

Non-Hodgkin's lymphoma (NHL) encompasses a wide variety of malignancies arising in lymphoid tissue. Depending on the subtype, it may grow slowly or rapidly, and often involves the bone marrow. It may arise in or spread to other organs, including the central nervous system. The two broadest sub-types are diffuse and nodular, also known as follicular lymphomas. Although both children and adults develop NHL, in contrast to adult lymphomas, childhood NHL is almost never follicular and occurs predominantly in the chest and abdomen, and less commonly at peripheral nodal sites.

The number of new cases of NHL is projected to have more than tripled over the last 30 years in both males and females while rates have doubled (Figure 10.1). The number of deaths each year from NHL has almost tripled over the last 30 years (Figure 10.2), whereas mortality rate increases have been more modest. Age-standardized rates have climbed faster among males than females.

Incidence Patterns by Age and Gender

With the exception of children and adolescents (not shown), incidence rates have increased; as with almost all cancers, incidence rates increase with increasing age and are higher among males than females. Among men, the largest increases were seen in men 80 years or older (Figure 10.3 and Table 16). Among women, the largest relative increases were in women aged 30-49 years (Table 16), although it is not apparent in Figure 10.4 because of the low rates at younger ages. The age-specific patterns of NHL mortality rates (Figures 10.5 and 10.6) were similar to those noted for incidence. As is the case for most cancers, NHL mortality rates have declined among children and adolescents. For the period 1991-1998, the average annual percent change in incidence was 1.4%, and the corresponding change in mortality for 1991-1999 was 1.3% (Table 16).

International Comparisons

Age-standardized incidence rates of NHL in Canada and the United States are among the highest in the world (Figures 10.7 and 10.8). Rates are low in east Asia, intermediate in Africa and high in Western Europe, Australia, and Northern America (United States and Canada). International variations reflect differences in reporting completeness as well as true variation related to exposure to risk factors.

Incidence and mortality rates for NHL tended to be higher in the United States than in Canada beginning in the 1990s (Figure 10.9); however, this gap is becoming less evident, perhaps as a result of better control of AIDS, which was a more important cause of NHL in the United States than in Canada in the 1990s.

Incidence Patterns of Non-Hodgkin's Lymphoma by Sub-type

The current classification scheme for NHL is an updated World Health Organization (WHO) version of the Revised European American Lymphoma (REAL) classification. It refers to morphology and cell lineage, and divides NHL according to B-cell or T-cell/natural killer-cell origin, and according to whether it is composed of precursor (thymic or lymphoblastic) or peripheral (mature or post-thymic) lymphocytes.¹ The current report relies upon the previous Working Formulation, which used cell morphology as the basis of sub-types of NHL. The greatest difference in sub-type by age was found between those under age 20 and those 20 years and older (Figure 10.10). For example, Burkitt lymphoma is a common form of NHL in children and adolescents but is rarely seen in adults.

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Broadly speaking, nodular/follicular forms of NHL tend to have an indolent, but ultimately fatal course. Usually the disease is widespread throughout the body and involves the bone marrow early in the course of the disease. Patients may live 10 years or more, intermittently requiring easily tolerated therapies. The diffuse forms tend to be much more aggressive but hold the possibility of cure, especially when the spread is limited.¹ Most cases of NHL are diffuse, although the increases have been greater for the nodular form (Figures 10.11 and 10.12).

Implications for Non-Hodgkin's Lymphoma Control Efforts

Unlike most major forms of cancer, both incidence and mortality rates of non-Hodgkin's lymphoma are increasing. The reasons for these increasing rates are not known but are likely to involve both true increases and improvements in the detection and classification of NHL. The introduction of immunological and genetic techniques has improved our ability to appropriately identify and categorize the condition; unfortunately, these improvements have complicated the interpretation of temporal trends. Improvements in our understanding of hematopoietic neoplasms have resulted in the recognition that certain leukemias and lymphomas are different manifestations of the same neoplasm, for example, lymphoblastic lymphoma is also a manifestation of acute lymphocytic leukemia.

The etiology of NHL is poorly understood but may be related to exposure to an infectious agent and/or to proliferation of lymphoid cells as an aberrant, uncontrolled immune response, or it may be associated with exposures that depress the immune system's surveillance and responsiveness, such as HIV infection or treatment with immunosuppressive drugs. For example, the Epstein-Barr virus is associated with Burkitt lymphoma.² Overall, the AIDS epidemic of the last two decades has had only a very minor role in increasing NHL rates in Canada.³ An uncommon form of NHL (MALT lymphoma) is associated with infection with *Helicobacter pylori*⁴ and provides a rare example of a cancer that can, at least in some cases, be controlled by antibiotics. Although not always consistent, epidemiologic studies suggest an increased risk of NHL with exposure to dioxins and phenoxy herbicides.^{5,6} Because of our limited understanding of the causes of NHL, it is not yet possible to prevent the disease overall, thus the search for the cause of the increasing rates remains an important and active area of research.

*Incidence rates for non-Hodgkin's lymphoma
have increased rapidly since 1974.*

Table 16

Average Annual Percent Change (AAPC) in Age-Standardized Incidence (1991-1998) and Mortality (1991-1999) Rates for Non-Hodgkin's Lymphoma, by Age group and Gender, Canada

Age Group	AAPC in Incidence 1991-1998			AAPC in Mortality 1991-1999		
	Total	M	F	Total	M	F
0-19	-2.5	-2.6	-1.8	-3.9	-5.1**	-1.2
20-29	1.0	1.4	0.4	3.5	3.3	4.6
30-39	1.0	-0.2	3.0*	0.3	0.0	0.5
40-49	0.8	-0.3	2.6*	-1.2	-1.5	-0.8
50-59	1.3*	2.1*	0.3	-0.5	1.0	-2.6**
60-69	2.1**	1.7*	2.6*	1.2	1.4	0.9
70-79	1.1*	1.0	1.2*	1.8*	2.7*	0.6
80+	2.2**	3.2**	0.9	2.4**	2.7**	2.0*
All ages	1.4**	1.3**	1.5**	1.3**	1.7**	0.6

* Significant at p = 0.05

**Significant at p = 0.01

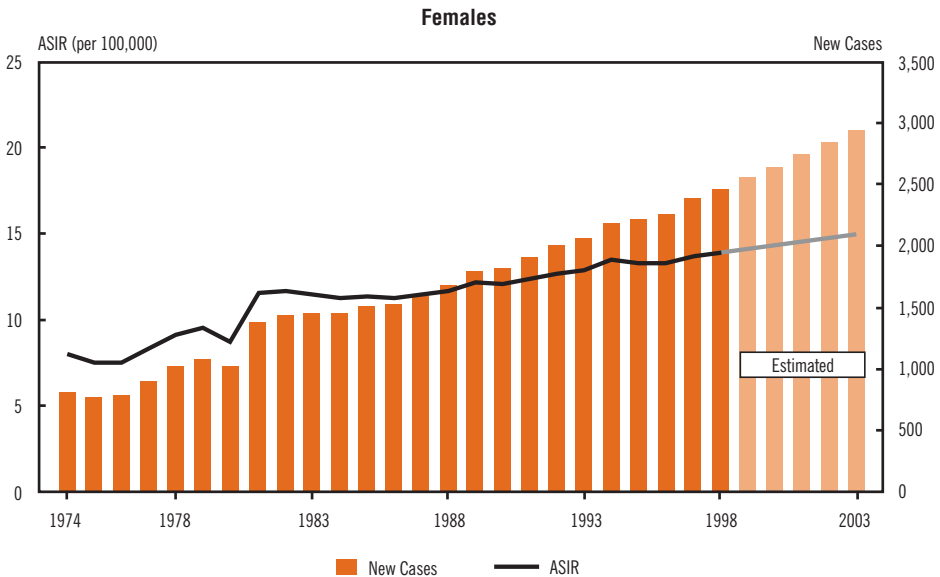
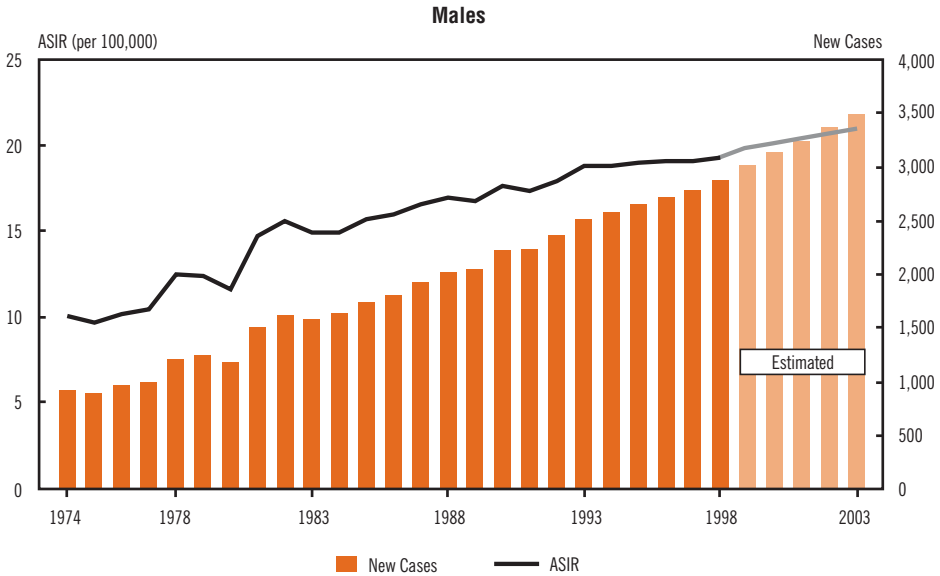
Note: A Poisson regression model was used for AAPC for mortality ages 0-19, since no deaths were observed among females in this age range during 1999.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

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Figure 10.1

New Cases and Age-Standardized Incidence Rates (ASIR) for Non-Hodgkin's Lymphoma, Canada, 1974-2003

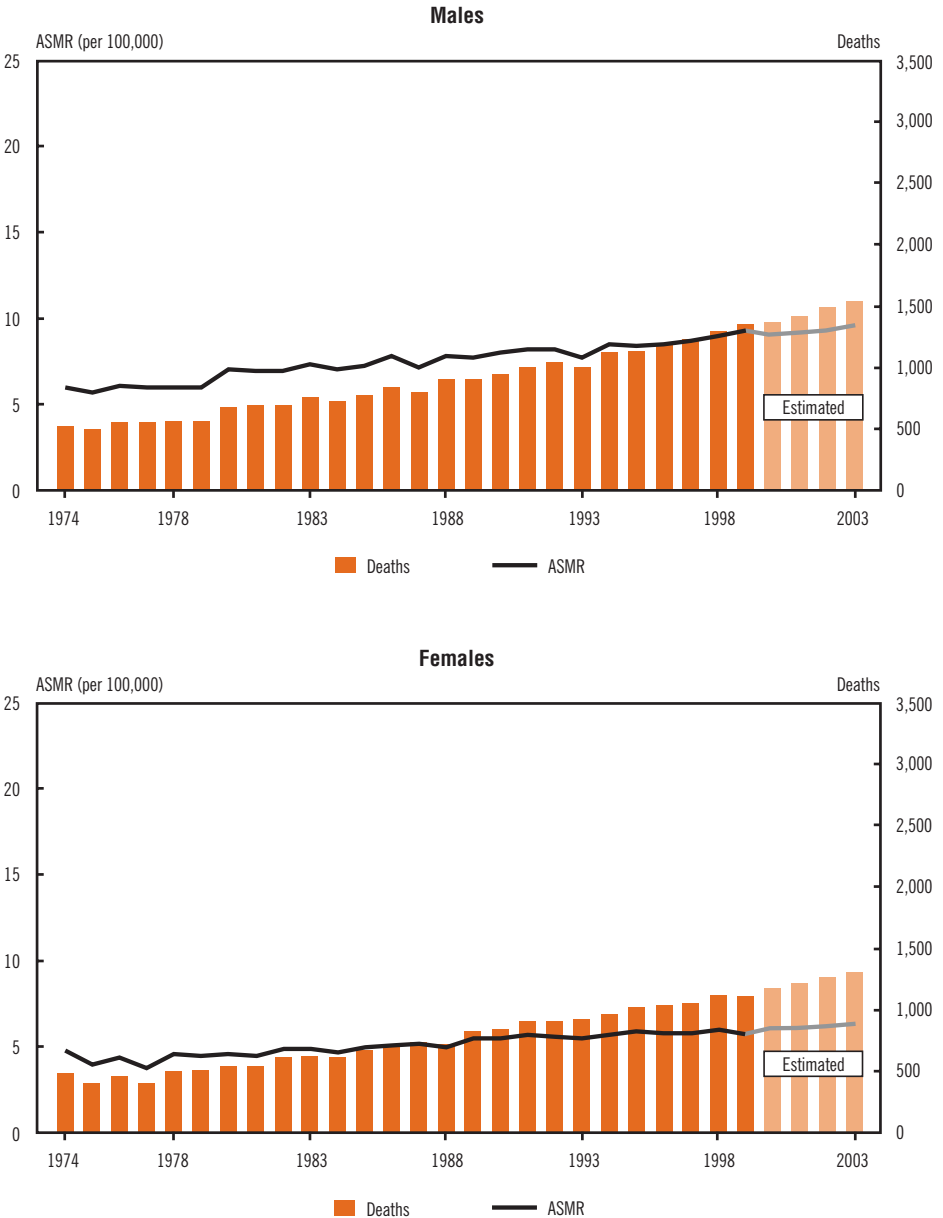


Note: Rates are standardized to the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 10.2

Deaths and Age-Standardized Mortality Rates (ASMR) for Non-Hodgkin's Lymphoma, Canada, 1974-2003



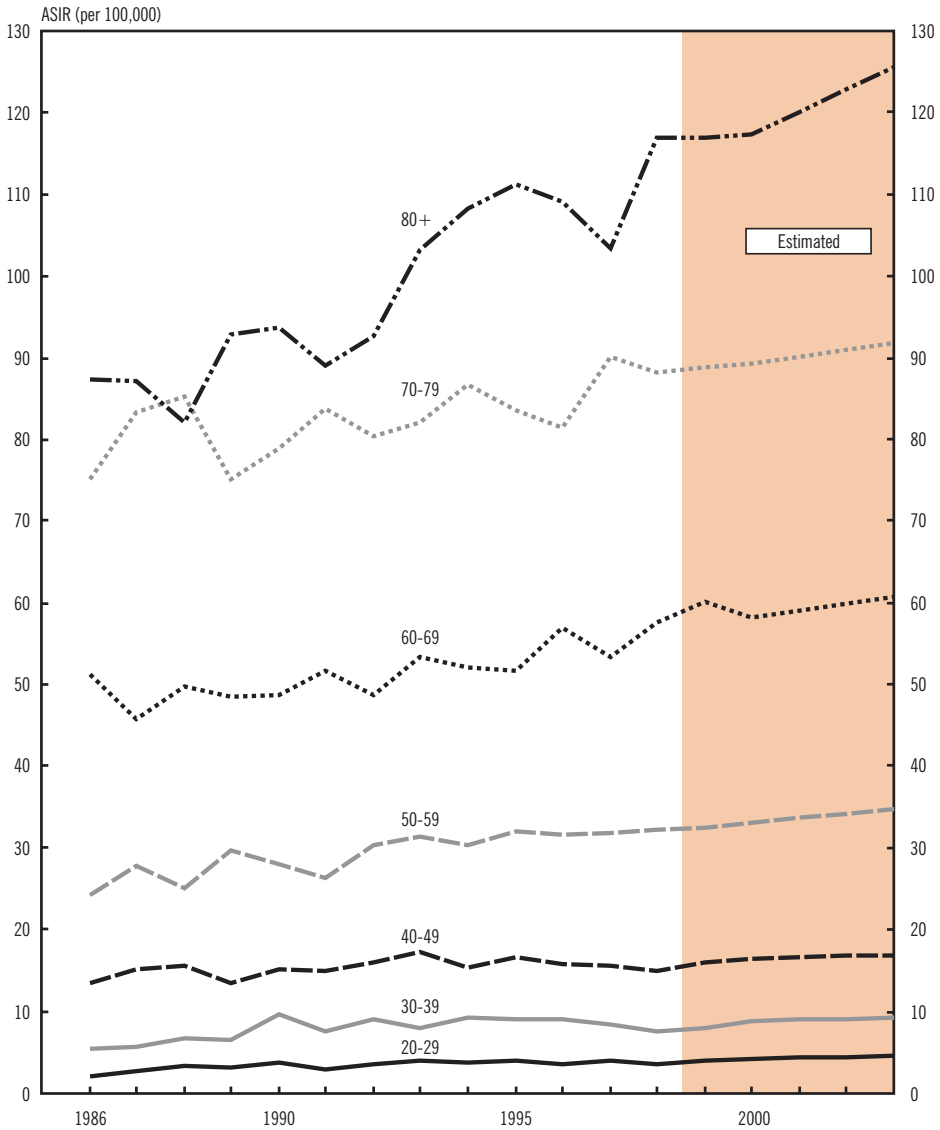
Note: Rates are standardized to the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

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Figure 10.3

Age-Standardized Incidence Rates (ASIR) for Non-Hodgkin's Lymphoma, Males, 10-year Age Groups, Canada, 1986-2003

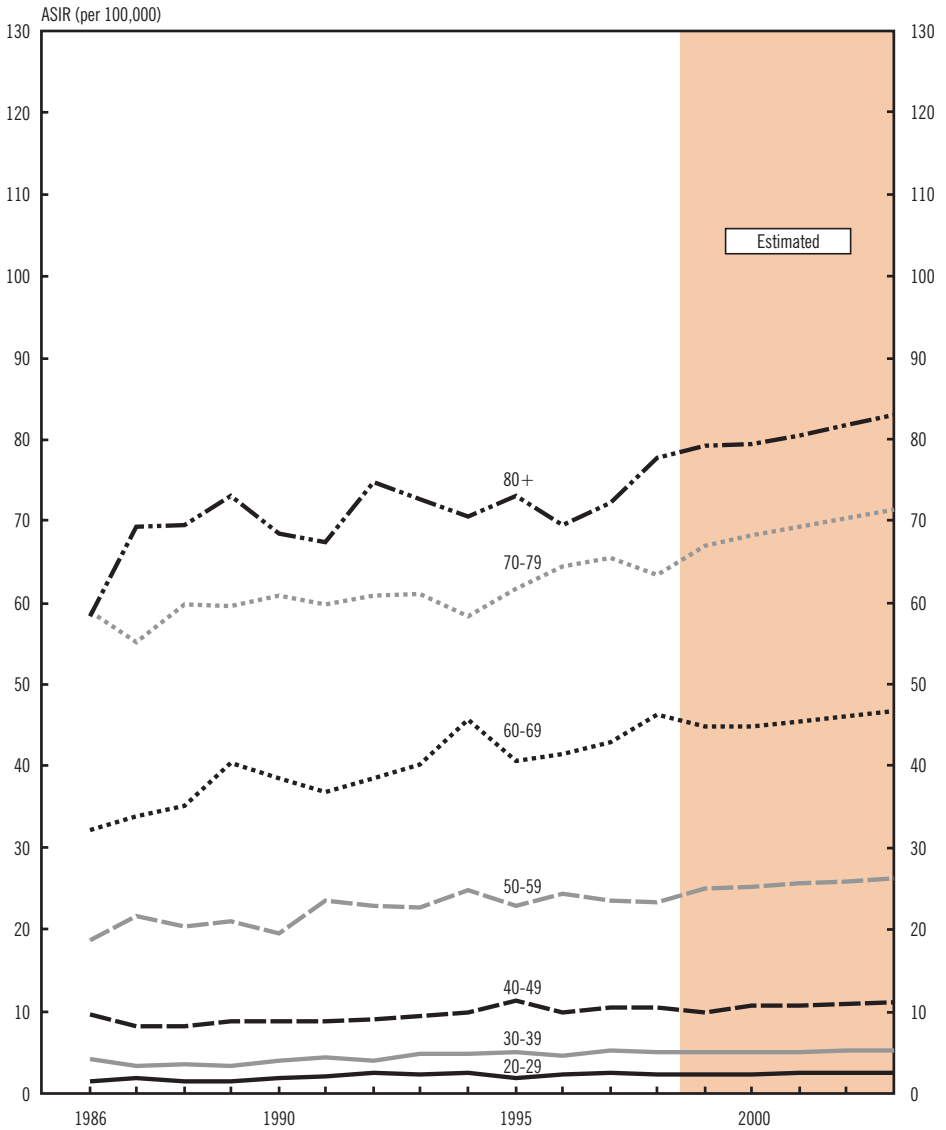


Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 10.4

Age-Standardized Incidence Rates (ASIR) for Non-Hodgkin's Lymphoma, Females, 10-year Age Groups, Canada, 1986-2003



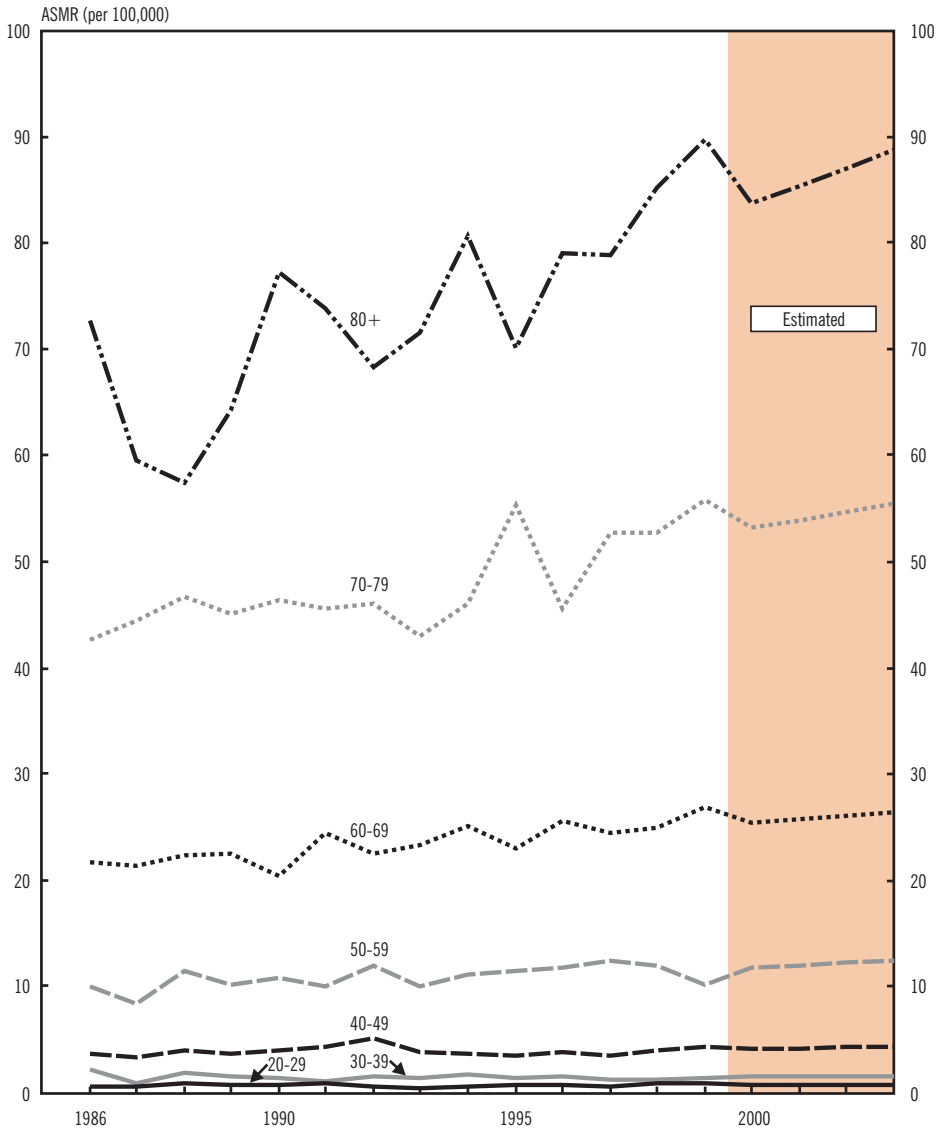
Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

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Figure 10.5

Age-Standardized Mortality Rates (ASMR) for Non-Hodgkin's Lymphoma, Males, 10-year Age Groups, Canada, 1986-2003

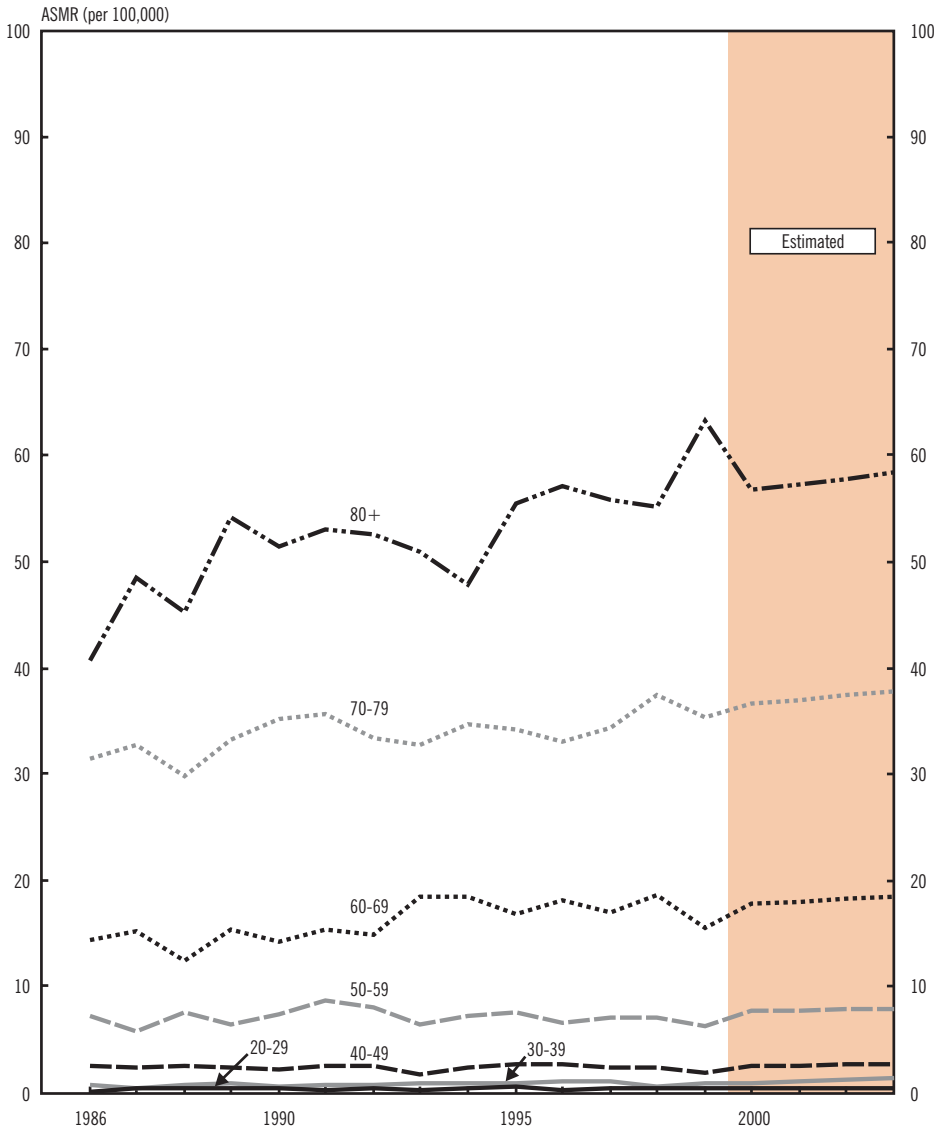


Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 10.6

Age-Standardized Mortality Rates (ASMR) for Non-Hodgkin's Lymphoma, Females, 10-year Age Groups, Canada, 1986-2003



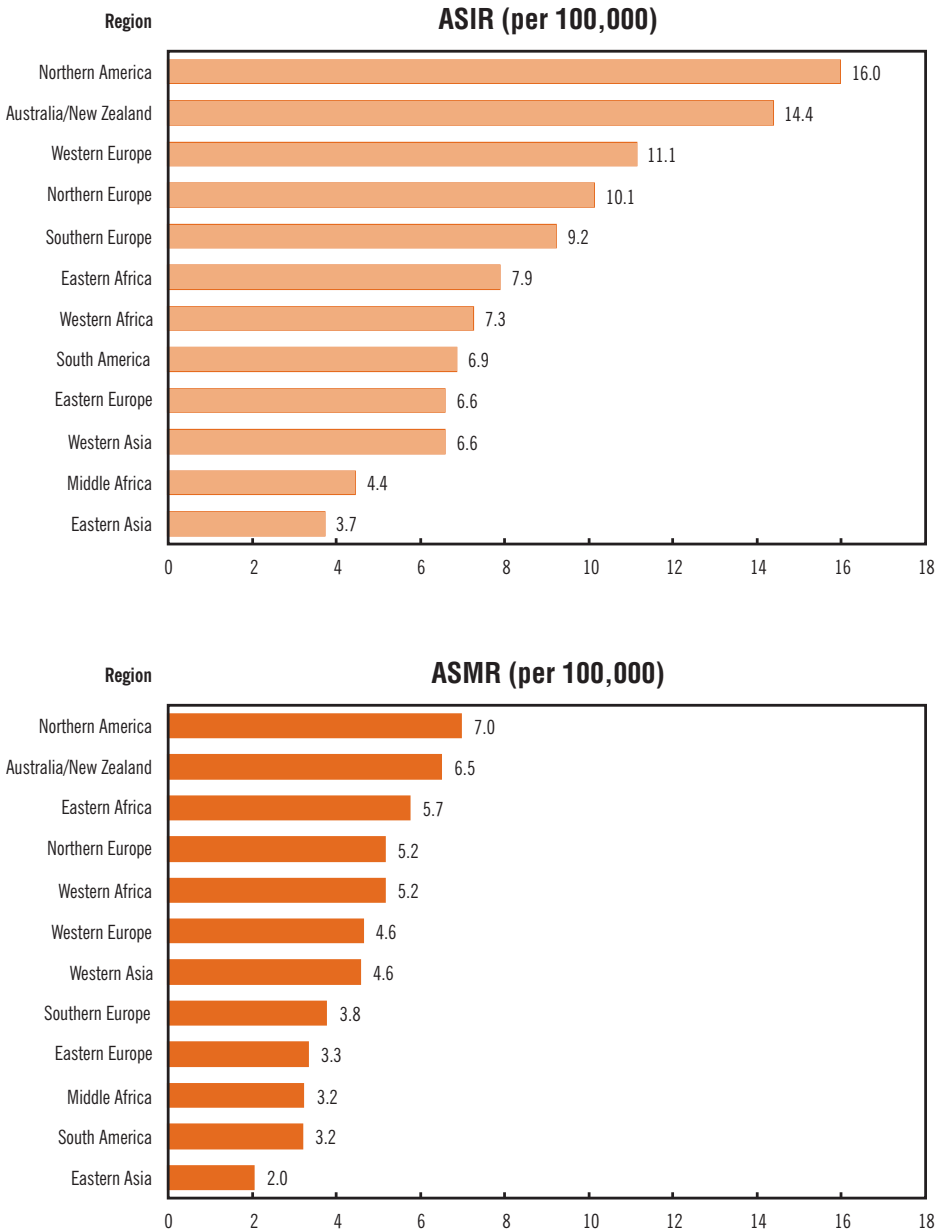
Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

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Figure 10.7

Age-Standardized Incidence Rates (ASIR) and Mortality Rates (ASMR) for Non-Hodgkin's Lymphoma by Selected WHO Region, Males, 2000 Estimates

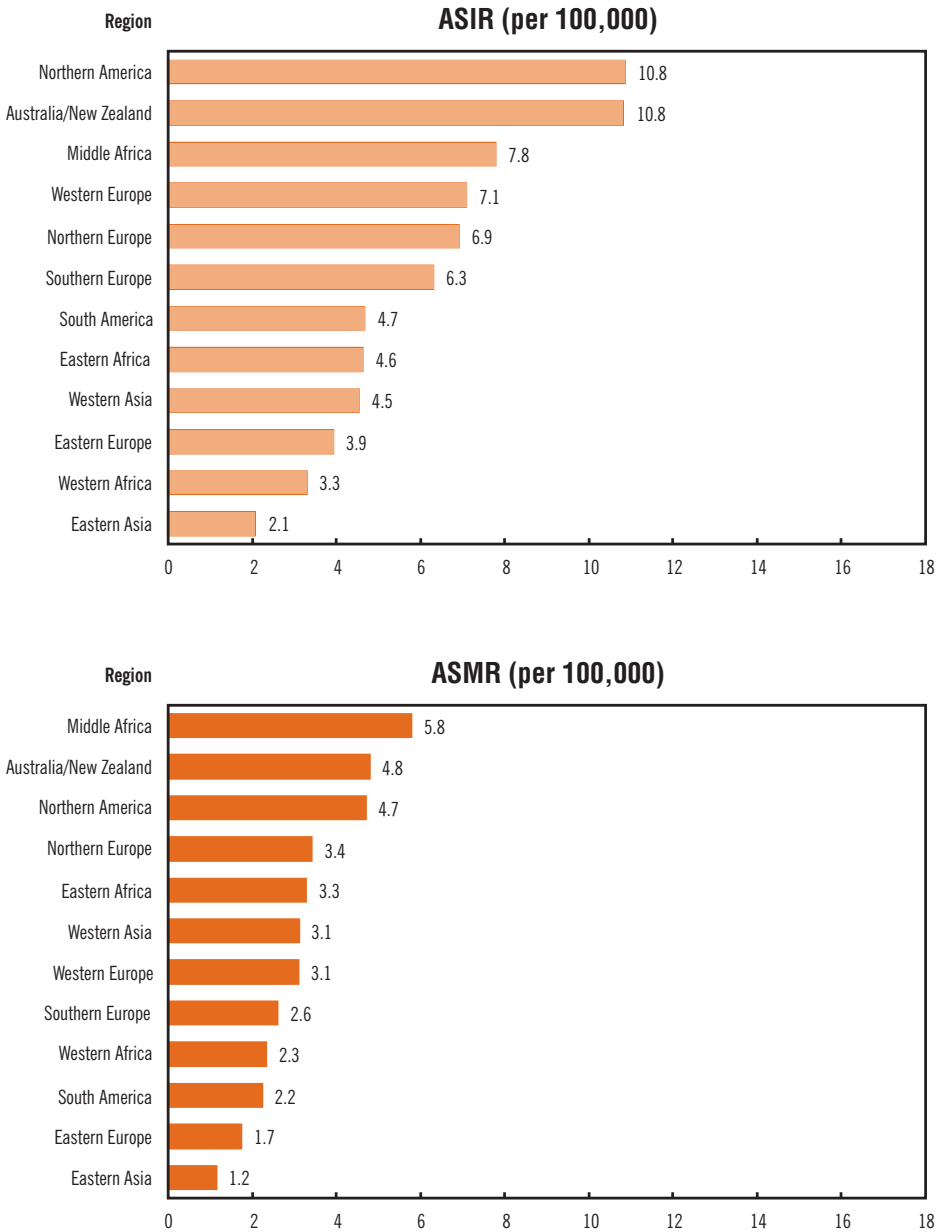


Note: Regions are defined by the World Health Organization, and rates are standardized to the world population. Reference: GLOBOCAN 2000: Lyon, IARCPress, 2001.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 10.8

Age-Standardized Incidence Rates (ASIR) and Mortality Rates (ASMR) for Non-Hodgkin's Lymphoma by Selected WHO Region, Females, 2000 Estimates



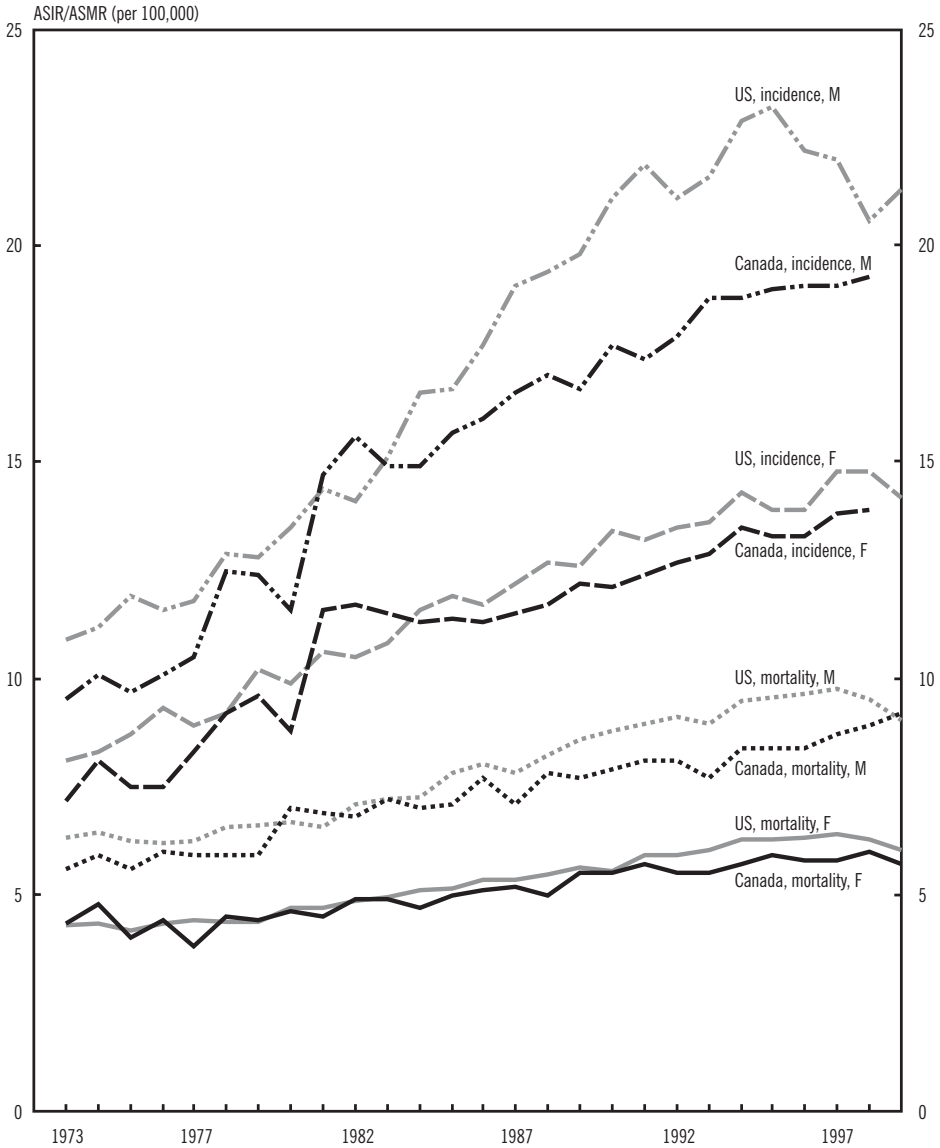
Note: Regions are defined by the World Health Organization, and rates are standardized to the world population. Reference: GLOBOCAN 2000: Lyon, IARCPress, 2001.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

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Figure 10.9

Age-Standardized Incidence and Mortality Rates (ASIR and ASMR) for Non-Hodgkin's Lymphoma, Canada and United States, 1973-1999



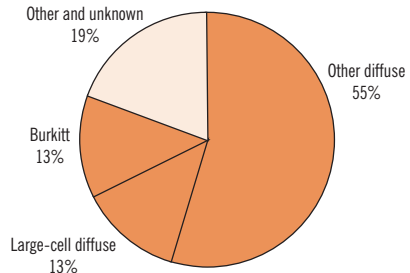
Note: Rates are standardized to the age distribution of the 1991 Canadian population. Incidence for the United States is from the 9 SEER Registries area.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

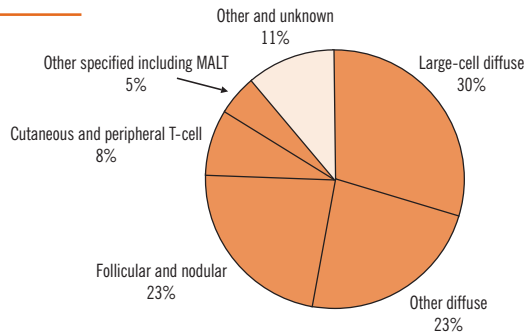
Figure 10.10

Frequencies for Non-Hodgkin's Lymphoma by Sub-type, Males and Females, Canada, 1998

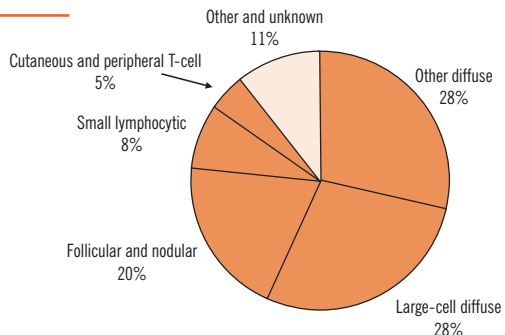
Ages 0-19, N = 80



Ages 20-44, N = 710



Ages 45+, N = 4,500



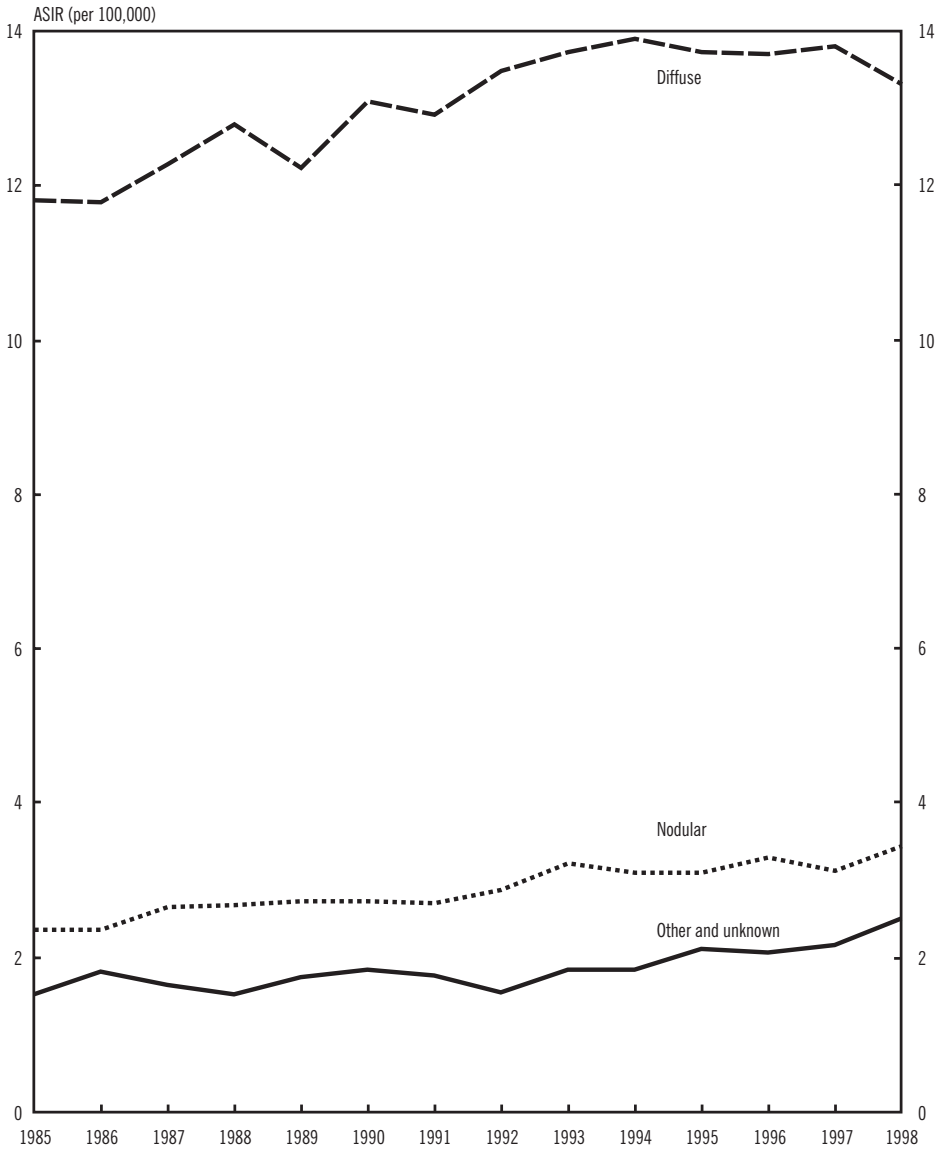
Note: Circle sizes are not dependent on the number of cases. Reference: International Classification of Diseases for Oncology, 2nd Revision, 1990, World Health Organization, Geneva, Switzerland.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

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Figure 10.11

Age-Standardized Incidence Rates (ASIR) for Non-Hodgkin's Lymphoma by Sub-type, Males, Canada, 1985-1998

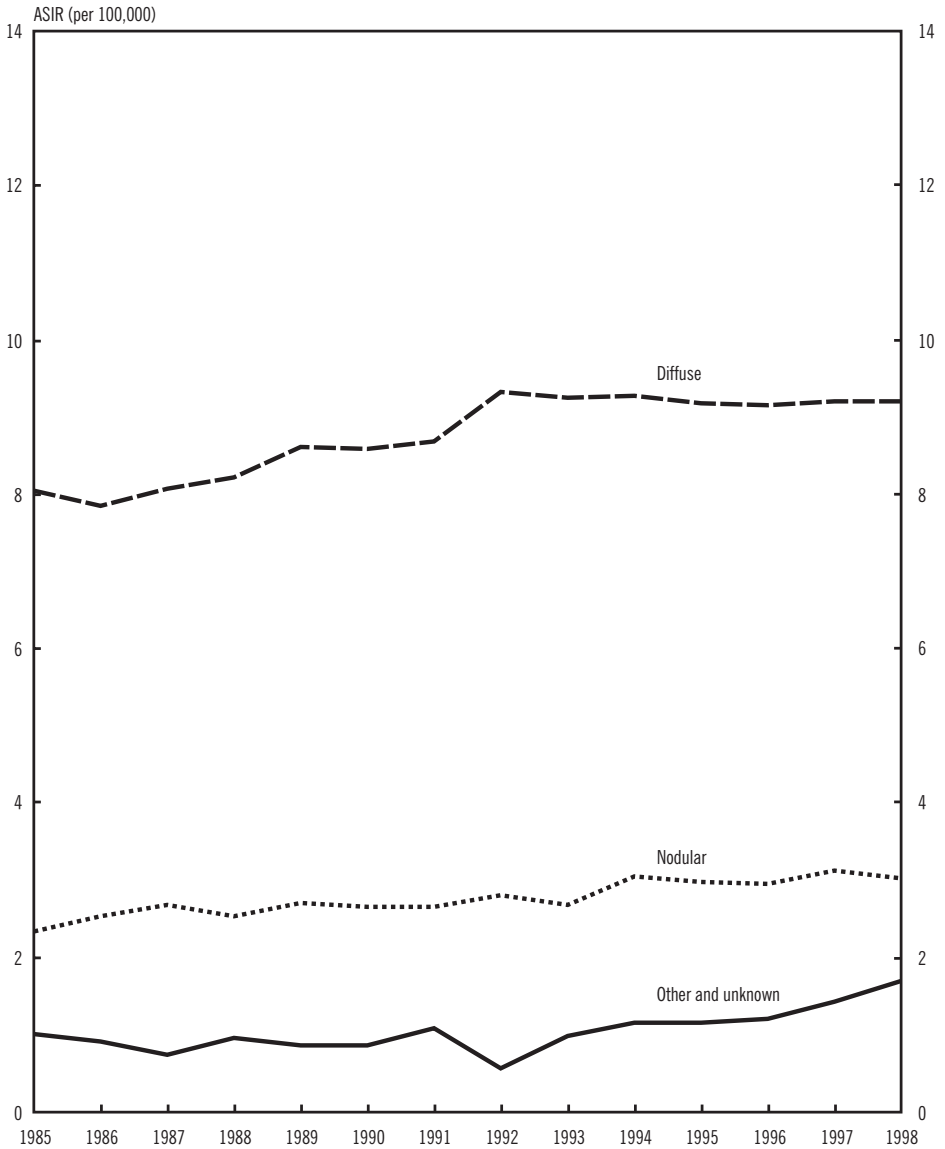


Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 10.12

Age-Standardized Incidence Rates (ASIR) for Non-Hodgkin's Lymphoma by Sub-type, Females, Canada, 1985-1998



Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada