

Tuberculosis

HIGHLIGHTS

- In 1998, the age-standardized incidence of tuberculosis (TB) per 100,000 population was higher in Peel (9.6) than Ontario (6.5) and Canada (5.9).
 - In Peel between 1982 and 2001, the number of cases of TB almost doubled (48 to 90 cases), largely due to population growth.
 - In Peel from 1992 to 2001, the highest incidence of TB was found in those over 60 years of age. The incidence of TB in men and women in Peel was similar over this same period.
 - In Peel from 1992 to 2001, most cases of TB were in foreign-born individuals (range 89 to 97%). The majority of these cases were from three TB-endemic countries: India (31%), the Philippines (14%) and Vietnam (13%).
 - The lungs were the predominant site affected by TB in individuals in both Peel and Ontario.
 - In Peel from 1992 to 2001, 10% of TB cases were resistant to drugs.
 - 73% were resistant to isoniazid alone or in combination with another drug
 - 7% were multi-drug resistant (resistant to at least isoniazid and rifampin)
 - The proportion of drug resistant TB cases in Peel was higher among foreign-born individuals than in those born in Canada.
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HISTORY OF TUBERCULOSIS

Tuberculosis (TB) has had a long and important role in human history. Over the years, it has gone by many names, including “consumption”, “white plague” and “phthisis”.¹ Evidence from ancient Egyptian mummies suggests TB has been with us for more than 4,000 years.¹ In ancient Greece, Hippocrates wrote of a common and deadly illness he called phthisis.¹ In Europe in the late 17th-century, one in every four deaths was attributable to TB.¹ During the first half of the 20th-century, TB remained the number one killer of Canadians. Until the advent of modern antibiotics, TB was usually treated in special isolation hospitals called sanatoria. In 1953, Canada reached a peak of 19,000 sanitarium beds dedicated to the treatment of TB patients. On average, TB patients stayed in sanatoria for just over one year, but many stayed at the “san” for three to five years.¹

Today, modern antibiotics are highly effective against tuberculosis (TB). Most TB patients can recover at home and return to work within a few weeks of onset. Most people do not require a hospital stay. In addition, the usual duration of therapy has shortened to between six and nine months. As a result of these and other developments, infectious diseases (of which TB is only a small part) now account for less than 1% of all deaths in Canada. Canada currently has one of the lowest incidences of TB in the world.

Unfortunately, the situation is not the same in other parts of the world. One-third of the world's population is infected with tuberculosis (TB). Although effective treatment and prevention strategies exist, TB still kills two to three million people every year (one death every 12 to 15 seconds), more than either AIDS or malaria.

BIOLOGY OF TUBERCULOSIS

Tuberculosis (TB) is a disease caused by a bacterium called *Mycobacterium tuberculosis*. TB mainly affects the lungs but can affect any other parts of the body.²

Tuberculosis (TB) organisms are released into the air when someone with infectious, active TB in their lungs or larynx coughs. TB spreads when these organisms are inhaled. TB found in other parts of the body cannot be spread to other people.

Frequent, repeated exposure to an infectious individual is usually required before someone becomes infected with tuberculosis (TB). It is estimated that exposure for several hours a day for a few months is necessary for an average, healthy adult to acquire the infection. In some special circumstances, the infection may be transmitted more readily.³

The vast majority of people with tuberculosis (TB) bacteria in their bodies do not have an active infection—they remain well and cannot spread the infection to others. The lifetime risk of inactive infection progressing to active disease is 10%.³ Active disease occurs when the bacteria spread and cause damage to the lungs and other parts of the body. Nearly all of the statistics in this section refer to people with active TB.

High-risk groups for tuberculosis (TB) infection include all individuals who have spent extended periods of time in parts of the world where the disease is prevalent, Aboriginal people, people with HIV/AIDS, seniors and homeless, urban-core residents.⁴ People living in overcrowded and sub-standard living conditions are also at greater risk of developing a TB infection.⁴

People working in health care institutions, social service organizations and correctional facilities may have frequent contact with high-risk individuals. Effective occupational health programs can prevent the development of tuberculosis in any exposed worker.⁴

Most people do not have frequent contact with, or are not among, the high-risk groups listed and therefore are unlikely to become infected with tuberculosis (TB).³

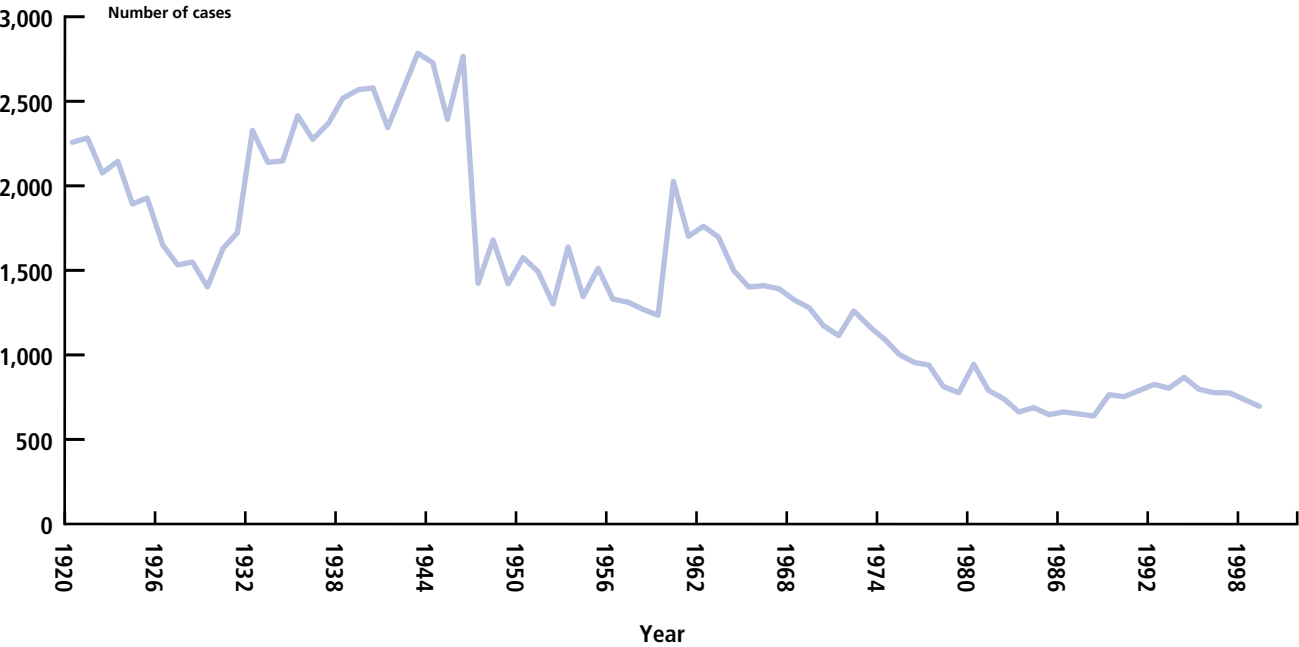
INCIDENCE OF TUBERCULOSIS IN CANADA AND ONTARIO

In 1998, Canada had one of the lowest active tuberculosis (TB) disease rates in the world (about 5.9 cases per 100,000 population).⁵ Comparable figures for Ontario and Peel for the same year were 6.5 and 9.6 cases per 100,000, respectively.

In Canada in 1997, there were seven cases of tuberculosis (TB) per 100,000.⁶ This incidence was similar to the United States (seven cases per 100,000)⁶ and Australia (eight cases per 100,000),⁵ but significantly lower than TB-endemic countries such as the Philippines (314 cases per 100,000),⁷ Vietnam (189 cases per 100,000),⁷ India (187 cases per 100,000)⁷ and Pakistan (181 cases per 100,000).⁷

The number of tuberculosis (TB) cases reported in Ontario and Canada has declined significantly since the Second World War.³⁴ The sharp drop between 1946 and 1947 was due to the introduction of the first antibiotics effective against TB. In Ontario, the total number of TB cases peaked in 1943 (2,789 cases) (see Figure 1.1). By 1988, the number of cases declined to a low of 644 cases. Since then, rates of TB in Ontario have stabilized, with an average of about 790 cases each year. In 1999, 700 cases of TB were reported, down from 779 cases in 1997.

Figure 1.1: Number of Reported Active Tuberculosis Cases by Year, Ontario, 1920–1999

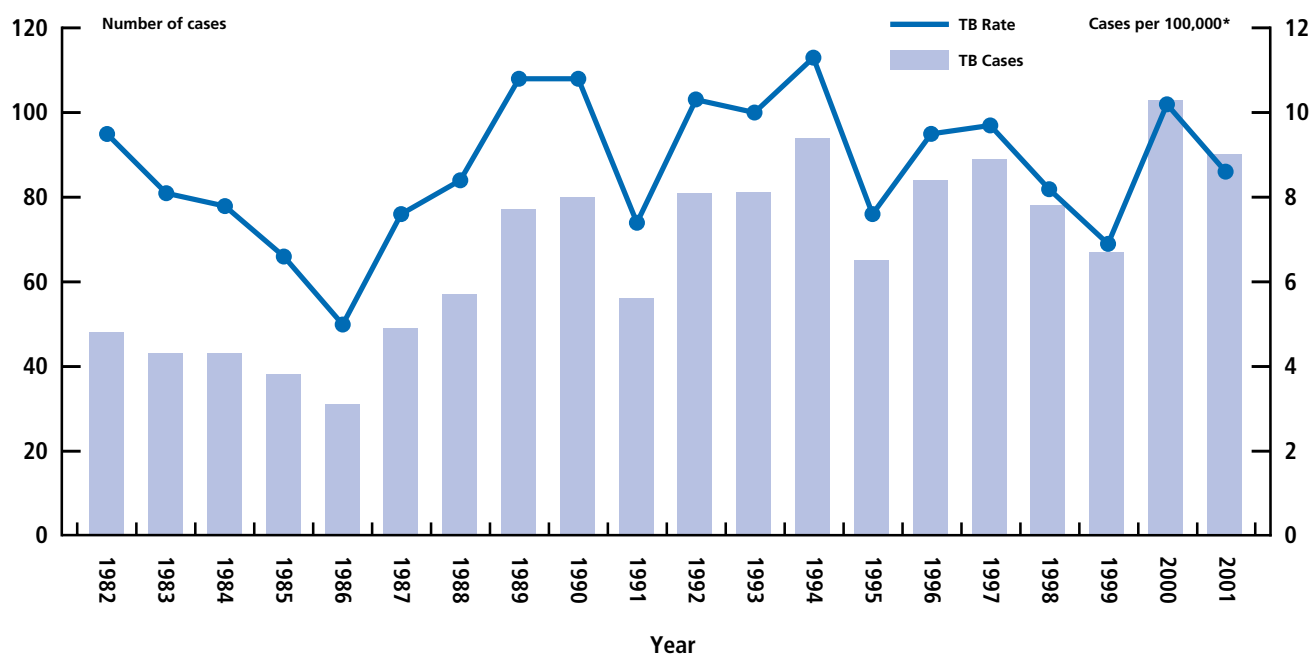


Sources: Ontario data 1920–1990 from Public Health Branch, Ontario Ministry of Health and Long-Term Care. Ontario data 1991–1999 from RDIS, Ontario Ministry of Health and Long-Term Care, as of 07/17/2001.

ACTIVE TUBERCULOSIS IN PEEL

Peel tuberculosis (TB) data are available for the last twenty years. Like Ontario, the incidence of TB in Peel declined in the early 1980s, reaching a low of five cases per 100,000 population in 1986 (see Figure 1.2). Incidence increased from 1986 to 1990 and has since stabilized to between six and 11 cases per 100,000. The total number of cases of TB in Peel more than doubled from 1982 to 2001 (48 to 90 cases), but this is largely due to population growth.

Figure 1.2: Incidence of Active Tuberculosis by Year, Region of Peel, 1982–2001

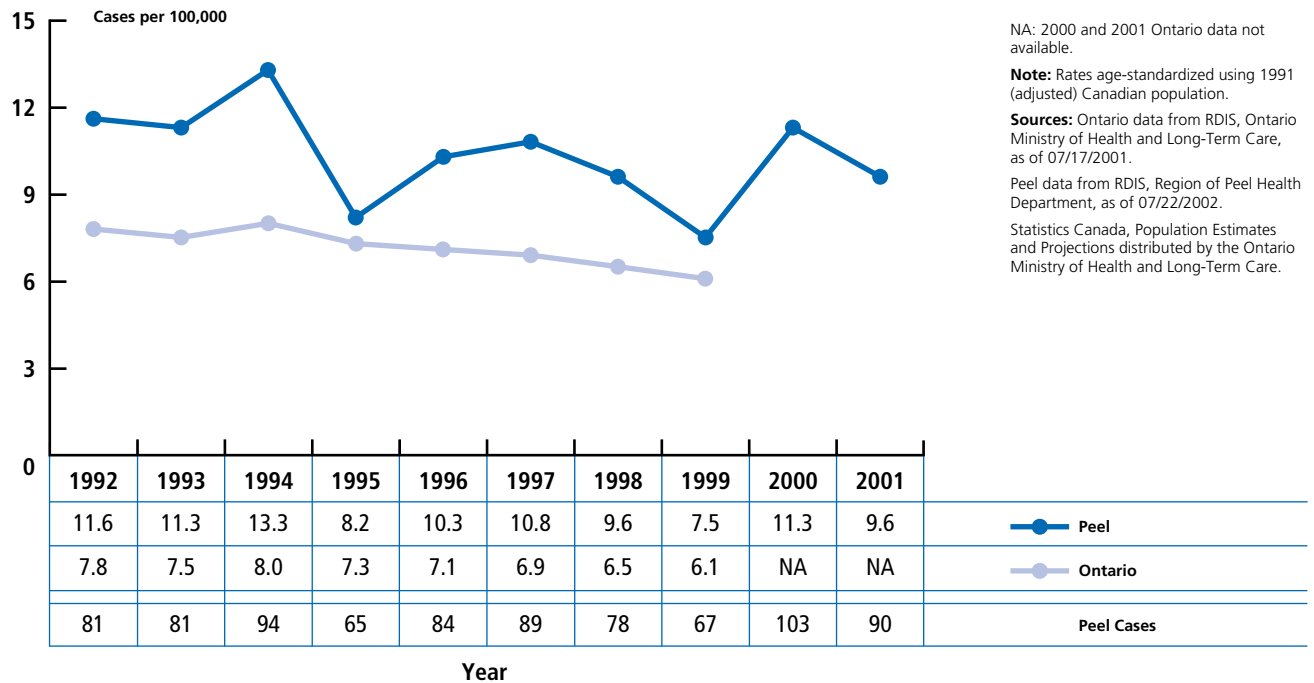


*Crude rates per 100,000.

Sources: Peel data 1982–1989 from Public Health Branch, Ontario Ministry of Health and Long-Term Care.
Peel data 1990–2001 from RDIS, Region of Peel Health Department, as of 07/22/2002.
Statistics Canada, Population Estimates and Projections distributed by the Ontario Ministry of Health and Long-Term Care.

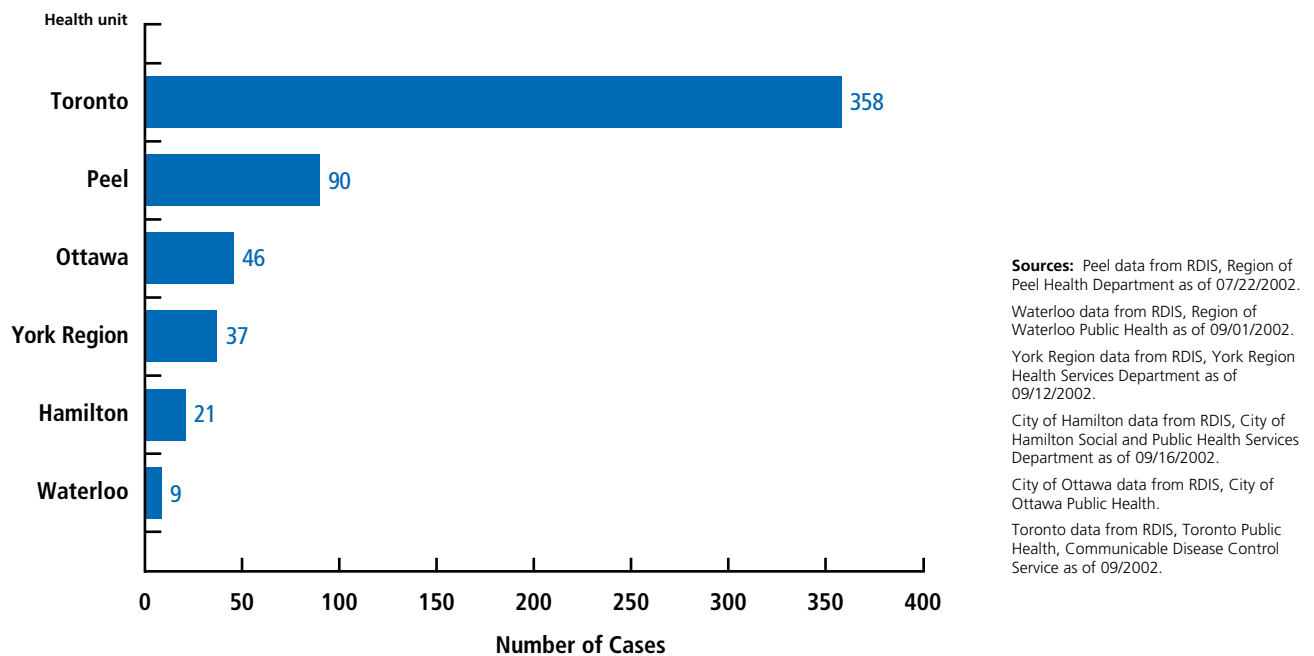
In Peel between 1992 and 2001, the incidence of tuberculosis (TB) fluctuated between 7.5 and 13.3 cases per 100,000 population (see Figure 1.3 on the following page). The incidence of TB in Ontario was generally lower than that in Peel and has demonstrated a gradual decline since 1994 (see Figure 1.3 on the following page).

Figure 1.3: Incidence of Active Tuberculosis by Year, Region of Peel and Ontario, 1992–2001



In Ontario in 2001, Peel was second only to Toronto for the number of tuberculosis cases (see Figure 1.4).⁸

Figure 1.4: Active Tuberculosis Cases by Health Unit in Ontario, 2001



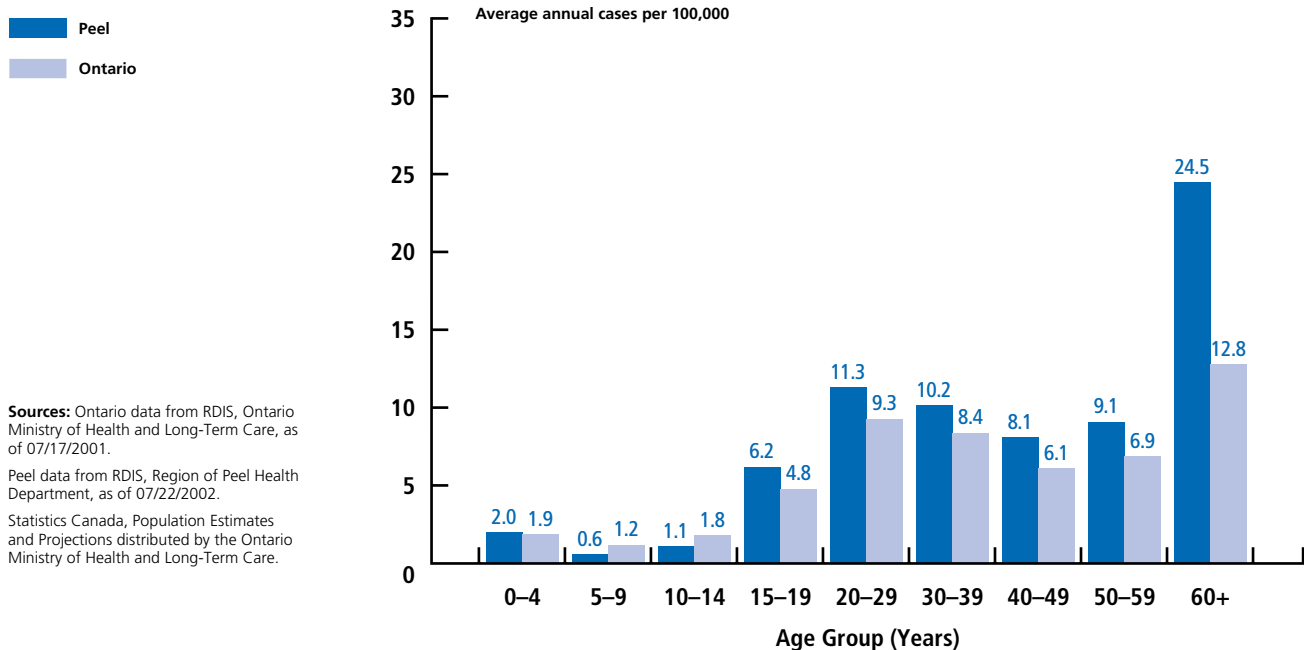
Between 1980 and 1988, reported tuberculosis (TB) cases in Peel accounted for about 6% of all TB cases in Ontario. Between 1992 and 1999, Peel accounted for about 10% of Ontario’s TB cases.

From 1995 to 2000, Peel’s hospitalization rates for tuberculosis (TB) ranged between three to five cases per 100,000. Twenty nine Peel residents died from TB from 1990 to 1999; however, deaths due to the disease remain relatively rare.

ACTIVE TUBERCULOSIS BY AGE AND SEX

The incidence of tuberculosis (TB) varies with age, typically peaking among those aged 60 years and older with a smaller peak among those aged 20 to 39 years (see Figure 1.5). Age-specific incidence was similar for all age groups in Peel and Ontario, except for those aged 60 years and older. The incidence for those 60 years and older was almost twice as high in Peel as in Ontario.

Figure 1.5: Incidence of Active Tuberculosis by Age Group, Region of Peel, 1992–2001 Combined, and Ontario, 1992–1999 Combined



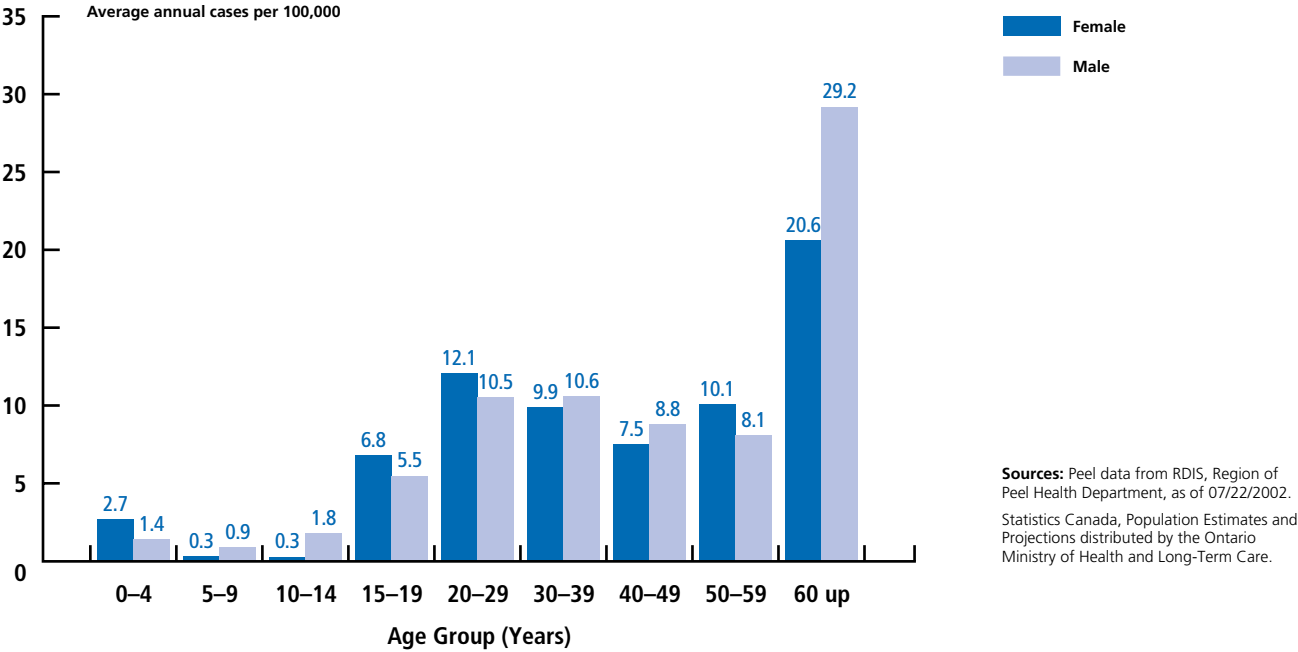
Sources: Ontario data from RDIS, Ontario Ministry of Health and Long-Term Care, as of 07/17/2001.

Peel data from RDIS, Region of Peel Health Department, as of 07/22/2002.

Statistics Canada, Population Estimates and Projections distributed by the Ontario Ministry of Health and Long-Term Care.

In Peel, the incidence of tuberculosis (TB) for males and females was similar among all age groups except those 60 years and older (see Figure 1.6). Although not shown, the average annual crude rate of TB in Peel was 9.4 per 100,000 for males and 9.0 per 100,000 for females.

Figure 1.6: Incidence of Active Tuberculosis by Age Group and Sex, Region of Peel, 1992–2001 Combined



ACTIVE TUBERCULOSIS BY COUNTRY OF BIRTH

Immigrants to Canada from countries with higher tuberculosis (TB) rates (TB-endemic countries) face a greater likelihood of developing active TB during their first five years in Canada than Canadian-born individuals.^{3,4}

In Peel from 1992 to 2001, the proportion of tuberculosis (TB) cases among foreign-born individuals increased from 89% to 97%. The proportion of foreign-born TB cases in Peel was higher than Ontario for every year from 1992 to 1999 (see Figure 1.7 on the following page).

The higher proportion of foreign-born cases in Peel may be due to the higher proportion of immigrants in Peel compared to Ontario (40% and 26%, respectively [1996 Census]) and the higher proportion of recent immigrants in Peel from TB-endemic countries. In 1996, Peel had a larger proportion of its population (9%) who had immigrated to Canada in the previous five years than Ontario (5%).

Figure 1.7: Proportion of Active Tuberculosis Cases Born Outside Canada, Region of Peel and Ontario, 1992–2001

NA: 2000 and 2001 Ontario data not available.

Sources: Ontario data from RDIS, Ontario Ministry of Health and Long-Term Care, as of 07/17/2001.

Peel data from RDIS, Region of Peel Health Department, as of 07/22/2002.

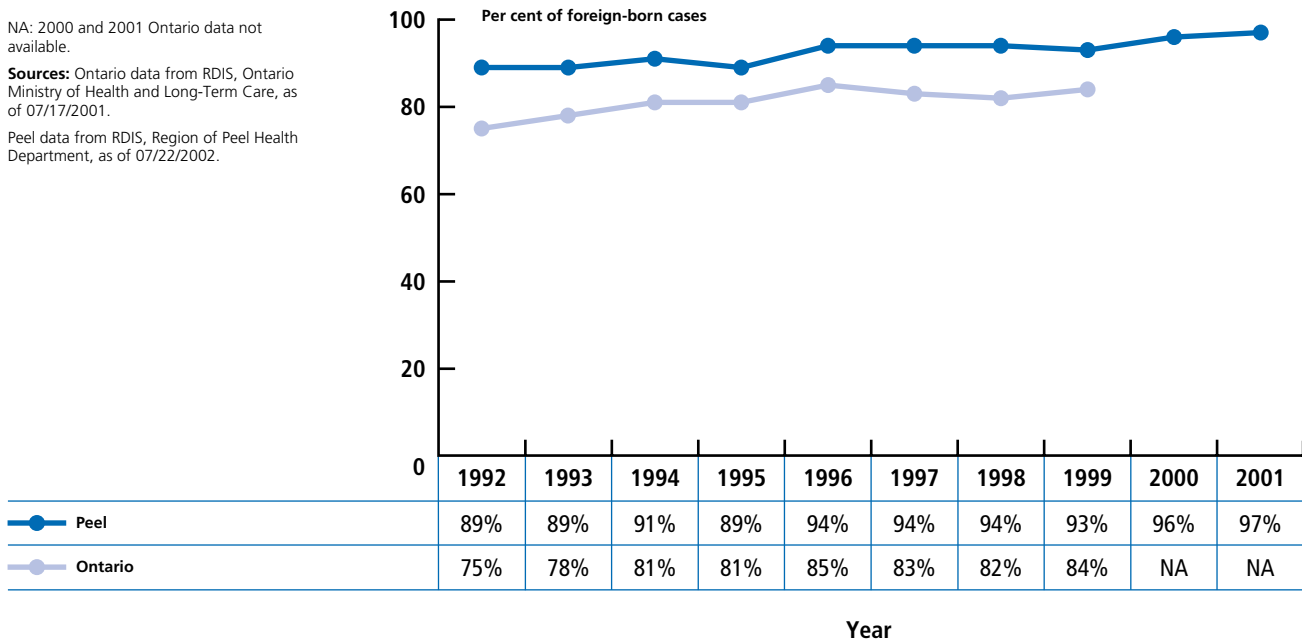
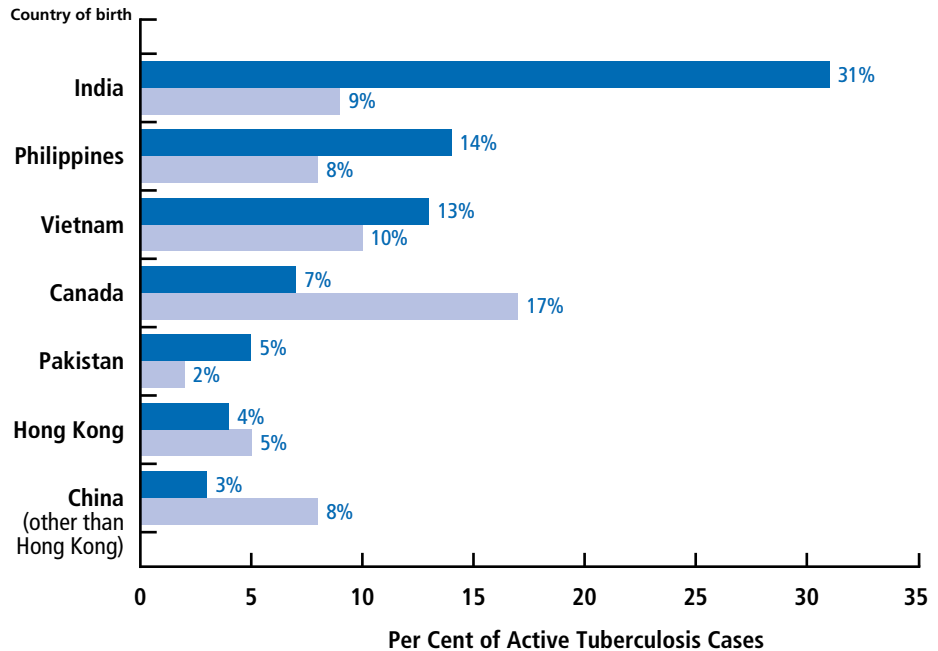


Figure 1.8: Proportion of Active Tuberculosis Cases by Country of Birth, Region of Peel, 1992–2001 Combined, and Ontario, 1992–1999 Combined

Peel
Ontario



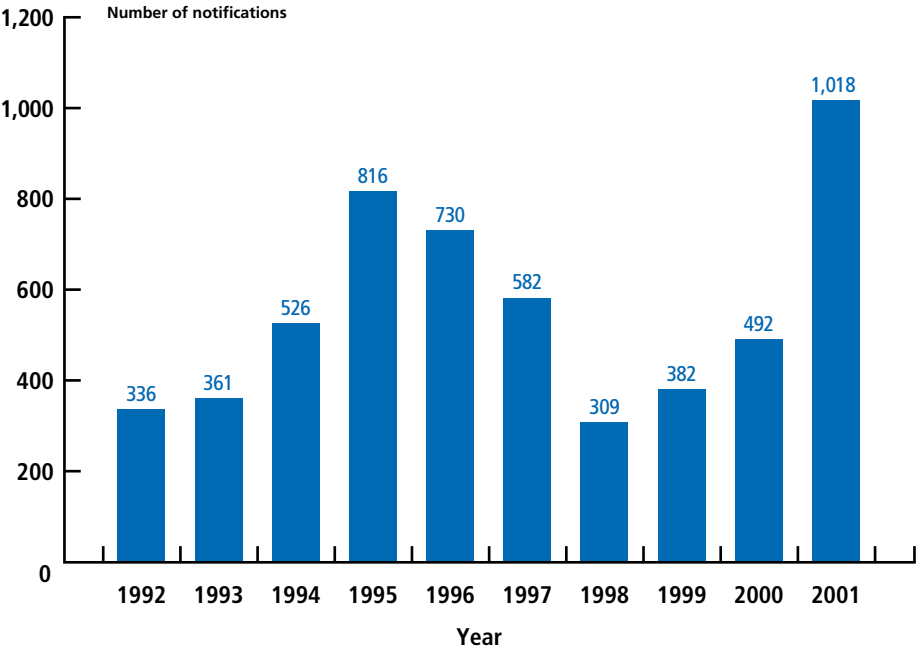
Sources: Ontario data from RDIS, Ontario Ministry of Health and Long-Term Care, as of 07/17/2002.

Peel data from RDIS, Region of Peel Health Department, as of 07/22/2002.

In Peel between 1992 and 2001, the most common countries of birth among tuberculosis (TB) cases included India (31%), the Philippines (14%), Vietnam (13%) and Canada (7%) (see Figure 1.8 on the previous page). The percentage of TB cases in individuals born in India was significantly higher in Peel between 1992 and 2001(31%) than in Ontario between 1992 and 1999 (9%), while the percentage of Canadian-born cases was significantly higher for Ontario (17%) compared to Peel (7%) (see Figure 1.8 on the previous page).

Citizenship and Immigration Canada (CIC) screens immigrants for tuberculosis (TB) and permits those with evidence of inactive, pulmonary TB to enter Canada on the condition they report to health authorities within 30 days.⁹ The annual number of immigrant notifications for TB follow-up received by the Region of Peel Health Department are presented in Figure 1.9. The annual number of notifications has fluctuated from year to year, although the number has steadily increased from 1998 to 2001. The sudden increase from 2000 to 2001 can be partly explained by improved reporting.

Figure 1.9: Immigration Notifications for Inactive Tuberculosis Follow-up, Region of Peel, 1992–2001

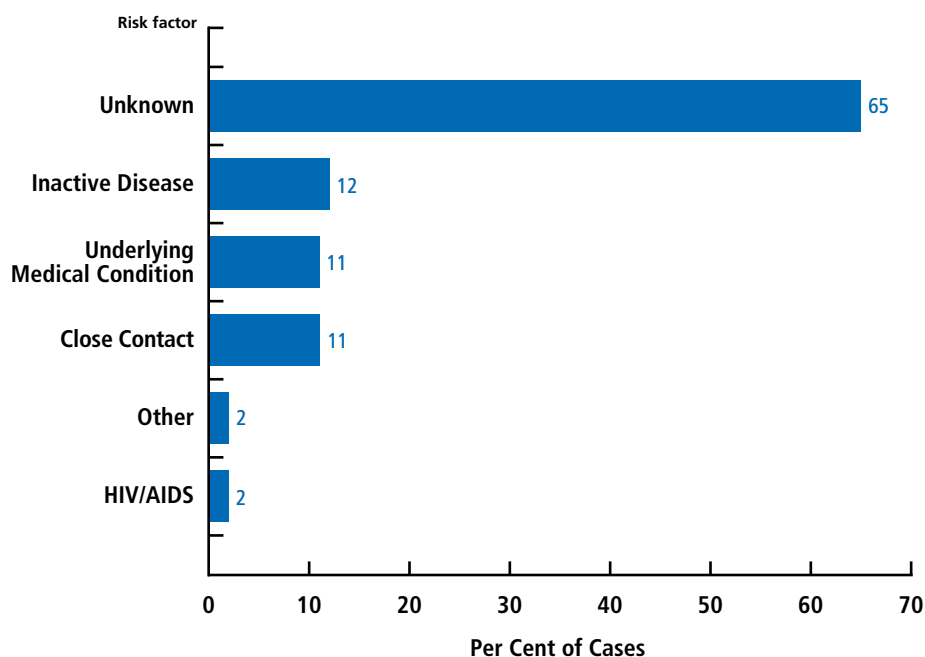


Source: Peel Data from RDIS, Region of Peel Health Department as of 07/22/2002.

RISK FACTORS AND RISK SETTINGS FOR ACTIVE TUBERCULOSIS

A “risk factor” is the most likely explanation for a particular person’s progression from inactive to active tuberculosis (TB). “Risk setting” refers to the location where transmission most likely occurred. Figures 1.10 and 1.11 present the risk factors and risk settings for TB cases in Peel. “Unknown risk factor” was reported for 65% of all TB cases in Peel. The three most reported known risk factors were having previous, inactive disease (12%) or an underlying medical condition (11%), and being in close contact with an individual with active TB (11%) (*see Figure 1.10*).

Figure 1.10: Risk Factors Reported for Active Tuberculosis Cases, Region of Peel, 1992–2001 Combined

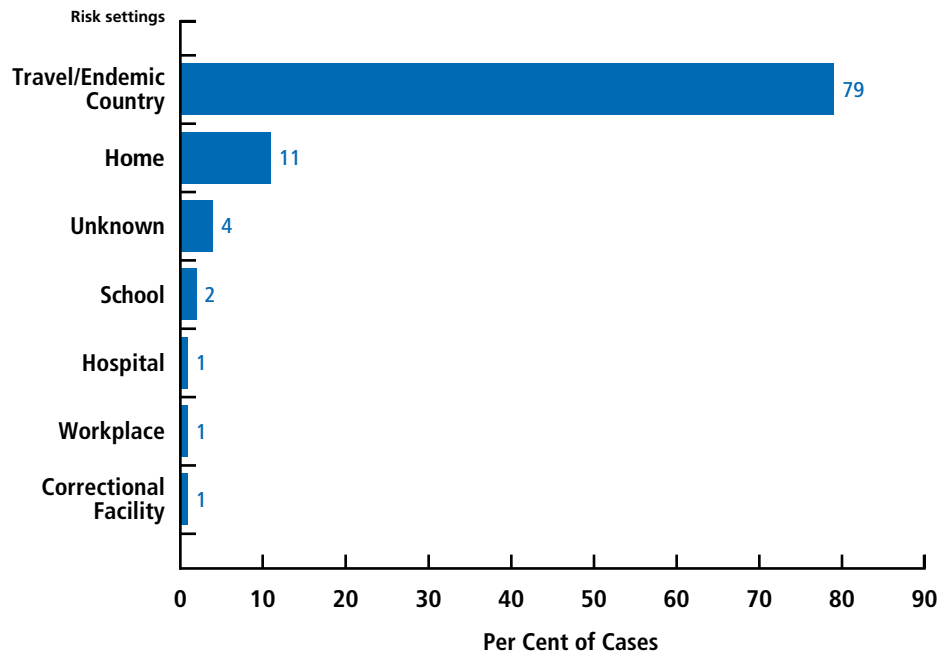


Per cent based on 832 tuberculosis cases. A case could be reported with more than one risk factor.

Source: RDIS, Region of Peel Health Department as of 07/22/2002.

In Peel from 1992 to 2001, travel to or living in a tuberculosis-endemic country was the most often reported risk setting (79%) reported by individuals with TB (*see Figure 1.11 on the following page*). Very few cases of TB arose as a result of exposure at work or school.

Figure 1.11: Risk Settings Reported for Active Tuberculosis Cases, Region of Peel, 1992–2001 Combined



Per cent based on 832 tuberculosis cases.
Source: RDIS, Region of Peel Health Department, as of 07/22/2002.

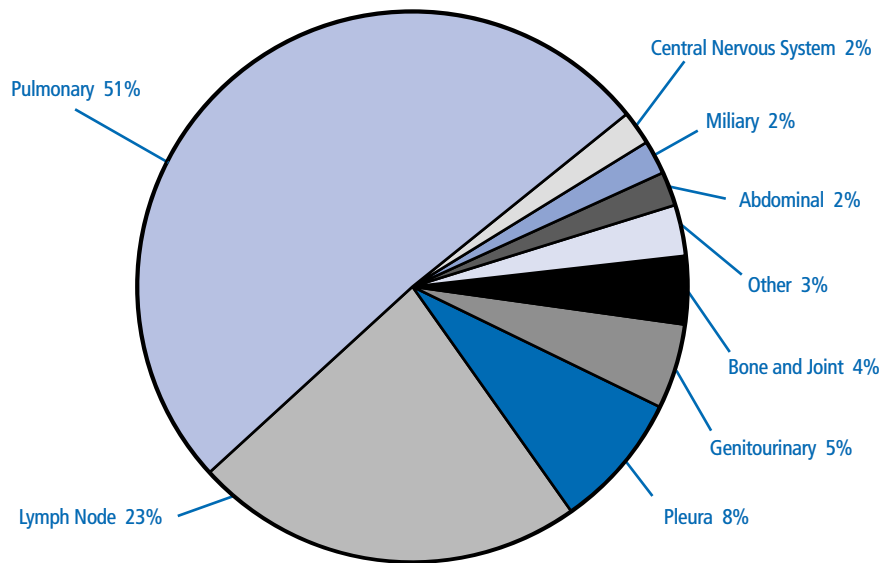
ANATOMIC SITE OF ACTIVE TUBERCULOSIS

Most people with active tuberculosis (TB) develop the disease in their lungs (pulmonary TB). People with non-pulmonary TB can develop the disease in their brain, kidneys, skin, bones, joints or lymph nodes. Non-pulmonary TB is more common in areas of the world where TB is prevalent.³

The lungs were the most commonly reported anatomic site of tuberculosis (TB) infections, followed by the lymph nodes, in cases in both Peel and Ontario. In Peel for the years 1992 to 2001, 51% of reported infection sites were pulmonary (see Figure 1.12 on the following page). In Ontario in 1998, 61.4% of TB cases were reported as pulmonary.⁸

In Peel, non-pulmonary tuberculosis (TB) was reported more frequently in foreign-born individuals than in Canadian-born individuals (see Figure 1.13 on the following page).

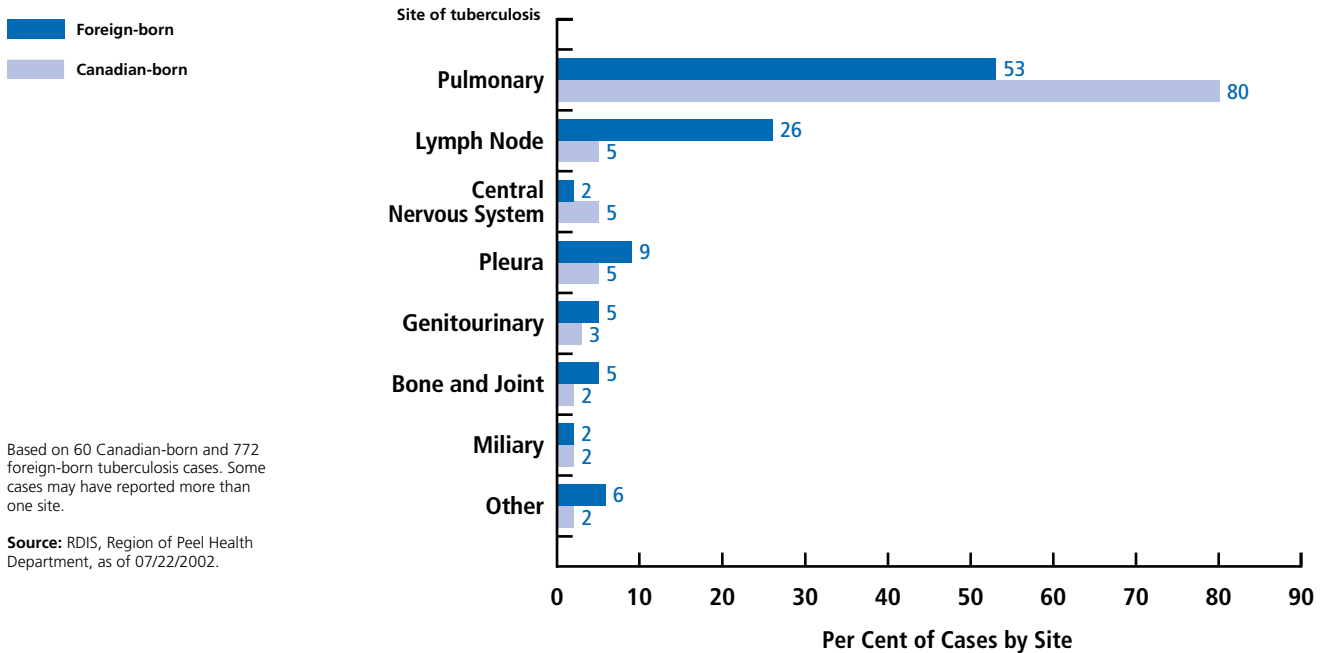
Figure 1.12: Active Tuberculosis Cases by Anatomic Site, Region of Peel, 1992–2001 Combined



Based on 888 sites reported by 832 tuberculosis cases in Peel from 1992 to 2001.

Source: RDIS, Region of Peel Health Department, as of 07/22/2002.

Figure 1.13: Active Tuberculosis Cases by Anatomic Site and Place of Birth, Region of Peel, 1992–2001 Combined



Based on 60 Canadian-born and 772 foreign-born tuberculosis cases. Some cases may have reported more than one site.

Source: RDIS, Region of Peel Health Department, as of 07/22/2002.

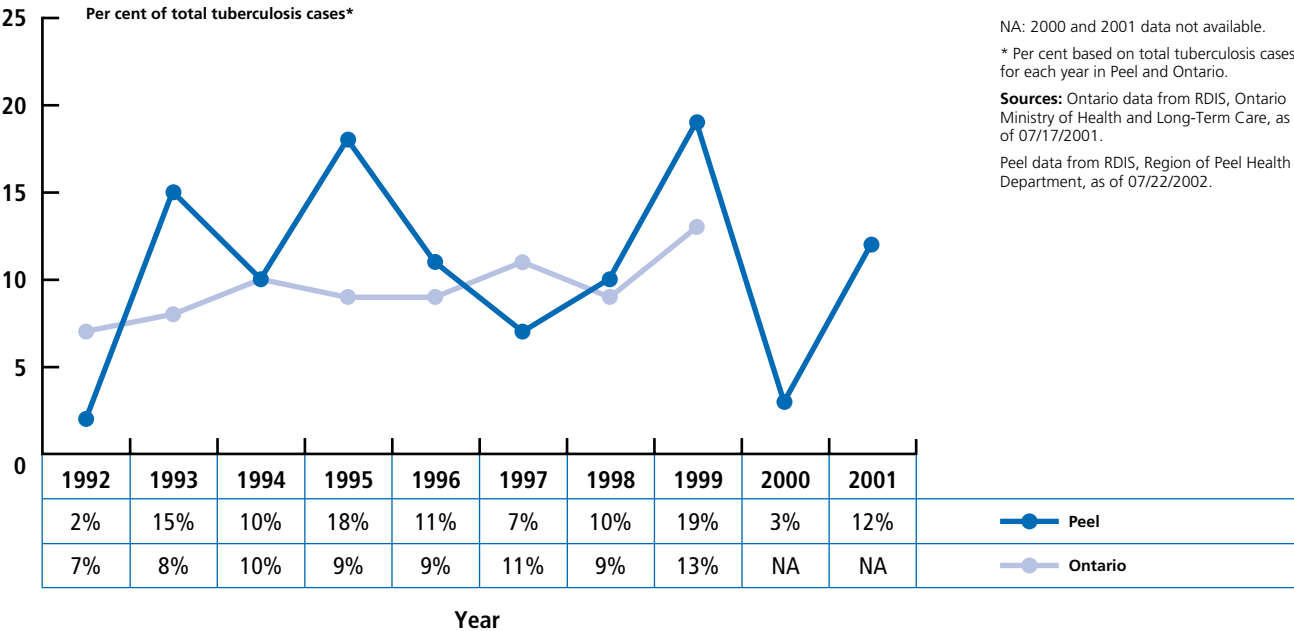
DRUG-RESISTANT TUBERCULOSIS

Drug resistance arises when medication is improperly prescribed or taken.³

A tuberculosis (TB) case is defined as being drug-resistant if the strain of TB causing the disease is resistant to one or more of the five first-line drugs: isoniazid, rifampin, pyrazinamide, ethambutol and streptomycin.¹⁰ Resistance prolongs treatment by at least three months. Resistance to at least isoniazid and rifampin—the two best TB drugs—is called multi-drug resistant tuberculosis (MDR-TB). MDR-TB is treated using second-line drugs (drugs other than the five, first-line drugs mentioned above). Second-line drugs are more expensive, less effective and have many more side effects than first-line drugs. As a result, treatment of MDR-TB continues for at least two years and must be closely monitored.

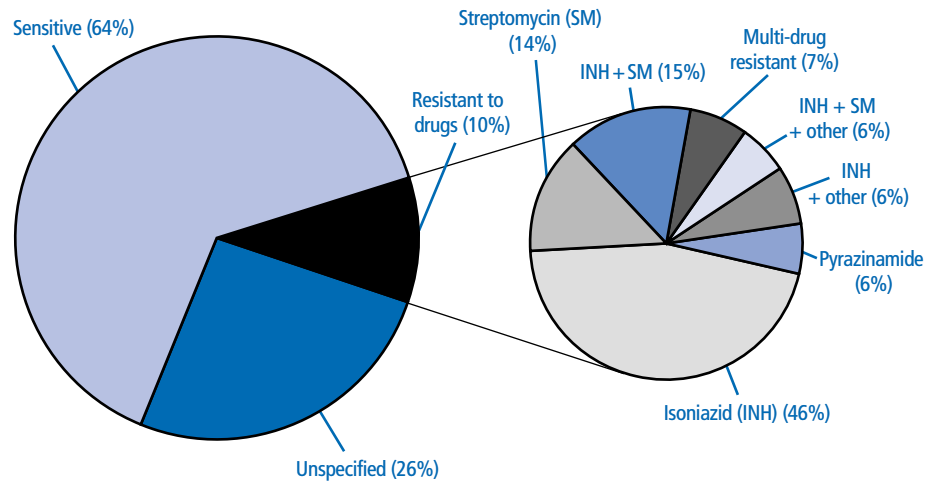
In Peel from 1992 to 2001, a total of 85 tuberculosis (TB) cases were resistant to one or more drugs. Drug resistance as a proportion of total TB cases fluctuated widely from year to year (see Figure 1.14).

Figure 1.14: Proportion of Drug-Resistant Tuberculosis by Year, Region of Peel and Ontario, 1992–2001



In Peel from 1992 to 2001, 74% of all tuberculosis (TB) cases reported drug sensitivity patterns. Twenty-six per cent of TB cases were classified as “unspecified” (see Figure 1.15). Unspecified cases are those for which TB specimens could not be cultured to obtain information on drug resistance. Ten per cent of total TB cases in Peel were classified as drug-resistant. Resistance to isoniazid, one of the two best anti-TB drugs, occurred in 73% of Peel’s resistant cases. Resistance in these cases occurred with isoniazid alone or in combination with resistance to another drug. Multi-drug resistant TB is especially troublesome and occurred in 7% of all drug-resistant cases in Peel.

Figure 1.15: Drug-Resistant Tuberculosis Cases, Region of Peel, 1992–2001 Combined



Based on 832 tuberculosis cases.
Source: RDIS, Region of Peel Health Department, as of 07/22/2002.

Multiple drug-resistant tuberculosis (MDR-TB) is the result of poor treatment of active TB. Physicians’ inadequate prescribing of antibiotics and patients’ non-compliance with treatment all contribute to MDR-TB.¹¹ In addition, the speed of air travel has increased the movement of people around the world and the possibility of importing drug-resistant TB into Canada.¹¹ Various studies have noted that foreign birth is a significant factor associated with drug resistance.¹¹

Poor compliance with anti-tuberculous therapy is the most common reason for treatment failure. Directly Observed Therapy (DOT), in which a trained individual observes the tuberculosis (TB) patient swallow each dose of medication, is an effective way to monitor adherence with therapy.¹² TB drug regimes using DOT have been shown to significantly reduce the rate of drug resistance and the rate of relapse when compared to self-administered therapy.¹²