40)						
Leukaemia	3	3.29	#	1.76		(0.35 - 4.97)	3	3.19	#	1.98		(0.40 - 5.60)

Table C-4 **Mortality for Males and Females 45 to 74 years old, 1986-1992:** Deaths in the study area population from the selected causes, corresponding Age-Standardized Mortality Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Mortality Ratios.

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR per 100,000	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
All Causes	1283	1645.92	++	1.12	++	(1.06 - 1.18)	799	929.45	++	1.16	++	(1.08 - 1.24)
Other Bacterial Diseases	4	5.24		1.28		(0.34 - 3.20)						
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System	1	1.14	#	2.93		(0.07 - 16.35)						
Meningitis due to Enterovirus	1	1.14	#	55.47	+	(1.40 - 309.06)						
Others Diseases due to Viruses and Chlamydiae	2	2.18	#	2.51		(0.30 - 9.07)						
Viral Hepatitus	1	1.06	#	1.40		(0.04 - 7.81)						
Diseases of Other Endocrine Glands	18	23.66		0.80		(0.47 - 1.26)	27	31.79	+	1.53	+	(1.01 - 2.22)
Diabetes Mellitus	18	23.66		0.81		(0.48 - 1.28)	26	30.50	+	1.50		(0.98 - 2.20)
Other Metabolic Disorders and Immunity Disorders	1	1.14	#	0.24		(0.01 - 1.34)						
Diseases of Blood and Blood-Forming Organs	1	1.50	#	0.33		(0.01 - 1.86)	1	1.19	#	0.45		(0.01 - 2.49)
Hereditary and Degenerative Diseases of the Central Nervous System	14	19.48		1.16		(0.63 - 1.94)	9	10.50		0.93		(0.43 - 1.75)
Parkinson's Disease	5	7.17		1.97		(0.64 - 4.53)	2	2.36	#	1.69		(0.21 - 6.12)
Other Disorders of the Central Nervous System	3	3.89	#	0.60		(0.12 - 1.70)	5	5.99		1.10		(0.36 - 2.53)
Multiple Sclerosis	1	1.06	#	0.72		(0.02 - 4.03)	4	4.88		1.83		(0.50 - 4.60)
Disorders of the Peripheral Nervous System	2	2.48	#	1.85		(0.22 - 6.67)	1	1.18	#	1.27		(0.03 - 7.06)
Muscular Dystrophies and Other Myopathies	2	2.48	#	3.16		(0.38 - 11.43)						
Hypertensive Disease	3	4.14	#	0.61		(0.12 - 1.72)	2	2.38	#	0.52		(0.06 - 1.89)
Ischaemic Heart Disease	392	505.78	++	1.20	++	(1.08 - 1.32)	184	214.94	++	1.40	++	(1.21 - 1.62)
Diseases of Pulmonary Circulation							8	9.18		1.72		(0.74 - 3.37)
Other Forms of Heart Disease	45	56.58		1.34		(0.98 - 1.80)	19	22.60		1.08		(0.65 - 1.68)
Diseases of Arteries, Arterioles and Capillaries	35	45.90		1.36		(0.95 - 1.90)	18	20.82	+	1.70	+	(1.01 - 2.68)
Atherosclerosis	3	4.01	#	0.72		(0.14 - 2.03)	2	2.36	#	0.90		(0.11 - 3.25)
Pneumonia and Influenza	13	17.03		0.73		(0.39 - 1.24)	9	10.61		0.87		(0.40 - 1.65)
Chronic Obstructive Pulmonary Disease and Allied Conditions	46	63.25		1.15		(0.84 - 1.54)	33	38.72	+	1.45		(1.00 - 2.04)
Chronic Bronchitis	1	1.34	#	0.58		(0.01 - 3.21)						
Emphysema	10	13.41		1.60		(0.77 - 2.93)	9	10.51	++	2.91	++	(1.33 - 5.48)
Asthma	3	3.54	#	1.16		(0.23 - 3.27)	3	3.68	#	1.02		(0.21 - 2.90)
Pneumoconioses and Other Lung Diseases due to External Agents	2	2.84	#	1.10		(0.13 - 3.98)	1	1.11	#	1.28		(0.03 - 7.16)
Diseases of Oesophagus, Stomach and Duodenum	8	9.97		1.53		(0.66 - 2.98)	6	7.02	+	2.29		(0.84 - 4.93)
Noninfective Enteritis and Colitis	4	5.21		1.43		(0.39 - 3.58)	4	4.56		1.14		(0.31 - 2.85)
Other Diseases of Intestines and Peritoneum	2	3.00	#	0.55		(0.07 - 1.99)	7	8.32		1.89		(0.76 - 3.85)
Other Diseases of Digestive System	53	65.01	+	1.36	+	(1.02 - 1.78)	23	26.84		1.33		(0.84 - 1.99)
Nephritis, Nephrotic Syndrome and Nephrosis	9	11.86		1.08		(0.49 - 2.03)	8	9.06		1.33		(0.58 - 2.61)
Other Diseases of Urinary System							4	4.47		2.09		(0.57 - 5.24)
Arthropathies and Related Disorders	1	1.50	#	0.54		(0.01 - 3.01)	6	7.08		1.60		(0.59 - 3.44)
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities							2	2.27	#	4.86		(0.59 - 17.57)
Ventricular Septal Defect	1	1.33	#	4.72		(0.12 - 26.30)	2	2.38	#	10.18	+	(1.23 - 36.77)
Atrial Septal Defect	2	2.65	#	18.31	+	(2.22 - 66.15)						
Pulmonary Artery Anomalies							1	1.18	#	55.64	+	(1.41 - 310.01)
Down Syndrome							2	2.32	#	7.56		(0.92 - 27.31)
Congenital Heart Defects	3	3.98	#	5.25	+	(1.06 - 14.88)	2	2.38	#	3.99		(0.48 - 14.42)
Circulatory System Anomalies							1	1.18	#	5.51		(0.14 - 30.67)
Digestive System Anomalies							1	1.18	#	16.54		(0.42 - 92.15)

Table C-4 Continued

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR per 100,000	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
Urinary System Anomalies	1	1.12	#	3.74		(0.09 - 20.86)						
Malignant Neoplam of Lip, Oral Cavity and Pharynx	14	17.24		1.09		(0.60 - 1.83)	4	4.61		1.04		(0.28 - 2.60)
Malignant Neoplasm of the Pharynx	4	4.87		1.00		(0.27 - 2.51)	1	1.18	#	1.06		(0.03 - 5.89)
Malignant Neoplasm of Digestive Organs and Peritoneum	146	186.48	++	1.27	++	(1.08 - 1.50)	81	93.22		1.11		(0.88 - 1.38)
Malignant Neoplasm of Oesophagus	23	29.82	++	1.68	+	(1.07 - 2.53)	6	6.86		1.57		(0.58 - 3.38)
Malignant Neoplasm of Stomach	22	27.46		1.31		(0.82 - 1.99)	11	12.79		1.34		(0.67 - 2.39)
Malignant Neoplasm of Colon and Rectum	57	73.07		1.30		(0.98 - 1.68)	41	46.96		1.31		(0.94 - 1.78)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	5	6.11		0.66		(0.21 - 1.51)	1	1.18	#	0.28		(0.01 - 1.57)
Malignant Neoplasm of Gallbladder and Extrahepatic Bile Ducts	1	1.34	#	0.39		(0.01 - 2.16)						
Malignant Neoplasm of the Pancreas	29	37.85	+	1.48		(0.99 - 2.12)	14	16.21		0.98		(0.53 - 1.63)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	204	258.64	++	1.33	++	(1.16 - 1.53)	68	77.88		1.01		(0.79 - 1.28)
Malignant Neoplasm of the Trachea, Bronchus and Lung	192	243.84	++	1.32	++	(1.14 - 1.53)	68	77.88		1.04		(0.81 - 1.32)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	8	9.73		0.95		(0.41 - 1.86)	66	76.92		0.91		(0.70 - 1.15)
Malignant Melanoma of Skin	5	6.37		0.96		(0.31 - 2.21)	3	3.45	#	1.07		(0.22 - 3.02)
Malignant Neoplasm of Female Breast							60	70.09		0.88		(0.67 - 1.13)
Malignant Neoplasm of Genitourinary Organs	53	70.54		1.12		(0.84 - 1.46)	42	48.82		1.03		(0.74 - 1.39)
Malignant Neoplasm of Ovary and Other Uterine Adnexa							19	22.19		0.99		(0.60 - 1.54)
Malignant Neoplasm of the Prostate	24	32.70		0.86		(0.55 - 1.27)						
Malignant Neoplasm of the Bladder	11	15.03		1.23		(0.61 - 2.19)	2	2.27	#	0.76		(0.09 - 2.73)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	17	21.49	+	1.74	+	(1.02 - 2.78)	5	5.85		1.05		(0.34 - 2.40)
Malignant Neoplasm of Other and Unspecified Sites	23	29.05		0.67		(0.43 - 1.01)	19	21.90		0.74		(0.45 - 1.16)
Malignant Neoplasm of Thyroid Gland	1	1.06	#	1.50		(0.04 - 8.36)	1	1.09	#	1.29		(0.03 - 7.20)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	34	43.46		1.04		(0.72 - 1.45)	23	26.32		0.98		(0.62 - 1.47)
Non-Hodgkin's Lymphoma	17	21.11		1.28		(0.75 - 2.05)	10	11.46		1.02		(0.49 - 1.87)
Leukaemia	9	11.97		0.76		(0.35 - 1.43)	7	7.96		0.87		(0.35 - 1.78)

Table C-5 **Mortality for Males and Females 75+ years old, 1986-1992:** Deaths in the study area population from the selected causes, corresponding Age-Standardized Mortality Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Mortality Ratios.

Cause of Death	Males							Females						
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval		Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	
All Causes	901	10773.48		1.05		(0.98 -	1.12)	1088	7098.50		1.03		(0.97 -	1.09)
Intestinal Infectious Diseases	1	11.47	#	2.62		(0.07 -	14.62)							
Other Bacterial Diseases	2	25.11	#	0.77		(0.09 -	2.77)	3	19.54	#	0.82		(0.17 -	2.32)
Disorders of Thyroid Gland	1	15.30	#	3.37		(0.09 -	18.78)							
Diseases of Other Endocrine Glands	14	153.32		0.79		(0.43 -	1.32)	32	207.80		1.21		(0.83 -	1.71)
Diabetes Mellitus	14	153.32		0.80		(0.44 -	1.33)	31	201.44		1.19		(0.81 -	1.69)
Other Metabolic Disorders and Immunity Disorders	2	26.77	#	0.72		(0.09 -	2.61)	4	26.15		0.89		(0.24 -	2.24)
Diseases of Blood and Blood-Forming Organs	5	61.69		1.51		(0.49 -	3.47)	4	26.10		0.84		(0.23 -	2.11)
Hereditary and Degenerative Diseases of the Central Nervous System	15	184.57		0.71		(0.40 -	1.18)	30	195.48		1.06		(0.72 -	1.52)
Parkinson's Disease	7	90.12		0.99		(0.40 -	2.02)	5	32.21		0.81		(0.26 -	1.87)
Disorders of the Peripheral Nervous System	1	11.47	#	2.58		(0.07 -	14.37)							
Muscular Dystrophies and Other Myopathies	1	11.47	#	13.97		(0.35 -	77.81)							
Hypertensive Disease	7	84.64		1.42		(0.57 -	2.90)	9	58.61		0.92		(0.42 -	1.74)
Ischaemic Heart Disease	310	3699.09	++	1.25	++	(1.12 -	1.40)	397	2589.85	++	1.27	++	(1.15 -	1.40)
Diseases of Pulmonary Circulation	8	103.76	++	2.32	+	(1.00 -	4.54)	3	19.74	#	0.62		(0.12 -	1.75)
Other Forms of Heart Disease	37	454.78		1.00		(0.71 -	1.38)	37	241.27	-	0.72	-	(0.51 -	0.99)
Diseases of Arteries, Arterioles and Capillaries	38	444.31		1.13		(0.80 -	1.55)	29	189.16	--	0.58	--	(0.39 -	0.84)
Atherosclerosis	8	96.61	-	0.51	-	(0.22 -	0.99)	12	78.65	--	0.35	--	(0.18 -	0.60)
Acute Respiratory Infections								2	12.92	#	3.50		(0.42 -	12.65)
Pneumonia and Influenza	38	463.58		0.81		(0.57 -	1.11)	35	229.29	--	0.61	--	(0.43 -	0.86)
Chronic Obstructive Pulmonary Disease and Allied Conditions	61	740.94		1.13		(0.86 -	1.45)	27	176.89		0.95		(0.62 -	1.38)
Chronic Bronchitis	6	73.16	+	2.59		(0.95 -	5.56)	4	26.10	+	3.28		(0.88 -	8.21)
Emphysema	20	244.09	++	3.02	++	(1.85 -	4.66)	5	32.91		1.96		(0.63 -	4.50)
Asthma	1	9.81	#	0.73		(0.02 -	4.09)							
Pneumoconioses and Other Lung Diseases due to External Agents	2	26.77	#	0.60		(0.07 -	2.17)	1	6.56	#	0.41		(0.01 -	2.26)
Diseases of Oesophagus, Stomach and Duodenum	5	61.19		1.04		(0.34 -	2.39)	7	45.89		1.12		(0.45 -	2.29)
Noninfective Enteritis and Colitis	4	50.22		1.16		(0.31 -	2.91)	10	65.13		1.46		(0.70 -	2.67)
Other Diseases of Intestines and Peritoneum	6	73.16		1.39		(0.51 -	3.00)	18	117.13	+	1.73	+	(1.03 -	2.74)
Other Diseases of Digestive System	12	146.33		0.98		(0.51 -	1.71)	15	98.04		1.10		(0.62 -	1.81)
Nephritis, Nephrotic Syndrome and Nephrosis	5	63.35		0.41	-	(0.13 -	0.94)	9	58.71		0.75		(0.34 -	1.41)
Other Diseases of Urinary System	4	44.23		0.95		(0.26 -	2.37)	2	13.13	#	0.32		(0.04 -	1.17)
Diseases of Male Genital Organs	3	31.10	#	2.04		(0.41 -	5.77)							
Other Diseases of Skin and Subcutaneous Tissue	1	15.30	#	1.81		(0.05 -	10.08)							
Arthropathies and Related Disorders								1	6.56	#	0.25		(0.01 -	1.42)
Rheumatism, excluding the Back	1	9.81	#	9.81		(0.25 -	54.66)							
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	1	11.47	#	1.97		(0.05 -	10.99)							
Atrial Septal Defect	1	9.81	#	61.02	+	(1.54 -	340.00)							
Central Nervous System Anomalies	1	11.47	#	6.98		(0.18 -	38.91)							
Congenital Heart Defects	1	9.81	#	10.50		(0.27 -	58.51)							
Malignant Neoplam of Lip, Oral Cavity and Pharynx	4	42.57		1.32		(0.36 -	3.30)	6	39.28	+	2.55		(0.94 -	5.49)
Malignant Neoplasm of the Pharynx								2	12.92	#	4.59		(0.56 -	16.57)
Malignant Neoplasm of Digestive Organs and Peritoneum	44	500.51		0.80		(0.58 -	1.08)	61	396.57		0.99		(0.76 -	1.27)
Malignant Neoplasm of Oesophagus	3	31.10	#	0.73		(0.15 -	2.06)							

Table C-5 Continued

Cause of Death	Males						Females					
	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval	Deaths	ASMR (per 100,000)	ASMR Flag	SMR	SMR Flag	95% Confidence Interval
Malignant Neoplasm of Stomach	5	54.04		0.55		(0.18 - 1.27)	6	38.82		0.84		(0.31 - 1.80)
Malignant Neoplasm of Colon and Rectum	21	256.07		0.90		(0.56 - 1.37)	30	194.88		1.10		(0.74 - 1.57)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	2	19.62	#	0.82		(0.10 - 2.97)	3	19.84	#	1.25		(0.25 - 3.54)
Malignant Neoplasm of Gallbladder and Extrahepatic Bile Ducts							6	38.88		1.92		(0.70 - 4.13)
Malignant Neoplasm of the Pancreas	9	91.63		1.04		(0.48 - 1.97)	9	58.61		0.78		(0.36 - 1.48)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	51	556.05		0.97		(0.73 - 1.28)	26	170.58		1.10		(0.72 - 1.61)
Malignant Neoplasm of the Trachea, Bronchus and Lung	47	515.15		0.94		(0.69 - 1.26)	25	164.22		1.10		(0.71 - 1.62)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	1	9.81	#	0.29		(0.01 - 1.63)	34	221.53		1.12		(0.78 - 1.57)
Malignant Melanoma of Skin							3	19.54	#	2.73		(0.55 - 7.74)
Malignant Neoplasm of Female Breast							31	201.99		1.11		(0.75 - 1.57)
Malignant Neoplasm of Genitourinary Organs	44	543.89		0.90		(0.65 - 1.20)	15	97.64		0.63		(0.35 - 1.04)
Malignant Neoplasm of Ovary and Other Uterine Adnexa							10	65.33		1.29		(0.62 - 2.35)
Malignant Neoplasm of the Prostate	36	447.79		1.00		(0.70 - 1.39)						
Malignant Neoplasm of the Bladder	7	80.81		0.77		(0.31 - 1.58)	1	6.36	#	0.23		(0.01 - 1.27)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	1	15.30	#	0.26		(0.01 - 1.43)						
Malignant Neoplasm of Other and Unspecified Sites	8	85.14		0.60		(0.26 - 1.18)	11	71.34		0.66		(0.33 - 1.18)
Malignant Neoplasm of Thyroid Gland	1	9.81	#	4.40		(0.11 - 24.51)						
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	21	236.29		1.23		(0.76 - 1.88)	17	111.47		0.96		(0.56 - 1.53)
Non-Hodgkin's Lymphoma	5	52.38		0.93		(0.30 - 2.13)	4	26.40		0.59		(0.16 - 1.49)
Hodgkin's Disease	1	11.47	#	3.31		(0.08 - 18.47)	1	6.61	#	2.61		(0.07 - 14.53)
Leukaemia	10	112.41		1.29		(0.62 - 2.36)	6	39.53		0.85		(0.31 - 1.82)

Table C-6 **Morbidity as Hospitalization Cases, in Males and Females of All Ages, 1986-1992:** Cases of Hospitalizations in the study area population from the selected causes, corresponding Age-Standardized Morbidity Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Morbidity Ratios.

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
All Causes	40567	14331.02	++	1.27	##	52338	16900.55	++	1.20	##
Intestinal Infectious Diseases	148	50.03	--	0.70	--	202	66.89	-	0.86	-
Other Bacterial Diseases	151	55.20	++	1.30	++	165	52.70	++	1.46	++
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System	23	7.55		0.95		15	5.15		0.67	
Meningitis due to Enterovirus	19	6.18		1.00		13	4.45		0.75	
Others Diseases due to Viruses and Chlamydiae	170	57.45	++	1.30	++	156	49.63	+	1.22	+
Viral Hepatitis	8	2.66		0.54		5	1.52		0.45	
Specific Diseases due to Coxsackie Virus	1	0.34	#	0.49						
Helminthiases						2	0.61	#	0.86	
Disorders of Thyroid Gland	21	6.80		1.16		98	31.60	+	1.24	+
Diseases of Other Endocrine Glands	487	168.13		1.00		673	207.71	++	1.25	++
Diabetes Mellitus	407	139.25	-	0.93		568	174.44	++	1.22	++
Ovarian Dysfunction						20	6.95	++	2.34	++
Other Metabolic Disorders and Immunity Disorders	171	59.84		1.20	+	277	88.91	+	1.13	
Diseases of Blood and Blood-Forming Organs	227	82.60		0.93		355	111.56	++	1.16	++
Inflammatory Diseases of the Central Nervous System	31	10.47		1.27		34	10.88	++	1.70	++
Bacterial Meningitis	7	2.26		0.73		6	2.02		0.80	
Meningitis of Unspecified Cause	14	4.85	+	1.93	+	9	2.90		1.57	
Encephalitis, Myelitis and Encephalomyelitis	10	3.36	++	2.45	+	11	3.39	++	2.42	+
Hereditary and Degenerative Diseases of the Central Nervous System	141	55.04	+	1.23	+	156	47.82	++	1.38	++
Parkinson's Disease	31	14.28		0.91		34	10.22		1.26	
Other Disorders of the Central Nervous System	237	80.58		1.06		455	152.89	++	1.61	++
Multiple Sclerosis	18	5.86		1.02		50	16.56		1.22	
Infantile Cerebral Palsy	17	5.35	++	2.09	++	20	6.54	++	2.98	++
Disorders of the Peripheral Nervous System	197	69.13	++	1.85	++	154	49.16	+	1.19	+
Muscular Dystrophies and Other Myopathies	14	4.44	+	1.79		1	0.28	#	0.20	
Disorders of the Eye and Adnexa	589	223.39		0.97		764	231.89	-	0.92	-
Blindness and Low Vision	5	1.81		2.25		4	1.18		2.11	
Diseases of the Ear and Mastoid Process	284	95.48		1.07		299	96.15	+	1.17	++
Hypertensive Disease	102	33.83		0.88		163	49.06		0.94	
Ischaemic Heart Disease	2716	962.30	++	1.09	++	1699	508.17	++	1.25	++
Diseases of Pulmonary Circulation	84	31.24	++	1.43	++	102	31.42	++	1.55	++
Other Forms of Heart Disease	1400	542.61	++	1.11	++	1307	392.71	++	1.18	++
Diseases of Arteries, Arterioles and Capillaries	526	186.55	++	1.23	++	273	82.60	++	1.19	++
Atherosclerosis	19	7.11	--	0.22	--	13	3.95	--	0.24	--
Acute Respiratory Infections	1187	400.79	++	1.52	++	820	276.99	++	1.56	++
Other Diseases of Upper Respiratory Tract	1530	486.78	++	1.34	++	1568	506.11	++	1.43	++
Pneumonia and Influenza	816	330.18	+	1.07		736	229.33	+	1.11	++
Chronic Obstructive Pulmonary Disease and Allied Conditions	1770	635.68	++	1.43	++	1464	463.87	++	1.38	++
Chronic Bronchitis	55	22.06		1.18		44	13.33		1.17	
Emphysema	63	23.50		1.30		55	16.37	++	1.86	++
Asthma	939	310.65	++	1.33	++	951	305.11	++	1.37	++
Pneumoconioses and Other Lung Diseases due to External Agents	27	9.96	-	0.74		11	3.35	-	0.50	-

Table C-6 Continued

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
Diseases of Oesophagus, Stomach and Duodenum	545	190.66		0.98		547	171.51	++	1.14	++
Noninfective Enteritis and Colitis	710	243.12	++	1.61	++	867	286.34	++	1.57	++
Other Diseases of Intestines and Peritoneum	761	271.75	++	1.22	++	930	291.36	++	1.20	++
Other Diseases of Digestive System	1298	457.00	++	1.26	++	1815	580.94	++	1.17	++
Nephritis, Nephrotic Syndrome and Nephrosis	171	62.96		1.03		134	40.94		1.06	
Other Diseases of Urinary System	1050	381.75	++	1.11	++	806	257.27		1.07	
Diseases of Male Genital Organs	1396	504.28	++	1.12	++					
Infertility, Male	17	6.32	++	2.07	++					
Disorders of Breast	34	11.63		0.94		202	66.78	--	0.63	--
Other Disorders of Female Genital Tract	1	0.39	#	3.50		3375	1129.22	++	1.60	++
Endometriosis						161	56.13	--	0.71	--
Infertility, Female						174	61.13	++	1.49	++
Pregnancy With Abortive Outcome						976	325.26	--	0.89	--
Spontaneous Abortion						162	54.31	--	0.43	--
Complications Mainly Related to Pregnancy						2058	690.38	--	0.80	--
Hypertension Complicating Pregnancy, Childbirth and the Puerperium						336	114.25		0.93	
Early or Threatened Labour						1037	345.18	++	1.09	+
Infections of Skin and Subcutaneous Tissue	418	146.95	++	1.19	++	265	84.13		1.04	
Other Inflammatory Conditions of Skin and Subcutaneous Tissue	77	25.87	+	1.34	+	86	28.22	++	1.37	++
Other Diseases of Skin and Subcutaneous Tissue	114	39.46		1.08		118	36.77		0.89	
Arthropathies and Related Disorders	1019	349.45	++	1.43	++	927	287.09	++	1.10	++
Dorsopathies	945	329.89	++	1.77	++	827	269.90	++	1.76	++
Rheumatism, Excluding the Back	442	149.86	++	1.57	++	347	109.91		1.08	
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	278	96.83		0.97		358	111.74	--	0.78	--
Certain Conditions Originating in the Perinatal Period	67	22.96	--	0.41	--	43	15.75	--	0.37	--

Table C-7 **Morbidity as Hospitalization Cases, in Males and Females 0 to 24 years old, 1986-1992:** Cases of Hospitalizations in the study area population from the selected causes, corresponding Age-Standardized Morbidity Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Morbidity Ratios.

Cause of Hospitalisation	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
All Causes	10565	9503.36	++	1.39	##	13072	11970.49	++	1.30	##
Intestinal Infectious Diseases	85	77.14	--	0.57	--	78	75.46	--	0.59	--
Other Bacterial Diseases	56	50.97		1.23		51	48.72		1.19	
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System	18	15.88		1.18		6	5.65		0.55	
Meningitis due to Enterovirus	16	14.16		1.26		5	4.67		0.55	
Others Diseases due to Viruses and Chlamydiae	105	93.74	+	1.21		93	84.32		1.15	
Viral Hepatitis	4	3.59		1.26		1	0.93	#	0.31	
Specific Diseases due to Coxsackie Virus	1	0.98	#	0.62						
Helminthiases						2	1.74	#	1.60	
Disorders of Thyroid Gland	1	0.80	#	0.65		4	3.65		0.65	
Diseases of Other Endocrine Glands	107	92.38	++	1.50	++	130	112.33	++	1.50	++
Diabetes Mellitus	96	82.49	++	1.53	++	123	106.07	++	1.64	++
Ovarian Dysfunction						3	2.78	#	1.27	
Other Metabolic Disorders and Immunity Disorders	71	64.86	++	1.98	++	74	69.50	++	1.79	++
Diseases of Blood and Blood-Forming Organs	78	70.12		0.94		89	83.63		1.11	
Inflammatory Diseases of the Central Nervous System	13	11.93		0.96		19	17.32	+	1.91	+
Bacterial Meningitis	6	5.63		0.81		5	4.82		0.96	
Meningitis of Unspecified Cause	6	5.50		1.62		5	4.48		1.81	
Encephalitis, Myelitis and Encephalomyelitis	1	0.80	#	0.62		6	5.05	++	3.85	++
Hereditary and Degenerative Diseases of the Central Nervous System	26	23.12	++	2.34	++	24	22.12	++	2.13	++
Other Disorders of the Central Nervous System	80	70.28		1.14		85	77.69		1.13	
Multiple Sclerosis	5	4.00	++	6.63	++	5	4.53		1.86	
Infantile Cerebral Palsy	16	14.22	++	2.30	++	20	18.67	++	3.47	++
Disorders of the Peripheral Nervous System	18	16.19		1.53		12	11.03		1.18	
Muscular Dystrophies and Other Myopathies	7	6.66		1.87						
Disorders of the Eye and Adnexa	76	68.00	++	1.39	++	43	40.77		1.00	
Blindness and Low Vision						1	0.83	#	3.40	
Diseases of the Ear and Mastoid Process	109	99.57	--	0.72	--	100	95.79		0.93	
Hypertensive Disease	3	2.56	#	0.76						
Ischaemic Heart Disease						2	1.92	#	1.67	
Diseases of Pulmonary Circulation	1	0.93	#	0.49		4	3.61		0.96	
Other Forms of Heart Disease	38	33.98		1.33		23	20.72		1.16	
Diseases of Arteries, Arterioles and Capillaries	4	3.46		0.61		7	7.18		1.08	
Acute Respiratory Infections	1058	994.04	++	1.53	++	620	612.54	++	1.50	++
Other Diseases of Upper Respiratory Tract	1262	1119.63	++	1.60	++	1351	1234.93	++	1.59	++
Pneumonia and Influenza	207	190.01		0.93		167	158.76		0.95	
Chronic Obstructive Pulmonary Disease and Allied Conditions	861	791.86	++	1.44	++	550	518.21	++	1.37	++
Chronic Bronchitis	1	0.98	#	0.35		3	3.03	#	1.42	
Asthma	684	624.67	++	1.25	++	447	414.94	++	1.21	++
Pneumoconioses and Other Lung Diseases due to External Agents	7	6.47		1.10		2	1.92	#	0.47	
Diseases of Oesophagus, Stomach and Duodenum	82	74.19		1.17		93	85.27	++	1.50	++
Noninfective Enteritis and Colitis	445	409.11	++	1.73	++	443	427.32	++	1.82	++
Other Diseases of Intestines and Peritoneum	73	65.62		1.05		71	66.04		1.07	

Table C-7 Continued

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
Other Diseases of Digestive System	54	48.47	+	1.40	+	154	139.80	+	1.18	+
Nephritis, Nephrotic Syndrome and Nephrosis	30	25.80		1.40		14	12.76		1.01	
Other Diseases of Urinary System	98	87.66		1.00		176	161.14		0.96	
Diseases of Male Genital Organs	297	268.85	++	2.01	++					
Infertility, Male	1	0.93	#	3.31						
Disorders of Breast	13	10.89		0.73		34	29.86	--	0.52	--
Other Disorders of Female Genital Tract						255	226.52	++	1.31	++
Endometriosis						12	10.82		0.76	
Infertility, Female						15	13.80	+	1.82	+
Pregnancy With Abortive Outcome						469	414.68	++	1.37	++
Spontaneous Abortion						73	64.86	--	0.68	--
Complications Mainly Related to Pregnancy						967	865.25		1.03	
Hypertension Complicating Pregnancy, Childbirth and the Puerperium						120	107.40		1.09	
Early or Threatened Labour						549	490.61	++	1.40	++
Infections of Skin and Subcutaneous Tissue	108	94.81		1.00		93	84.33		1.11	
Other Inflammatory Conditions of Skin and Subcutaneous Tissue	40	37.53	++	1.94	++	41	39.58	++	2.15	++
Other Diseases of Skin and Subcutaneous Tissue	37	32.69	+	1.42	+	23	20.94		0.95	
Arthropathies and Related Disorders	152	132.12	++	1.33	++	94	82.70		0.99	
Dorsopathies	47	42.54	++	1.88	++	39	34.57	++	1.70	++
Rheumatism, Excluding the Back	84	72.80	++	1.94	++	80	71.54	++	1.59	++
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	73	63.79		0.80		60	53.39	-	0.73	-
Certain Conditions Originating in the Perinatal Period	67	65.52	--	0.42	--	42	43.99	--	0.36	--

Table C-8 **Morbidity as Hospitalization Cases, in Males and Females 25 to 44 years old, 1986-1992:** Cases of Hospitalizations in the study area population from the selected causes, corresponding Age-Standardized Morbidity Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Morbidity Ratios.

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
All Causes	7219	7963.89	++	1.33	++	16834	17514.88	++	1.10	##
Intestinal Infectious Diseases	22	24.68		0.88		58	60.46	++	1.54	++
Other Bacterial Diseases	13	14.43		1.36		28	29.26	++	2.54	++
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System	4	4.51		0.61		8	8.30		0.97	
Meningitis due to Enterovirus	2	2.27	#	0.38		7	7.26		0.98	
Others Diseases due to Viruses and Chlamydiae	28	31.20		1.15		21	21.81		0.90	
Viral Hepatitis	2	2.27	#	0.30						
Disorders of Thyroid Gland	2	2.15	#	0.46		39	40.65	++	1.54	+
Diseases of Other Endocrine Glands	74	81.81		0.91		87	90.93		1.12	
Diabetes Mellitus	52	57.32	-	0.71	-	57	59.59		0.95	
Ovarian Dysfunction						16	16.63	++	2.71	++
Other Metabolic Disorders and Immunity Disorders	19	20.84		0.89		69	71.85		1.10	
Diseases of Blood and Blood-Forming Organs	10	11.20	--	0.34	--	42	43.79		1.13	
Inflammatory Diseases of the Central Nervous System	12	13.11	++	2.84	++	5	5.25		1.29	
Meningitis of Unspecified Cause	6	6.52	++	4.01	++	2	2.10	#	1.49	
Encephalitis, Myelitis and Encephalomyelitis	6	6.59	++	5.22	++	2	2.10	#	1.46	
Hereditary and Degenerative Diseases of the Central Nervous System	15	16.39		1.62		12	12.46		1.28	
Other Disorders of the Central Nervous System	68	75.30		1.06		261	271.08	++	2.44	++
Multiple Sclerosis	7	7.52		0.85		24	25.04		1.12	
Infantile Cerebral Palsy	1	1.07	#	1.67						
Disorders of the Peripheral Nervous System	58	63.31	++	2.16	++	51	53.14	++	1.48	++
Muscular Dystrophies and Other Myopathies	1	1.15	#	0.65						
Disorders of the Eye and Adnexa	53	58.21		1.08		48	49.93		1.21	
Diseases of the Ear and Mastoid Process	55	60.33		1.22		54	56.19		0.98	
Hypertensive Disease	11	12.13		0.73		8	8.31		0.58	
Ischaemic Heart Disease	200	215.94		1.12		26	27.38		0.75	
Diseases of Pulmonary Circulation	17	18.65	++	2.28	++	15	15.54		1.29	
Other Forms of Heart Disease	96	105.03	+	1.26	+	60	62.54	+	1.38	+
Diseases of Arteries, Arterioles and Capillaries	19	20.60		1.32		14	14.67		1.04	
Atherosclerosis						1	1.06	#	0.62	
Acute Respiratory Infections	26	28.71		1.24		50	52.09	++	1.59	++
Other Diseases of Upper Respiratory Tract	149	165.34	--	0.69	--	148	154.05		0.91	
Pneumonia and Influenza	63	69.65		1.01		82	85.55		1.16	
Chronic Obstructive Pulmonary Disease and Allied Conditions	87	95.01	++	1.60	++	164	171.08	++	1.26	++
Chronic Bronchitis	2	2.20	#	1.25						
Emphysema	6	6.44	++	5.15	++					
Asthma	60	65.80	+	1.38	+	148	154.42	++	1.29	++
Pneumoconioses and Other Lung Diseases due to External Agents	2	2.19	#	0.72		0	0.00	#	0.00	
Diseases of Oesophagus, Stomach and Duodenum	109	119.35		0.90		100	104.18		1.12	
Noninfective Enteritis and Colitis	111	122.51	++	1.42	++	172	178.80	++	1.38	++
Other Diseases of Intestines and Peritoneum	173	189.27	++	1.27	++	187	194.82	++	1.26	++
Other Diseases of Digestive System	283	309.73	++	1.31	++	602	626.79	++	1.24	++
Nephritis, Nephrotic Syndrome and Nephrosis	29	32.15		1.20		16	16.59		0.87	

Table C-8 Continued

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
Other Diseases of Urinary System	202	222.66		0.94		221	230.18		1.13	
Diseases of Male Genital Organs	74	81.40		0.90						
Infertility, Male	15	16.56	++	2.07	+					
Disorders of Breast	11	12.30		1.37		104	108.31		0.85	
Other Disorders of Female Genital Tract						1892	1971.74	++	1.77	++
Endometriosis						130	135.29	--	0.76	--
Infertility, Female						158	163.88	++	1.47	++
Pregnancy With Abortive Outcome						505	524.49	--	0.67	--
Spontaneous Abortion						88	91.43	--	0.33	--
Complications Mainly Related to Pregnancy						1090	1131.75	--	0.67	--
Hypertension Complicating Pregnancy, Childbirth and the Puerperium						216	224.13	-	0.86	-
Early or Threatened Labour						488	506.88	--	0.87	--
Infections of Skin and Subcutaneous Tissue	124	137.18		1.18		54	56.27		1.00	
Other Inflammatory Conditions of Skin and Subcutaneous Tissue	14	15.26		1.24		13	13.58		1.00	
Other Diseases of Skin and Subcutaneous Tissue	18	19.79		0.67		17	17.61	--	0.48	--
Arthropathies and Related Disorders	260	287.59	++	1.51	++	158	164.62	++	1.25	++
Dorsopathies	444	487.54	++	2.01	++	344	358.67	++	2.15	++
Rheumatism, Excluding the Back	132	145.50	++	1.74	++	83	86.66		0.97	
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	90	100.30		1.06		73	75.87	-	0.78	-

Table C-9 **Morbidity as Hospitalization Cases, in Males and Females 45 to 74 years old, 1986-1992:** Cases of Hospitalizations in the study area population from the selected causes, corresponding Age-Standardized Morbidity Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Morbidity Ratios.

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
All Causes	17770	21872.06	++	1.22	##	15442	17796.39	++	1.22	##
Intestinal Infectious Diseases	33	40.43		1.28		45	51.78		1.02	
Other Bacterial Diseases	53	67.12	+	1.35	+	49	56.19	++	1.55	++
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System						1	1.27	#	0.38	
Meningitis due to Enterovirus						1	1.27	#	0.93	
Others Diseases due to Viruses and Chlamydiae	28	33.68	++	1.75	++	24	28.02		1.35	
Viral Hepatitis	2	2.39	#	0.44		2	2.30	#	0.58	
Disorders of Thyroid Gland	17	20.13		1.63		49	55.97		1.22	
Diseases of Other Endocrine Glands	247	301.67		0.94		322	372.96	++	1.21	++
Diabetes Mellitus	212	259.04		0.89		269	312.12	+	1.14	+
Ovarian Dysfunction						1	1.12	#	4.35	
Other Metabolic Disorders and Immunity Disorders	62	77.94		1.14		88	100.93		1.14	
Diseases of Blood and Blood-Forming Organs	95	122.00		1.19		121	141.23	+	1.19	
Inflammatory Diseases of the Central Nervous System	6	6.88		1.00		7	8.16		1.35	
Bacterial Meningitis	1	1.10	#	0.85		1	1.27	#	0.78	
Meningitis of Unspecified Cause	2	2.64	#	1.04		2	2.35	#	1.44	
Encephalitis, Myelitis and Encephalomyelitis	3	3.14	#	2.44		3	3.46	#	2.12	
Hereditary and Degenerative Diseases of the Central Nervous System	56	70.42		1.01		58	66.96		1.17	
Parkinson's Disease	13	17.59		0.70		19	22.09		1.39	
Other Disorders of the Central Nervous System	78	94.61		1.04		82	95.70		1.01	
Multiple Sclerosis	6	7.21		0.73		21	24.52		1.29	
Disorders of the Peripheral Nervous System	104	124.96	++	1.82	++	74	84.39		1.11	
Muscular Dystrophies and Other Myopathies	6	6.56	+	2.77	+	1	1.08	#	0.44	
Disorders of the Eye and Adnexa	312	397.21		0.93		322	371.10	--	0.83	--
Blindness and Low Vision	5	6.90	++	3.73	+	1	1.18	#	1.18	
Diseases of the Ear and Mastoid Process	107	128.42	++	1.74	++	120	137.67	++	1.60	++
Hypertensive Disease	79	92.76		1.00		102	116.83		0.99	
Ischaemic Heart Disease	2064	2524.77	++	1.07	++	1027	1176.39	++	1.22	++
Diseases of Pulmonary Circulation	50	62.11	+	1.33		53	61.06	++	1.61	++
Other Forms of Heart Disease	839	1055.67	++	1.12	++	586	673.60	++	1.21	++
Diseases of Arteries, Arterioles and Capillaries	423	525.61	++	1.36	++	172	196.87	++	1.27	++
Atherosclerosis	14	17.31	--	0.22	--	5	5.85	--	0.16	--
Acute Respiratory Infections	60	77.24	++	1.43	++	71	81.21	++	1.45	++
Other Diseases of Upper Respiratory Tract	113	134.34		0.85		59	67.55	-	0.74	-
Pneumonia and Influenza	260	328.99		1.04		211	241.89		1.06	
Chronic Obstructive Pulmonary Disease and Allied Conditions	534	685.60	++	1.35	++	518	594.03	++	1.38	++
Chronic Bronchitis	31	39.48		1.08		32	36.65	+	1.45	
Emphysema	43	55.22	+	1.39	+	52	59.16	++	2.59	++
Asthma	165	205.64	++	1.71	++	252	291.45	++	1.49	++
Pneumoconioses and Other Lung Diseases due to External Agents	12	15.30		0.87		5	5.76		0.87	
Diseases of Oesophagus, Stomach and Duodenum	291	350.34		1.01		252	289.88	+	1.16	+
Noninfective Enteritis and Colitis	113	139.92	++	1.46	++	161	185.82	++	1.30	++
Other Diseases of Intestines and Peritoneum	424	522.77	++	1.33	++	455	526.34	++	1.25	++

Table C-9 Continued

cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag	Cases	ASmR (per 100,000)	ASmR Flag	SmR	SmR Flag
Other Diseases of Digestive System	795	956.89	++	1.24	++	808	930.74	+	1.08	+
Nephritis, Nephrotic Syndrome and Nephrosis	80	100.81		0.93		79	89.43	+	1.27	+
Other Diseases of Urinary System	568	695.03	++	1.14	++	287	329.40		1.06	
Diseases of Male Genital Organs	791	1010.12		1.02						
Infertility, Male	1	1.30	#	1.53						
Disorders of Breast	9	11.22		1.04		59	68.04	--	0.48	--
Other Disorders of Female Genital Tract	1	1.48	#	6.22		1136	1331.89	++	1.47	++
Endometriosis						19	23.31	--	0.48	--
Infertility, Female						1	1.08	#	2.30	
Pregnancy With Abortive Outcome						2	2.55	#	0.64	
Spontaneous Abortion						1	1.27	#	0.85	
Complications Mainly Related to Pregnancy						1	1.27	#	0.82	
Infections of Skin and Subcutaneous Tissue	152	186.13	++	1.32	++	81	93.61		1.03	
Other Inflammatory Conditions of Skin and Subcutaneous Tissue	21	25.28		1.00		25	29.18		1.08	
Other Diseases of Skin and Subcutaneous Tissue	48	60.27		1.16		59	67.94		1.19	
Arthropathies and Related Disorders	525	630.20	++	1.48	++	540	618.88	++	1.17	++
Dorsopathies	422	503.57	++	1.63	++	355	416.24	++	1.53	++
Rheumatism, Excluding the Back	207	251.24	++	1.41	++	150	172.44		0.94	
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	95	114.28		1.02		152	174.03	--	0.69	--
Certain Conditions Originating in the Perinatal Period						1	1.27	#	2.33	

Table C-10 **Morbidity as Hospitalization Cases, in Males and Females 75+ years old, 1986-1992:** Cases of Hospitalizations in the study area population from the selected causes, corresponding Age-Standardized Morbidity Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Morbidity Ratios.

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	Smr Flag	Cases	ASmR (per 100,000)	ASmR Flag	Smr	SmR Flag
All Causes	5013	55532.64	++	1.13	++	6990	44818.85	++	1.21	++
Intestinal Infectious Diseases	8	86.56		0.85		21	135.48		1.01	
Other Bacterial Diseases	29	322.80		1.30		37	237.47		1.35	
Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases of Central Nervous System	1	9.61	#	4.52						
Meningitis due to Enterovirus	1	9.61	#	17.33						
Others Diseases due to Viruses and Chlamydiae	9	111.24	++	2.50	+	18	115.10	++	3.15	++
Viral Hepatitis						2	12.82	#	4.78	
Disorders of Thyroid Gland	1	11.16	#	0.56		6	38.63		0.84	
Diseases of Other Endocrine Glands	59	627.00		0.84		134	862.13	+	1.23	+
Diabetes Mellitus	47	498.90	-	0.76		119	765.56	++	1.28	+
Other Metabolic Disorders and Immunity Disorders	19	208.52	-	0.60	-	46	295.39	-	0.72	-
Diseases of Blood and Blood-Forming Organs	44	484.37		0.84		103	659.49		1.16	
Inflammatory Diseases of the Central Nervous System						3	19.20	#	3.10	
Hereditary and Degenerative Diseases of the Central Nervous System	44	498.27		1.14		62	397.74	++	1.46	++
Parkinson's Disease	18	210.50		1.20		15	96.42		1.15	
Other Disorders of the Central Nervous System	11	118.49		0.72		27	173.04		1.41	
Disorders of the Peripheral Nervous System	17	198.18	+	1.59		17	109.57		0.91	
Disorders of the Eye and Adnexa	148	1646.32		0.87		351	2249.27		0.97	
Blindness and Low Vision						2	12.58	#	4.07	
Diseases of the Ear and Mastoid Process	13	138.09		1.60		25	159.51		1.39	
Hypertensive Disease	9	98.10	-	0.50	-	53	340.06		1.00	
Ischaemic Heart Disease	452	4949.71	++	1.16	++	644	4137.28	++	1.33	++
Diseases of Pulmonary Circulation	16	180.07		1.34		30	192.78	++	1.77	++
Other Forms of Heart Disease	427	4752.29		1.04		638	4084.21	++	1.15	++
Diseases of Arteries, Arterioles and Capillaries	80	885.26		0.85		80	511.98		1.09	
Atherosclerosis	5	56.17	--	0.24	--	7	44.64	--	0.35	--
Acute Respiratory Infections	43	487.12	++	1.79	++	79	506.09	++	2.30	++
Other Diseases of Upper Respiratory Tract	6	59.22		0.89		10	64.88		1.78	
Pneumonia and Influenza	286	3342.91	++	1.25	++	276	1765.00	++	1.26	++
Chronic Obstructive Pulmonary Disease and Allied Conditions	288	3180.91	++	1.50	++	232	1485.37	++	1.48	++
Chronic Bronchitis	21	231.22		1.55		9	58.12		0.85	
Emphysema	14	148.87		0.88		3	19.20	#	0.36	
Asthma	30	335.12	++	1.60	+	104	665.99	++	2.45	++
Pneumoconioses and Other Lung Diseases due to External Agents	6	63.86	-	0.44	-	4	25.35	-	0.37	-
Diseases of Oesophagus, Stomach and Duodenum	63	699.46		0.82		102	655.63		0.93	
Noninfective Enteritis and Colitis	41	462.10	+	1.49	+	91	583.62	++	1.49	++
Other Diseases of Intestines and Peritoneum	91	1026.93		0.90		217	1388.69		1.11	
Other Diseases of Digestive System	166	1819.71	+	1.21	+	251	1611.15	++	1.32	++
Nephritis, Nephrotic Syndrome and Nephrosis	32	359.75		0.93		25	160.68		0.76	
Other Diseases of Urinary System	182	2022.58	++	1.31	++	122	780.90		1.13	
Diseases of Male Genital Organs	234	2562.59		0.97						
Disorders of Breast	1	14.63	#	0.61		5	32.25		0.60	
Other Disorders of Female Genital Tract						92	592.63	++	1.32	+

Table C-10 Continued

Cause of Hospitalization	Males					Females				
	Cases	ASmR (per 100,000)	ASmR Flag	SmR	Smr Flag	Cases	ASmR (per 100,000)	ASmR Flag	Smr	SmR Flag
Infections of Skin and Subcutaneous Tissue	34	394.04	+	1.52	+	37	235.85		0.96	
Other Inflammatory Conditions of Skin and Subcutaneous Tissue	2	19.22	#	0.43		7	45.01		0.92	
Other Diseases of Skin and Subcutaneous Tissue	11	118.87		1.02		19	122.37		0.84	
Arthropathies and Related Disorders	82	867.40		1.17		135	866.40		0.86	
Dorsopathies	32	359.37		1.14		89	570.60	++	1.59	++
Rheumatism, Excluding the Back	19	192.29		1.24		34	219.10		1.28	
Osteopathies, Chondropathies and Acquired Musculoskeletal Deformities	20	223.54		1.17		73	468.53		1.14	

Table C-11 **Morbidity as Cancer Incidence, in Males and Females of All Ages, 1986-1992:** Incidence of selected cancers in the study area population, corresponding Age-Standardized Incidence Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

a. Males:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	1293	472.17		1.03		(0.98-	1.09)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	62	21.04		1.22		(0.94 -	1.56)
Malignant Neoplasm of the Pharynx	17	5.62		1.30		(0.76 -	2.08)
Malignant Neoplasm of Digestive Organs and Peritoneum	330	120.33		1.12	+	(1.00 -	1.25)
Malignant Neoplasm of Oesophagus	22	7.42		1.24		(0.78 -	1.87)
Malignant Neoplasm of Stomach	44	15.76		1.11		(0.80 -	1.49)
Malignant Neoplasm of Colon and Rectum	198	73.63		1.12		(0.97 -	1.29)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	7	2.29		0.59		(0.24 -	1.21)
Malignant Neoplasm of GallBladder and Extrahepatic Bile Ducts	5	1.77		0.71		(0.23 -	1.62)
Malignant Neoplasm of Pancreas	40	14.33		1.35		(0.97 -	1.85)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	297	103.70		1.07		(0.95 -	1.20)
Malignant Neoplasm of the Trachea, Bronchus and Lung	258	91.11		1.05		(0.93 -	1.19)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	44	14.90		0.86		(0.63 -	1.16)
Malignant Melanoma of Skin	32	10.82		0.89		(0.61 -	1.25)
Malignant Neoplasm of Genitourinary Organs	360	139.83		0.96		(0.87 -	1.07)
Malignant Neoplasm of the Prostate	218	87.65		0.90		(0.79 -	1.03)
Malignant Neoplasm of Testis	9	3.29		0.63		(0.29 -	1.19)
Malignant Neoplasm of the Bladder	86	32.86		1.15		(0.92 -	1.42)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	44	14.75		1.09		(0.79 -	1.46)
Malignant Neoplasm of Other and Unspecified Sites	84	30.47		1.01		(0.80 -	1.25)
Malignant Neoplasm of Thyroid Gland	8	2.82		1.15		(0.50 -	2.25)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	116	41.90		0.97		(0.80 -	1.17)
Non-Hodgkin's Lymphoma	46	15.82		0.92		(0.67 -	1.22)
Hodgkin's Disease	8	2.85		0.77		(0.33 -	1.50)
Leukaemia	48	17.89		1.14		(0.84 -	1.51)

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	1054	323.18	-	0.93	-	(0.87-	0.98)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	24	7.40		1.13		(0.72 -	1.68)
Malignant Neoplasm of the Pharynx	< 5	0.97	#	< 1.00		(0.12 -	1.73)
Malignant Neoplasm of Digestive Organs and Peritoneum	231	68.93		0.97		(0.85 -	1.10)
Malignant Neoplasm of Oesophagus	8	2.33		1.10		(0.47 -	2.14)
Malignant Neoplasm of Stomach	30	9.02		1.35		(0.91 -	1.93)
Malignant Neoplasm of Colon and Rectum	157	46.80		1.01		(0.86 -	1.19)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	< 5	0.90	#	< 1.00		(0.11 -	1.51)
Malignant Neoplasm of GallBladder and Extrahepatic Bile Ducts	6	1.81		0.57		(0.21 -	1.22)
Malignant Neoplasm of Pancreas	22	6.54		0.79		(0.49 -	1.19)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	110	33.08		0.84		(0.69 -	1.01)
Malignant Neoplasm of the Trachea, Bronchus and Lung	100	30.00	-	0.82	-	(0.67 -	1.00)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	317	97.93	-	0.87	-	(0.78 -	0.98)
Malignant Melanoma of Skin	23	7.29		0.70		(0.44 -	1.05)
Malignant Neoplasm of Female Breast	283	87.20	-	0.89	-	(0.79 -	1.00)
Malignant Neoplasm of Genitourinary Organs	204	63.50		0.98		(0.85 -	1.13)
Malignant Neoplasm of Ovary and Other Uterine Adnexa	47	14.66		0.99		(0.72 -	1.31)
Malignant Neoplasm of the Bladder	25	7.57		1.02		(0.66 -	1.50)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	28	8.56		1.13		(0.75 -	1.63)

Table C-11 Continued

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval
Malignant Neoplasm of Other and Unspecified Sites	75	23.87		0.91		(0.71 - 1.14)
Malignant Neoplasm of Thyroid Gland	19	6.36		0.89		(0.54 - 1.39)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	93	28.46		0.98		(0.79 - 1.20)
Non-Hodgkin's Lymphoma	37	11.32		0.91		(0.64 - 1.25)
Hodgkin's Disease	9	2.95		1.03		(0.47 - 1.94)
Leukaemia	31	9.47		0.98		(0.67 - 1.40)

Table C-12 **Morbidity as Cancer Incidence, in Males and Females 0 to 24 years old, 1986-1992:** Incidence of selected cancers in the study area population, corresponding Age-Standardized Incidence Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

a. Males:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	20	17.75		0.82		(0.50	1.26)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	< 5	0.93	#	> 1.00		(0.06 -	13.30)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	< 5	0.88	#	< 1.00		(0.01 -	1.68)
Malignant Neoplasm of Genitourinary Organs	< 5	1.86	#	< 1.00		(0.06 -	1.87)
Malignant Neoplasm of Testis	< 5	0.93	#	< 1.00		(0.01 -	1.93)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	< 5	0.93	#	> 1.00		(0.04 -	8.01)
Malignant Neoplasm of Other and Unspecified Sites	< 5	3.54		< 1.00		(0.20 -	1.90)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	12	10.55		1.14		(0.59 -	1.99)
Non-Hodgkin's Lymphoma	5	4.39		2.16		(0.70 -	4.95)
Hodgkin's Disease	< 5	2.59	#	< 1.00		(0.19 -	2.66)
Leukaemia	< 5	3.57		< 1.00		(0.22 -	2.02)

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	29	26.60		1.34		(0.90	1.92)
Malignant Neoplasm of Digestive Organs and Peritoneum	< 5	0.83	#	> 1.00		(0.04 -	8.66)
Malignant Neoplasm of Stomach	< 5	0.83	#	> 1.00		(0.34 -	74.65)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	< 5	2.81	#	< 1.00		(0.17 -	2.36)
Malignant Neoplasm of Female Breast	< 5	0.93	#	> 1.00		(0.07 -	15.53)
Malignant Neoplasm of Genitourinary Organs	5	4.70		1.93		(0.63 -	4.44)
Malignant Neoplasm of Ovary and Other Uterine Adnexa	< 5	0.93	#	< 1.00		(0.02 -	5.30)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	< 5	1.92	#	> 1.00		(0.35 -	10.38)
Malignant Neoplasm of Other and Unspecified Sites	11	10.21	+	1.84		(0.92 -	3.29)
Malignant Neoplasm of Thyroid Gland	< 5	1.85	#	< 1.00		(0.12 -	3.51)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	9	8.06		1.10		(0.51 -	2.08)
Non-Hodgkin's Lymphoma	< 5	1.70	#	> 1.00		(0.23 -	6.75)
Hodgkin's Disease	< 5	0.83	#	< 1.00		(0.01 -	1.64)
Leukaemia	6	5.53		1.63		(0.60 -	3.50)

Table C-13 **Morbidity as Cancer Incidence, in Males and Females 25 to 44 years old, 1986-1992:** Incidence of selected cancers in the study area population, corresponding Age-Standardized Incidence Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

a. Males:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval
All Malignant Neoplasms	69	75.26		0.93		(0.72- 1.17)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	< 5	3.27	#	< 1.00		(0.13 - 1.86)
Malignant Neoplasm of the Pharynx	< 5	2.19	#	> 1.00		(0.18 - 5.36)
Malignant Neoplasm of Digestive Organs and Peritoneum	8	8.60		0.72		(0.31 - 1.42)
Malignant Neoplasm of Stomach	< 5	1.08	#	< 1.00		(0.02 - 3.34)
Malignant Neoplasm of Colon and Rectum	5	5.37		0.83		(0.27 - 1.92)
Malignant Neoplasm of Pancreas	< 5	2.15	#	> 1.00		(0.24 - 7.07)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	< 5	4.30		< 1.00		(0.16 - 1.44)
Malignant Neoplasm of the Trachea, Bronchus and Lung	< 5	2.15	#	< 1.00		(0.05 - 1.38)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	9	9.80		0.79		(0.36 - 1.49)
Malignant Melanoma of Skin	6	6.50		0.68		(0.25 - 1.47)
Malignant Neoplasm of Genitourinary Organs	17	18.64		1.12		(0.65 - 1.79)
Malignant Neoplasm of Testis	7	7.84		0.77		(0.31 - 1.56)
Malignant Neoplasm of the Bladder	< 5	2.15	#	< 1.00		(0.09 - 2.73)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	7	7.53	+	2.50	+	(1.01 - 5.11)
Malignant Neoplasm of Other and Unspecified Sites	11	11.97		1.11		(0.55 - 1.97)
Malignant Neoplasm of Thyroid Gland	< 5	3.28	#	> 1.00		(0.25 - 3.53)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	17	18.67		1.11		(0.65 - 1.77)
Non-Hodgkin's Lymphoma	7	7.60		0.87		(0.35 - 1.77)
Hodgkin's Disease	< 5	3.37	#	< 1.00		(0.16 - 2.24)
Leukaemia	7	7.70	+	2.31		(0.93 - 4.72)

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval
All Malignant Neoplasms	126	132.03		0.98		(0.82- 1.17)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	< 5	2.09	#	< 1.00		(0.12 - 3.53)
Malignant Neoplasm of the Pharynx	< 5	1.06	#	> 1.00		(0.04 - 8.67)
Malignant Neoplasm of Digestive Organs and Peritoneum	5	5.31		0.58		(0.19 - 1.33)
Malignant Neoplasm of Stomach	< 5	2.12	#	> 1.00		(0.22 - 6.50)
Malignant Neoplasm of Colon and Rectum	< 5	3.18	#	< 1.00		(0.11 - 1.53)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	5	5.22		0.91		(0.29 - 2.09)
Malignant Neoplasm of the Trachea, Bronchus and Lung	< 5	3.16	#	< 1.00		(0.13 - 1.82)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	46	48.25		0.81		(0.59 - 1.08)
Malignant Melanoma of Skin	7	7.27		0.63		(0.26 - 1.29)
Malignant Neoplasm of Female Breast	37	38.91		0.84		(0.59 - 1.16)
Malignant Neoplasm of Genitourinary Organs	37	38.69		1.29		(0.91 - 1.78)
Malignant Neoplasm of Ovary and Other Uterine Adnexa	10	10.48		1.58		(0.76 - 2.89)
Malignant Neoplasm of the Bladder	< 5	3.16	#	> 1.00		(0.55 - 7.77)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	< 5	1.03	#	< 1.00		(0.01 - 2.53)
Malignant Neoplasm of Other and Unspecified Sites	19	19.90		1.23		(0.74 - 1.92)
Malignant Neoplasm of Thyroid Gland	10	10.45		1.07		(0.51 - 1.95)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	12	12.57		1.10		(0.57 - 1.91)
Non-Hodgkin's Lymphoma	5	5.29		1.07		(0.34 - 2.45)
Hodgkin's Disease	5	5.21		1.65		(0.53 - 3.79)
Leukaemia	< 5	2.08	#	< 1.00		(0.09 - 2.54)

Table C-14 **Morbidity as Cancer Incidence, in Males and Females 45 to 74 years old, 1986-1992:** Incidence of selected cancers in the study area population, corresponding Age-Standardized Incidence Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

a. Males:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	941	1174.21	++	1.12	++	(1.05-	1.20)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	49	57.95		1.30		(0.96 -	1.72)
Malignant Neoplasm of the Pharynx	14	16.63		1.36		(0.74 -	2.27)
Malignant Neoplasm of Digestive Organs and Peritoneum	259	326.36	++	1.25	++	(1.10 -	1.41)
Malignant Neoplasm of Oesophagus	21	26.66	+	1.55		(0.96 -	2.37)
Malignant Neoplasm of Stomach	36	45.91		1.32		(0.93 -	1.83)
Malignant Neoplasm of Colon and Rectum	151	190.32	+	1.21	+	(1.03 -	1.42)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	6	7.08		0.70		(0.26 -	1.51)
Malignant Neoplasm of GallBladder and Extrahepatic Bile Ducts	< 5	4.82		< 1.00		(0.23 -	2.15)
Malignant Neoplasm of Pancreas	30	37.89	+	1.45		(0.98 -	2.08)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	245	301.90	+	1.16	+	(1.02 -	1.31)
Malignant Neoplasm of the Trachea, Bronchus and Lung	211	261.67		1.13		(0.98 -	1.29)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	32	38.68		1.09		(0.75 -	1.54)
Malignant Melanoma of Skin	25	30.26		1.13		(0.74 -	1.68)
Malignant Neoplasm of Genitourinary Organs	237	303.56		1.02		(0.89 -	1.16)
Malignant Neoplasm of the Prostate	143	188.95		0.96		(0.81 -	1.13)
Malignant Neoplasm of Testis	< 5	1.10	#	< 1.00		(0.01 -	2.68)
Malignant Neoplasm of the Bladder	59	72.09		1.18		(0.90 -	1.53)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	33	39.94		1.11		(0.77 -	1.57)
Malignant Neoplasm of Other and Unspecified Sites	53	64.54		1.08		(0.81 -	1.41)
Malignant Neoplasm of Thyroid Gland	< 5	4.79		> 1.00		(0.29 -	2.71)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	66	81.22		0.95		(0.74 -	1.21)
Non-Hodgkin's Lymphoma	30	37.35		0.95		(0.64 -	1.35)
Hodgkin's Disease	< 5	1.05	#	< 1.00		(0.01 -	1.83)
Leukaemia	25	30.95		1.06		(0.69 -	1.57)

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	663	760.71		0.93		(0.86-	1.01)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	16	18.73		1.18		(0.67 -	1.91)
Malignant Neoplasm of the Pharynx	< 5	1.18	#	< 1.00		(0.01 -	1.61)
Malignant Neoplasm of Digestive Organs and Peritoneum	148	168.72		1.07		(0.90 -	1.26)
Malignant Neoplasm of Oesophagus	6	6.68		1.39		(0.51 -	2.99)
Malignant Neoplasm of Stomach	20	22.75	+	1.66	+	(1.02 -	2.57)
Malignant Neoplasm of Colon and Rectum	103	117.17		1.12		(0.92 -	1.36)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	< 5	1.17	#	< 1.00		(0.01 -	1.82)
Malignant Neoplasm of GallBladder and Extrahepatic Bile Ducts	< 5	2.45	#	< 1.00		(0.04 -	1.19)
Malignant Neoplasm of Pancreas	13	14.88		0.82		(0.44 -	1.40)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	85	97.03		0.87		(0.70 -	1.08)
Malignant Neoplasm of the Trachea, Bronchus and Lung	77	87.99		0.85		(0.67 -	1.06)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	209	240.61		0.88		(0.77 -	1.01)
Malignant Melanoma of Skin	12	13.84		0.73		(0.38 -	1.27)
Malignant Neoplasm of Female Breast	192	221.09		0.89		(0.77 -	1.02)
Malignant Neoplasm of Genitourinary Organs	130	149.76		0.97		(0.81 -	1.15)
Malignant Neoplasm of Ovary and Other Uterine Adnexa	26	29.80		0.83		(0.54 -	1.22)
Malignant Neoplasm of the Bladder	13	14.62		0.93		(0.49 -	1.58)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	22	25.43		1.36		(0.86 -	2.06)

Table C-14 Continued

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval
Malignant Neoplasm of Other and Unspecified Sites	33	38.01		0.82		(0.56 - 1.15)
Malignant Neoplasm of Thyroid Gland	6	7.05		0.70		(0.26 - 1.50)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	42	47.86		0.85		(0.61 - 1.15)
Non-Hodgkin's Lymphoma	20	22.85		0.81		(0.50 - 1.26)
Hodgkin's Disease	< 5	3.37	#	> 1.00		(0.34 - 4.84)
Leukaemia	11	12.58		0.77		(0.39 - 1.37)

Table C-15 **Morbidity as Cancer Incidence, in Males and Females 75+ years old, 1986-1992:** Incidence of selected cancers in the study area population, corresponding Age-Standardized Incidence Rates (per 100,000 population) and rate comparisons with Ontario data including Standardized Incidence Ratios.

a. Males:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	263	2889.62	-	0.84	-	(0.74-	0.95)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	9	96.17		1.12		(0.51 -	2.10)
Malignant Neoplasm of the Pharynx	< 5	11.16	#	< 1.00		(0.02 -	4.54)
Malignant Neoplasm of Digestive Organs and Peritoneum	63	695.20		0.83		(0.64 -	1.06)
Malignant Neoplasm of Oesophagus	< 5	9.61	#	< 1.00		(0.01 -	1.46)
Malignant Neoplasm of Stomach	7	73.47		0.64		(0.26 -	1.31)
Malignant Neoplasm of Colon and Rectum	42	477.89		0.92		(0.66 -	1.24)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	< 5	9.61	#	< 1.00		(0.01 -	2.59)
Malignant Neoplasm of GallBladder and Extrahepatic Bile Ducts	< 5	11.16	#	< 1.00		(0.01 -	2.52)
Malignant Neoplasm of Pancreas+B44	8	79.99		1.01		(0.44 -	1.98)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	48	504.66		0.83		(0.61 -	1.10)
Malignant Neoplasm of the Trachea, Bronchus and Lung	45	475.82		0.84		(0.62 -	1.13)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	< 5	24.25	#	< 1.00		(0.03 -	1.03)
Malignant Melanoma of Skin	< 5	14.63	#	< 1.00		(0.01 -	1.23)
Malignant Neoplasm of Genitourinary Organs	104	1160.38		0.85		(0.70 -	1.03)
Malignant Neoplasm of the Prostate	75	830.63		0.82		(0.64 -	1.02)
Malignant Neoplasm of the Bladder	25	288.21		1.14		(0.74 -	1.68)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	< 5	30.38	#	< 1.00		(0.08 -	1.15)
Malignant Neoplasm of Other and Unspecified Sites	16	179.30		0.85		(0.49 -	1.38)
Malignant Neoplasm of Thyroid Gland	< 5	9.61	#	> 1.00		(0.06 -	13.10)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	21	229.67		0.87		(0.54 -	1.33)
Non-Hodgkin's Lymphoma	< 5	41.54		< 1.00		(0.13 -	1.22)
Hodgkin's Disease	< 5	11.16	#	> 1.00		(0.06 -	13.95)
Leukaemia	12	128.48		1.12		(0.58 -	1.95)

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval	
All Malignant Neoplasms	2236	1513.76	-	0.85	-	(0.75-	0.97)
Malignant Neoplasm of Lip, Oral Cavity and Pharynx	6	38.72		1.14		(0.42 -	2.44)
Malignant Neoplasm of the Pharynx	< 5	6.53	#	> 1.00		(0.03 -	7.66)
Malignant Neoplasm of Digestive Organs and Peritoneum	77	492.94		0.85		(0.67 -	1.06)
Malignant Neoplasm of Oesophagus	< 5	12.67	#	< 1.00		(0.08 -	2.52)
Malignant Neoplasm of Stomach	7	44.54		0.78		(0.31 -	1.59)
Malignant Neoplasm of Colon and Rectum	51	327.10		0.89		(0.67 -	1.17)
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	< 5	12.82	#	< 1.00		(0.12 -	3.45)
Malignant Neoplasm of GallBladder and Extrahepatic Bile Ducts	< 5	25.40		< 1.00		(0.26 -	2.39)
Malignant Neoplasm of Pancreas	9	57.60		0.80		(0.37 -	1.51)
Malignant Neoplasm of Respiratory and Intrathoracic Organs	20	128.15		0.72		(0.44 -	1.12)
Malignant Neoplasm of the Trachea, Bronchus and Lung	20	128.15		0.77		(0.47 -	1.18)
Malignant Neoplasm of Bone, Connective Tissue, Skin and Breast	59	380.02		0.91		(0.70 -	1.18)
Malignant Melanoma of Skin	< 5	25.72		< 1.00		(0.26 -	2.42)
Malignant Neoplasm of Female Breast	53	341.39		0.90		(0.68 -	1.18)
Malignant Neoplasm of Genitourinary Organs	32	205.14		0.76		(0.52 -	1.08)
Malignant Neoplasm of Ovary and Other Uterine Adnexa	10	64.27		1.11		(0.53 -	2.03)
Malignant Neoplasm of the Bladder	9	57.98		0.95		(0.44 -	1.80)
Malignant Neoplasm of Kidney, Other and Unspecified Urinary Organs	< 5	19.11	#	< 1.00		(0.10 -	1.47)
Malignant Neoplasm of Other and Unspecified Sites	12	77.03		0.58		(0.30 -	1.01)

Table C-15 Continued

b. Females:

Cancer	Incidence	ASIR (per 100,000)	ASIR Flag	SIR	SIR Flag	95% Confidence Interval
Malignant Neoplasm of Thyroid Gland	< 5	6.29	#	< 1.00		(0.02 - 4.28)
Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	30	191.75		1.13		(0.76 - 1.61)
Non-Hodgkin's Lymphoma	10	63.94		0.97		(0.46 - 1.77)
Leukaemia	12	76.74		1.12		(0.58 - 1.95)

Table C-16 **Birth Weights for Male and Female Infants, 1986-1992:** Number and percentage of Births by Weight and Mean and Median birth weights, for both the study-area and Ontario populations.

a. Male Infants				
Weight Intervals (g)	Ontario	% of Total	St. Mary's River	% of Total
Total [2]	**518976**	**100**	**4253**	**100**
400-500	241	0.05	1	0.02
501-750	830	0.16	4	0.09
751-1000	991	0.19	7	0.16
1001-1250	1181	0.23	7	0.16
1251-1500	1510	0.29	8	0.19
1501-1750	2066	0.40	19	0.45
1751-2000	3269	0.63	28	0.66
2001-2250	5853	1.13	50	1.18
2251-2500	11047	2.13	90	2.12
Total 2500 or less	**26988**	**5.20**	**214**	**5.03**
2501-2750	22065	4.25	187	4.40
2751-3000	44564	8.59	364	8.56
3001-3250	74592	14.37	562	13.21
3251-3500	98739	19.03	762	17.92
3501-3750	96884	18.67	829	19.49
3751-4000	74631	14.38	620	14.58
4001-4250	43929	8.46	370	8.70
4251-4500	22150	4.27	203	4.77
4501-4750	9173	1.77	79	1.86
4751-5000	3491	0.67	37	0.87
5001-5250	1108	0.21	21	0.49
5251-5500	384	0.07	4	0.09
5501-5750	118	0.02	-	-
5751-6000	44	0.01	1	0.02
6001-6250	28	0.01	-	-
6251-6500	15	0.00	-	-
6501 and over	73	0.01	-	-
Total 2500 and over	**491988**	**94.80**	**4039**	**94.97**
Unknown[1]	1840	0.353	3	0.070

Mean weight(grams)[2]	3460	3485*
Median weight(grams)[2]	3490	3510

[1]Unknown weight is value of 9999, 0,blank, and less than 400 grams. Unknown are given as percentage of all births.

[2]Based on known weights only.

*Significantly higher $p<0.01$

Table C-16 Continued

b. Female Infants				
Weight Intervals (g+A84)	Ontario	% of Total	St. Mary's River	% of Total
Total [2]	**494203**	**100**	**3924**	**100**
400-500	217	0.0	1	0.03
501-750	828	0.2	2	0.05
751-1000	937	0.2	5	0.13
1001-1250	1034	0.2	9	0.23
1251-1500	1417	0.3	7	0.18
1501-1750	2029	0.4	16	0.41
1751-2000	3477	0.7	23	0.59
2001-2250	6333	1.3	49	1.25
2251-2500	13364	2.7	101	2.57
Total 2500 or less	**29636**	**6.0**	**213**	**5.43**
2501-2750	28719	5.8	224	5.71
2751-3000	58116	11.8	427	10.88
3001-3250	88779	18.0	716	18.25
3251-3500	102231	20.7	797	20.31
3501-3750	85119	17.2	659	16.79
3751-4000	55888	11.3	458	11.67
4001-4250	27265	5.5	244	6.22
4251-4500	11950	2.4	112	2.85
4501-4750	4325	0.9	46	1.17
4751-5000	1410	0.3	21	0.54
5001-5250	433	0.1	4	0.10
5251-5500	147	0.0	3	0.08
5501-5750	63	0.0	-	-
5751-6000	28	0.0	-	-
6001-6250	15	0.0	-	-
6251-6500	14	0.0	-	-
6501 and over	65	0.0	-	-
Total 2500 and over	**464567**	**94.0**	**3711**	**94.57**
Unknown[1]	1585	0.320	2	0.051

Mean weight(grams)[2]	3335	3369*
Median weight(grams)[2]	3360	3370

[1]Unknown weight is value of 9999, 0,blank, and less than 400 grams. Unknown are given as percentage of all births.

[2]Based on known weights only.

*Significantly higher $p<0.01$

Table C-17 **Birth Outcomes as Incidence of Congenital Anomalies, for Male and Female Infants <1 year old, 1986-1992:** Incidence of selected Anomalies in the study area population, corresponding Age-Specific Incidence Rates (per 10,000 births) and rate comparisons with Ontario data including Incidence Ratios.

a. Male Infants

Type of Anomaly	Incidence	ASIR (per 10,000)	Incidence Ratio	95 % Confidence Interval	Ratio Flag
Births	4,277				
All anomalies	189	441.9	0.79	(0.68-0.91)	-
Central Nervous System Anomalies	14	32.7	1.07	(0.58-1.79)	
Anencephalus and Similar Anomalies	1	2.3	1.30	(0.02-7.24)	
Spina Bifida	5	11.7	1.76	(0.57-4.1)	
Microcephalus and Brain Reduction	1	2.3	0.44	(0.01-2.47)	
Congenital Hydrocephalus	6	14.0	1.53	(0.56-3.33)	
Eye Anomalies	6	14.0	2.21	(0.81-4.81)	
Congenital Heart Defects	28	65.5	0.88	(0.58-1.27)	
Ventricular Septal Defect	10	23.4	0.83	(0.4-1.52)	
Atrial Septal Defect	7	16.4	0.88	(0.35-1.81)	
Circulatory System Anomalies	11	25.7	0.98	(0.49-1.76)	
Pulmonary Artery Anomalies	3	7.0	0.88	(0.18-2.58)	
Respiratory System Anomalies	5	11.7	0.80	(0.26-1.88)	
Cleft Lip and/or Palate	9	21.0	1.20	(0.55-2.28)	
Digestive System Anomalies	29	67.8	1.14	(0.76-1.64)	
Hypospadias, Epispadias	10	23.4	0.53	(0.25-0.97)	-
Urinary System Anomalies	7	16.4	0.54	(0.22-1.12)	
Renal Agenesis and Dysgenesis	3	7.0	1.36	(0.27-3.96)	
Clubfoot	13	30.4	0.65	(0.34-1.09)	
Polydactyly, Syndactyly	3	7.0	0.38	(0.08-1.11)	
Down Syndrome	4	9.4	0.67	(0.18-1.72)	

b. Female Infants

Type of Anomaly	Incidence	ASIR (per 10,000)	Incidence Ratio	95 % Confidence Interval	Ratio Flag
Births	3,953				
All anomalies	127	321.3	0.68	(0.57-0.81)	-
Central nervous system anomalies	11	27.8	0.88	(0.44-1.57)	
Anencephalus and Similar Anomalies	4	10.1	3.11	(0.84-7.97)	
Spina Bifida	5	12.6	1.52	(0.49-3.54)	
Microcephalus and Brain Reduction	1	2.5	0.37	(0.00-2.06)	
Congenital Hydrocephalus	3	7.6	1.08	(0.22-3.14)	
Eye Anomalies	3	7.6	1.34	(0.27-3.91)	
Congenital Heart Defects	23	58.2	0.81	(0.51-1.21)	
Ventricular Septal Defect	6	15.2	0.52	(0.19-1.12)	
Atrial Septal Defect	11	27.8	1.54	(0.77-2.75)	
Circulatory System Anomalies	7	17.7	0.77	(0.31-1.59)	
Pulmonary Artery Anomalies	5	12.6	1.58	(0.51-3.68)	
Respiratory System Anomalies	2	5.1	0.45	(0.05-1.62)	
Cleft Lip and/or Palate	5	12.6	0.86	(0.28-2.01)	
Digestive System Anomalies	10	25.3	0.87	(0.41-1.59)	
Urinary System Anomalies	3	7.6	0.48	(0.10-1.39)	
Renal Agenesis and Dysgenesis	1	2.5	0.81	(0.01-4.52)	
Clubfoot	14	35.4	0.82	(0.45-1.38)	
Polydactyly, Syndactyly	2	5.1	0.45	(0.05-1.63)	

Table C-17 Continued

b. Female Infants					
Type of Anomaly	Incidence	ASIR (per 10,000)	Incidence Ratio	95 % Confidence Interval	Ratio Flag
Limb Reduction Anomalies	1	2.5	0.75	(0.01-4.16)	
Down Syndrome	6	15.2	1.29	(0.47-2.81)	

Table C-18 Birth Outcomes as Infant Mortality, for Males and Females <1 year old, 1986-1992: Deaths in the study-area population from All Causes, corresponding Age-Specific Mortality Rates (per 100,000 births) and rate comparisons with Ontario data including Mortality Ratios.

a. Male Infants

Cause of Death	Deaths	*ASMR* /100,000	*ASMR* Flag	Mortality Ratio	Ratio Flag	95% Confidence Interval
All Causes	25	605.47		0.85		(0.55 - 1.26)

b. Female Infants

Cause of Death	Deaths	*ASMR* /100,000	*ASMR* Flag	Mortality Ratio	Ratio Flag	95% Confidence Interval
All Causes	19	500.26		0.85		(0.51 - 1.33)

Appendix D: Glossary

age categories	5 consecutive age groupings used to simplify the presentation of health data and statistics
age groups	19 systematic divisions of the population according to age and spanning all possible ages from 0 to 85+ years
age-specific	pertaining to one of the 19 age groups
age-standardized	having undergone either a direct or indirect mathematical process to eliminate age as a confounding variable when comparing data
AOC	Area of Concern - a severely contaminated geographical region in the Great Lakes basin designated under Annex 2 of the Great Lakes Water Quality Agreement as requiring a Remedial Action Plan; 43 such areas have been defined with 16 situated wholly or partially in Ontario
births	refers only to live births
birth outcomes	birth weights as well as congenital anomalies incidence and infant mortality from birth to 12 months of age
CD	Census Division - a general term applied to counties, regional districts and regional municipalities
CMA	Census Metropolitan Area - a geopolitical unit consisting of an urban core and the adjacent urban and rural areas that have a high degree of social and economic integration with the core
CSD	Census Subdivision - a general term applied to a municipality, Indian Reserve, unorganized territory or subdivision
congenital anomalies	certain mental or physical traits, malformations or diseases existing at birth which may be hereditary or due to an influence occurring during gestation up to the moment of birth
contaminant	substance foreign to a natural system or present in unnatural quantities
health outcome	a change in health status resulting in death and/or disease
ICD-9 codes	International Classification of Diseases, Ninth Revision codes - the classification of health outcomes based on body systems and/or anatomical sites affected

incidence (as a rate)	the number of new occurrences (new cases of specific cancers or congenital anomalies) in a defined population within a specified time period
morbidity	the condition of being sick or ill
morbidity (as a rate)	the number of hospitalizations in a defined population within a specified time period
mortality	the loss of life
mortality (as a rate)	the number of deaths in a defined population within a specified time period
ORC	Ontario Residence Code - a four digit system used in Ontario which identifies a geographical location and for which there exists a mapping into Standard Geographic Codes
rate	a measure of the frequency of an occurrence or a phenomenon
RAP	Remedial Action Plan - the multifaceted project designed to rehabilitate an Area of Concern
SGC	Standard Geographic Code - a seven digit designation for a geographic unit, used throughout Canada, which contains provincial, census division and census subdivision information, and is equivalent to legislatively-determined, provincial municipalities as units of local government
study area	the geographic location, situated in the proximity of the Area of Concern and defined by Standard Geographic Codes, for which health data have been collected