



**LANGUAGE AS A DETERMINANT OF HEALTH STATUS  
AND SERVICE QUALITY**

# Avoidable Mortality of the Two Main Linguistic Communities in Québec

**INSTITUT NATIONAL  
DE SANTÉ PUBLIQUE  
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Report

# Avoidable Mortality of the Two Main Linguistic Communities in Québec

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## ABSTRACT

This report examines the avoidable mortality rates of Québec's two main linguistic groups, francophones and anglophones, over four periods: 1990–1994, 1995–1999, 2000–2004, and 2005–2007. The analysis was performed for Québec as a whole and for three specific areas: the Montréal census metropolitan area (CMA), all of Québec's other census metropolitan areas (Gatineau, Québec City, Sherbrooke, Trois-Rivières, and Saguenay), and the rest of Québec, i.e., non-metropolitan areas, or non-CMAs.

Avoidable mortality refers to deaths occurring before age 75 due to causes that are known to be preventable. It is considered as an indicator of the quality of health services and public health interventions. Given advances in knowledge about the causes of disease and the means of treatment, we should ideally see a decrease in avoidable deaths, regardless of where people live or to what linguistic group they belong. We used the classification method developed by Tobias and Jackson (2001), which identifies the potential of primary, secondary, or tertiary care to reduce mortality for 62 different causes of death.

Avoidable death rates for Québec anglophones and francophones generally decreased between 1990–1994 and 2005–2007, with a few exceptions.

The avoidable mortality rate for lung cancer in anglophone women in Québec as a whole and in the Montréal CMA remained unchanged for 18 years. In the other CMAs and non-metropolitan areas, the rate seems to have increased, but it is impossible to confirm this statistically. However, the avoidable mortality rate for lung cancer in francophone women increased significantly throughout Québec.

The avoidable mortality rate for colorectal cancer decreased significantly for francophone men and women in 18 years. This decline however has not been observed among anglophones while the trend of rates is stagnated.

Other major causes of avoidable mortality, such as ischemic heart disease and breast cancer (in women), decreased considerably in both groups across Québec during the period studied, although the decreases were not always significant for the anglophone population.

Anglophones often had lower avoidable mortality rates than francophones in 1990–1994. The more rapid decrease for the latter group brought mortality rates for the two linguistic groups closer together and sometimes eliminated differences that were significant at the beginning of the period studied.

Anglophone men and women in Québec still had significantly lower rates of lung cancer, suicide, intentional injuries, traffic accidents, and chronic obstructive pulmonary disease in 2005–2007.

Reduced mortality in francophone men eliminated the difference in favor of anglophone men that had existed in 1990–1994 with respect to ischemic heart disease, colorectal cancer, and cerebrovascular disease.

There were no significant differences between women in the two linguistic groups for colorectal cancer, cerebrovascular disease, and breast cancer rates throughout the entire period studied. The difference in favour of anglophones that existed for the ischemic heart disease has disappeared.

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## INTRODUCTION

This analysis is part of a major initiative to improve our knowledge of the health status of Québec's anglophone linguistic minority community.

The concept of avoidable mortality was first introduced in 1970 by the Working Group on Preventable and Manageable Diseases directed by David Rustein of the Harvard Medical School in the United States. They introduced the notion of premature death and proposed a list of causes of death that can be prevented by timely and appropriate treatment.<sup>1</sup> This work served as a starting point for examining avoidable mortality, and many researchers used it as a basis for their own work. The first studies focused mainly on evaluating health services, and the causes of death were chosen accordingly. The primary interest was in deaths that could be prevented by medical and hospital care, otherwise known as amenable mortality.<sup>2</sup>

As knowledge advanced, more recent work focused on distinguishing more clearly between causes of death that are amenable to intervention of a more medical nature, called secondary or tertiary prevention, and those sensitive to population-based interventions that are often beyond the direct control of health services, known as primary prevention.

This approach was adopted in 1998 by Simonato et al.,<sup>3</sup> who divided avoidable causes into three categories: primary avoidable mortality, secondary avoidable mortality, and tertiary avoidable mortality.

Tobias and Jackson<sup>4</sup> refined this approach in 2001. They increased the number of causes of avoidable death from 24 to 56 and considered deaths before age 75 rather than age 64.<sup>5</sup> After an extensive literature review, they attributed a relative weight to each cause, based on the three prevention categories. They then submitted the weightings to an expert committee of clinicians and epidemiologists before drawing up a final list. Researchers at the Hunter New England Area Health Service in Australia modified this list slightly in 2003 after comparing version 9 and version 10 of the International Classification of Diseases (ICD) coding system. We used their list, which is presented in Appendix 1 with the weights for each cause based on the three prevention categories.

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<sup>1</sup> McKee, M. "For debate--Does health care save lives?" *Croat Med. J.* 1999, 40:123–128.

<sup>2</sup> "Amenable mortality is a subset of the broader construct of avoidable mortality, which includes deaths from causes that can be prevented (incidence reduction) as well as those that can be treated (case fatality reduction). Avoidable mortality therefore reflects influences from well beyond the boundaries of the health care system as conventionally defined. By contrast, amenable mortality provides a more specific and focused indicator of health care performance."

<sup>3</sup> Simonato, L., Ballard, T., Bellini, P., and Winkelmann, R. "Avoidable mortality in Europe 1955–1994: a plea for prevention." *J. Epidemiol Community Health* 1998, 52: 624–630.

<sup>4</sup> Tobias, M., Jackson G. "Avoidable mortality in New Zealand." 1981–97. *Aust N Z J Public Health* 2001, 25: 12–20

<sup>5</sup> All deaths due to other causes or occurring after age 75 are not considered to be avoidable.

Our analysis puts all deaths that could have been prevented by changes in personal behavior (changes in lifestyle habits) or actions at the population level (public health policies) under the “**primary avoidable mortality**” heading. The objective of primary prevention is to stop the disease from appearing in the first place.

Deaths that could have been prevented through early screening and intervention associated with primary health care are classified under the heading “**secondary avoidable mortality.**” The objective of secondary prevention is to detect the disease early and slow its progression.

Lastly, deaths that could have been reduced through medical and surgical treatments are grouped under the heading “**tertiary avoidable mortality.**” This mainly refers to the ability of the medical and hospital system to make accurate diagnoses, act quickly and effectively (prehospital emergency care), and provide good medical and surgical care. The objective of tertiary prevention is to reduce the disease fatality rate.

The following three examples illustrate how avoidable deaths are categorized as primary, secondary, or tertiary. According to the committee of experts set up by Tobias and Jackson, 95% of deaths due to lung cancer could have been avoided by primary prevention and 5% by surgery, chemotherapy, or radiotherapy. Consequently, 95% of the total number of deaths due to lung cancer were classified under “primary avoidable mortality” and 5% under “tertiary avoidable mortality.”

Fifty percent of deaths due to ischemic heart disease could have been prevented by primary prevention, 25% by secondary prevention, and 25% by tertiary prevention. Therefore 50%, 25%, and 25% of the total number of deaths were attributed to each of the three categories.

Lastly, 50% of deaths due to breast cancer could have been prevented by tertiary prevention, 35% by secondary prevention, and only 15% by primary prevention. Deaths due to breast cancer are therefore distributed between the three categories in the same proportions.

The Canadian Institute for Health Information presents three detailed case studies on ischemic heart disease, lung cancer, and breast cancer that help explain the complexity of the interaction between primary, secondary, and tertiary level interventions in reducing mortality due to a specific disease. We invite the reader to have a look at these examples.<sup>6</sup>

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<sup>6</sup> Canadian Institute for Health Information, Health Indicators 2 [https://secure.cihi.ca/free\\_products/health\\_indicators\\_2012\\_en.pdf](https://secure.cihi.ca/free_products/health_indicators_2012_en.pdf).

# 1 METHODOLOGY

## 1.1 DATA SOURCES

The mortality data used in the numerator (1990 to 2007) are from Ministère de la Santé et des Services sociaux death records.

The data from the four surveys used for the denominator were specially ordered from Statistics Canada.

## 1.2 LANGUAGE USED AND CORRECTION OF LANGUAGE DATA

The only indicator of linguistic affiliation on Québec death records is the language spoken at home by the deceased, which is entered on the death certificate normally filled out by a health care worker. We analyzed the reliability of the “language spoken at home” variable from death records in a previous document published in this collection.<sup>7</sup> The language spoken at home is also available from the Canadian census, which is the other required data source for calculating mortality rates.

A number of answer combinations are possible, and we selected only the francophone and anglophone groups. Deaths for which the recorded language spoken at home was French only or French and a language other than English were categorized as “francophone.” Deaths where the recorded language spoken was English only or English and a language other than French were classified as “anglophone”.<sup>8</sup> Deaths where both languages were recorded (bilingual) or where a language other than French or English (allophone) was given were not used in our analysis.

Many death certificates do not include information on language (average of 11.3% from 1990 to 2007). We applied multiple imputation<sup>9 10</sup> to all the data (all causes combined) to allocate a language of use to deaths of unknown language affiliation.<sup>11</sup> The imputation was based on age, gender, birthplace (Québec, another Canadian province, foreign country), and social deprivation quintile<sup>12</sup> distributions, and the known proportion of anglophone deaths per dissemination area. Given the qualitative nature of the language variable, we used discriminant function analysis,<sup>13</sup> a statistical technique that generated five probable values for

<sup>7</sup> Trempe, et al. *La validité de la variable “Langue d’usage à la maison” du Fichier des décès du Québec*. Institut national de santé publique du Québec, 2012.

<sup>8</sup> Statistics Canada uses this classification system for the census.

<sup>9</sup> Raghunathan, T.E. “What do we do with missing data? Some options for analysis of incomplete data.” *Annu Rev Public Health* 2004, 25: 99–117.

<sup>10</sup> Sterne, J.A.C., White, I.R., Carlin, J.B., Spratt, M., Royston, P., Kenward, M.G., Wood, A.M, and Carpenter J.R. “Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls.” *BMJ* 338.

<sup>11</sup> Imputation of language was performed for all deaths, not only for those of people under 75 years of age.

<sup>12</sup> Pampalon, R., Hamel, D., Gamache, P., and Raymond, G. *A deprivation index for health planning in Canada*. 2009.

<sup>13</sup> SAS Institute Inc. *The MI procedure*. Cary, NC: SAS; 2004

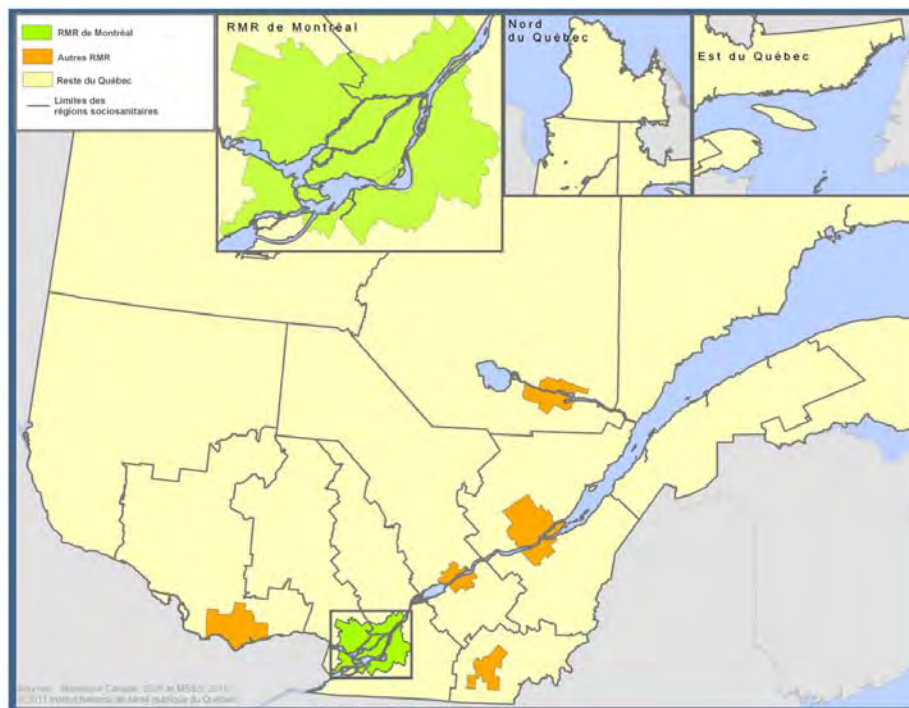
each missing value. The process gave rise to five complete death records, and each record was analyzed separately before estimating the average of their results.

After the imputations, the total number of deaths increased in each linguistic group, but their proportional distribution remained identical. The average of the five imputations attributed 124,473 deaths to the “French” language use group and 14,321 to the “English” language use group for the period studied. All our analyses used the results of these imputations.

### 1.3 GEOGRAPHY

In theory, the databases used for most of the project should have allowed us to refine our geographical analysis to the dissemination area level.<sup>14</sup> However, the anglophone population is not big enough in many regions of Québec to perform statistically reliable analyses at this level. This obliged us to divide Québec into three major areas, the Montréal census metropolitan area (CMA), the other five metropolitan areas in the province (Québec City, Trois-Rivières, Sherbrooke, Saguenay, and Gatineau) called “other CMAs,” and the rest of Québec. This third group is composed of all the towns, villages, and rural areas that do not belong to a metropolitan area and is designated “non-CMAs.”

These geographical groupings provide larger numbers of deaths and, despite their limitations, paint a picture of Québec’s social and demographic diversity.



**Figure 1 Map of areas studied**

<sup>14</sup> Dissemination area (DA): small area composed of one or more neighboring blocks, with a population of 400 to 700 persons. All of Canada is divided into dissemination areas.  
Source: Statistics Canada, *Census dictionary*.



Census metropolitan areas (CMAs) are the geographical units used by Statistics Canada and correspond to an area composed of one or more neighboring municipalities situated around an urban core. A CMA must have a population of at least 100,000 inhabitants, of which at least 50,000 live in the urban core.<sup>15</sup>

Table 1 presents 2006 population numbers and the numbers of deaths for the entire study period.

#### 1.4 TIME PERIODS

We based our work on *Portrait de santé du Québec et de ses régions* (2011) produced by INSPQ, using the same periods to group deaths: 1990-1994, 1995-1999, 2000–2004, and 2005–2007.

The number of avoidable deaths recorded in Québec between 1990 and 2007, after correction for missing language data, was 294,237: 257,102 (87.4%) of these deaths had French as the declared language of use, 25,597, (8.7%), English as the declared language of use, 1,853 had both languages (0.6%), and 9,686 another language (3.3%), (See table 1).

**Table 1** Number of avoidable deaths by linguistic group and period, Québec

	French	English	Bilingual	Allophone	Total
<b>1990–1994</b>	72,142	7,695	561	2,921	83,319
<b>1995–1999</b>	69,215	7,147	459	2,865	79,687
<b>2000–2004</b>	73,333	6,933	508	2,573	83,346
<b>2005–2007</b>	42,411	3,822	325	1,327	47,885
<b>Total</b>	257,102	25,597	1,853	9,686	294,237

The last period is shorter than the others because data for 2008 and 2009 was unavailable when the analyses were conducted.

#### 1.5 SELECTED CAUSES OF DEATH

The work of Tobias and Jackson covered the years prior to 2000 and only used version 9 of the international classification of diseases coding system (ICD-9). Since the 10th version (ICD-10) was used for Québec death records starting in 2000, we needed to compare ICD-9 with ICD-10 to select the initial causes of death recorded as of 2000.

<sup>15</sup> For more information go to the Statistics Canada website: <http://www12.statcan.gc.ca/census-recensement/2011/ref/dict/index-eng.cfm>.

We found this comparison on the website of Hunter New England Area Health Services, New South Wales, Australia.<sup>16</sup> They worked closely with Tobias and Jackson and they use the same weighting method for causes of avoidable deaths based on the contribution of each of the prevention types (primary, secondary, and tertiary). They drew up a list of 62 causes of death. This list, which we used, is slightly different than that of Tobias and Jackson (2001), who had selected 56 causes.

The move from ICD-9 to ICD-10 in 2000 created a break in the temporal analysis of a number of causes of death. Two key factors explain this phenomenon. Certain diseases were moved to other categories or divided into subcategories, and certain rules and instructions for selecting the initial cause of death were changed. Most causes of death were little affected, by the change, and comparing data before and after 2000 is not a problem in these cases. However, the effect on certain causes of death was more significant and in some cases explains the differences in temporal trends. A number of studies were performed worldwide to verify the scope of the changes.<sup>17 18 19 20 21</sup> The two Québec studies cited provide a much more exhaustive review of these than ours does.

Since the break affects anglophones as much as francophones, it is unlikely that it distorts the comparative analysis between the two linguistic groups.

## 1.6 AGES OF DECEASED

Age is also a criteria used in analyzing avoidable mortality. Tobias and Jackson used an age range of 0 to 75 years, and excluded deaths after age 75.<sup>22</sup> We used the same age range, except for leukemia, where the maximum age was under 44, a change that was also suggested by NSW Health. Some researchers use different age breakdowns, but we preferred to keep the one Tobias and Jackson used in their original work.

## 1.7 CENSUS DATA USED FOR CALCULATING AND CORRECTING THIS DATA

We used Statistics Canada population data from the 1991, 1996, 2001, and 2006 censuses as denominators for the mortality rates. These denominators concern the total population under 75, broken down by age, gender, language spoken at home, and geographical area.

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<sup>16</sup> [http://www2.hnehealth.nsw.gov.au/hneph/HHNE/toc/app\\_icd\\_diag.htm](http://www2.hnehealth.nsw.gov.au/hneph/HHNE/toc/app_icd_diag.htm).

<sup>17</sup> Brock et al. "The effect of the introduction of ICD-10 on cancer mortality trends in England and Wales." *Health Stat Q.* 2004 Autumn;(23): 7–17. London, England.

<sup>18</sup> Brock et al. "The impact of introducing ICD-10 on analysis of respiratory mortality trends in England and Wales." *Health Stat Q.* 2006 Spring (29): 9–17. London, England.

<sup>19</sup> Griffiths et al. "The impact of introducing ICD-10 on trends in mortality from circulatory diseases in England and Wales." *Health Stat Q.* 2004 Summer;(22): 14–20. London, England.

<sup>20</sup> Paquette et al. *Proposition pour l'analyse des séries temporelles des données de mortalité selon la cause au Québec à la suite de l'adoption de la 10 E révision de la classification internationale des maladies*, Institut national de santé publique du Québec, 2006.

<sup>21</sup> Anderson et al. "Comparability of cause of death between ICD-9 and ICD-10: preliminary estimates." *Natl Vital Stat Rep.* 2001 May 18; 49(2): 1–32. CDC, Atlanta.

<sup>22</sup> Note that deaths before age 75 are not all avoidable, but some of them could be avoided if certain effective measures were put in place.

This data was corrected to add residents of collective households who are not included in census data on language spoken at home (census long form).<sup>23</sup> We also corrected the data to counter the undercoverage inherent to the census itself (individuals not included in the census) as well as to obtain the population on July 1 (in the middle of the year) as the census data are collected in May.

This correction is based on estimates and projections by Institut de la statistique du Québec using Canadian census data.

An adjustment was then applied to obtain the population in the middle of each of the four periods we studied (1992, 1997, 2002, and 2006).

## **1.8 HEALTHY MIGRANT EFFECT**

Québec has a large percentage of immigrants whose language is other than French or English. About 80% of them live in the greater Montréal area and many speak English or French at home; in theory, this is the language that should appear on the death certificates.

It is recognized in the literature that immigrants generally have lower mortality rates than the local population. This is known as the healthy migrant effect.<sup>24,25</sup> The impact of this effect is greater for Québec anglophones because of their smaller population and because many immigrants adopted English as their language of use in the past. The healthy migrant effect could be an important methodological limit that gives the impression that anglophone mortality rates are lower than they really are.

However, Canadian studies show that the healthy immigrant effect wears off quite quickly and that after 20 years, immigrant mortality rates are similar to those of the nonimmigrant population.<sup>26</sup> Therefore we can assume that the greater proportion of immigrants in the anglophone population does not skew our mortality analyses.

## **1.9 CALCULATING AVOIDABLE MORTALITY**

Our analysis is essentially based on the relationship between the number of deaths in a given linguistic group and the proportion of the total population who speak that language. In the first case, the data comes from death certificates filled out by a third party and in the second case the data comes from the census.

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<sup>23</sup> The census long form does not include people in institutions such as long-term care hospitals (CHSLD); these establishments are particularly important in mortality analyses.

<sup>24</sup> Hyman, I. "Setting the Stage: Reviewing Current Knowledge on the Health of Canadian Immigrants." *Canadian Journal of Public Health*. May-June 2004, Volume 95, No 3.

<sup>25</sup> Singh, G.K., and Miller, B.A. "Health, Life Expectancy, and Mortality Patterns Among Immigrant Populations in the United States." *Canadian Journal of Public Health*. May-June 2004, Vol. 95, no 3.

<sup>26</sup> Ng, E. and the LHAD research team. *Le point sur l'effet de l'immigrant en santé: mortalité selon la période d'immigration et le lieu de naissance*. Statistics Canada, September 2011.

Our study uses estimates of adjusted avoidable mortality rates by language, gender, geographical area, and the four study periods. To take age structure into account, we calculated the adjusted rates using the direct standardization method.

The crude age-specific rates for age groups 0-4, 5-14, 15-24, 25-44, 45-64, and 65-74 were calculated first. Using the same age groups, we then applied these crude age-specific rates to our reference population (Québec's total population in 2006) (both genders combined) in order to estimate anticipated deaths. Adjusted rates were subsequently obtained by dividing the total number of anticipated deaths by the reference population.<sup>27,28</sup>

We calculated the total adjusted avoidable mortality rates—i.e., for all causes combined, and for each of the three intervention categories (primary, secondary, and tertiary)—according to the weight attributed to each intervention category for each cause of death.<sup>29</sup> The rates were calculated for each linguistic group, gender, geographic area, and period. We used the same method to calculate the adjusted rates for the 62 causes taken individually.

To estimate the statistical precision of the adjusted rates, a coefficient of variation (CV)<sup>30</sup> was calculated. In keeping with the methodology set out in the *Portrait de santé du Québec et de ses régions* (2011), estimates with CVs lower or equal to 16.66% can be used without restriction. Estimates with CVs between 16.66% and 33.33% should be interpreted with caution.

To test whether differences in avoidable mortality between francophones and anglophones were significant, we performed Z-tests on the log-transformed rates.<sup>31,32,33</sup> If the P values were greater than 0.05, we considered there to be no significant difference between the two linguistic groups.

The analyses were performed with Microsoft Excel and SAS 9.1 software from the SAS Institute Inc., Cary, NC.

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<sup>27</sup> Ministère de la Santé et des Services sociaux. *Pour guider l'action - Portrait de santé du Québec et ses régions*, 2011.

<sup>28</sup> Infocentre de santé publique du Québec. *Cadre méthodologique des indicateurs du Plan commun de surveillance*, June 2011.

<sup>29</sup> For example, 50% of deaths due to ischemic heart disease were associated with primary prevention, 25% with secondary prevention, and 25% with tertiary prevention.

<sup>30</sup> Even though the data was combined in multi-year groups, the small number of deaths, especially for the anglophone minority, means that estimates can be highly variable. Calculating coefficients of variation makes it possible to measure the level of precision and reject estimates that are too imprecise.

<sup>31</sup> *Op. cit.*, *Pour guider l'action, Portrait de santé du Québec et de ses régions* 2011.

<sup>32</sup> *Op. cit.*, *Cadre méthodologique des indicateurs du plan de surveillance*.

<sup>33</sup> Carriere K.C. and Roos, L.L. "Comparing Standardized Rates of Events." *Am J Epidemiol* 1994, 140: 472–82.

## 2 AVOIDABLE MORTALITY IN ANGLOPHONE AND FRANCOPHONE MEN IN QUÉBEC FOR THE PERIOD 1990 TO 2007

### 2.1 SITUATION FOR QUÉBEC AS A WHOLE

#### 2.1.1 Avoidable mortality in general and by prevention type

Table 2 shows that for Québec as a whole, general avoidable mortality rates<sup>34</sup> and avoidable mortality rates for the three prevention types decreased from 1990 to 2007 in both anglophone and francophone **men**, but did so more rapidly in the latter group. General avoidable mortality rates decreased 38.2% for francophones and 28.9% for anglophones. Despite the more rapid decrease among francophones, the rate for anglophone men was still significantly lower at 234 per 100,000 in 2005–2007 than that of francophones, at 302 per 100,000.

The two linguistic groups followed the worldwide trend of decreasing general mortality, but the reduction occurred more quickly in francophones.

**Table 2 Standardized rates of avoidable mortality (general and by prevention type) in men by mother tongue<sup>†</sup> and period<sup>††</sup> in Québec as a whole (adjusted rates per 100,000 inhabitants)**

	Linguistic Group	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	Decrease over time T4 vs. T1 P value	
General avoidable mortality	Francophone	489	424	344	302	–38.2%	S
	Anglophone	329	302	264	234	–28.9%	S
Through primary prevention	Francophone	298	258	209	185	–37.8%	S
	Anglophone	192	177	151	135	–29.7%	S
Through secondary prevention	Francophone	98	86	70	60	–38.6%	S
	Anglophone	70	65	58	51	–27.3%	S
Through tertiary prevention	Francophone	94	80	64	57	–38.9%	S
	Anglophone	66	60	54	48	–27.8%	S

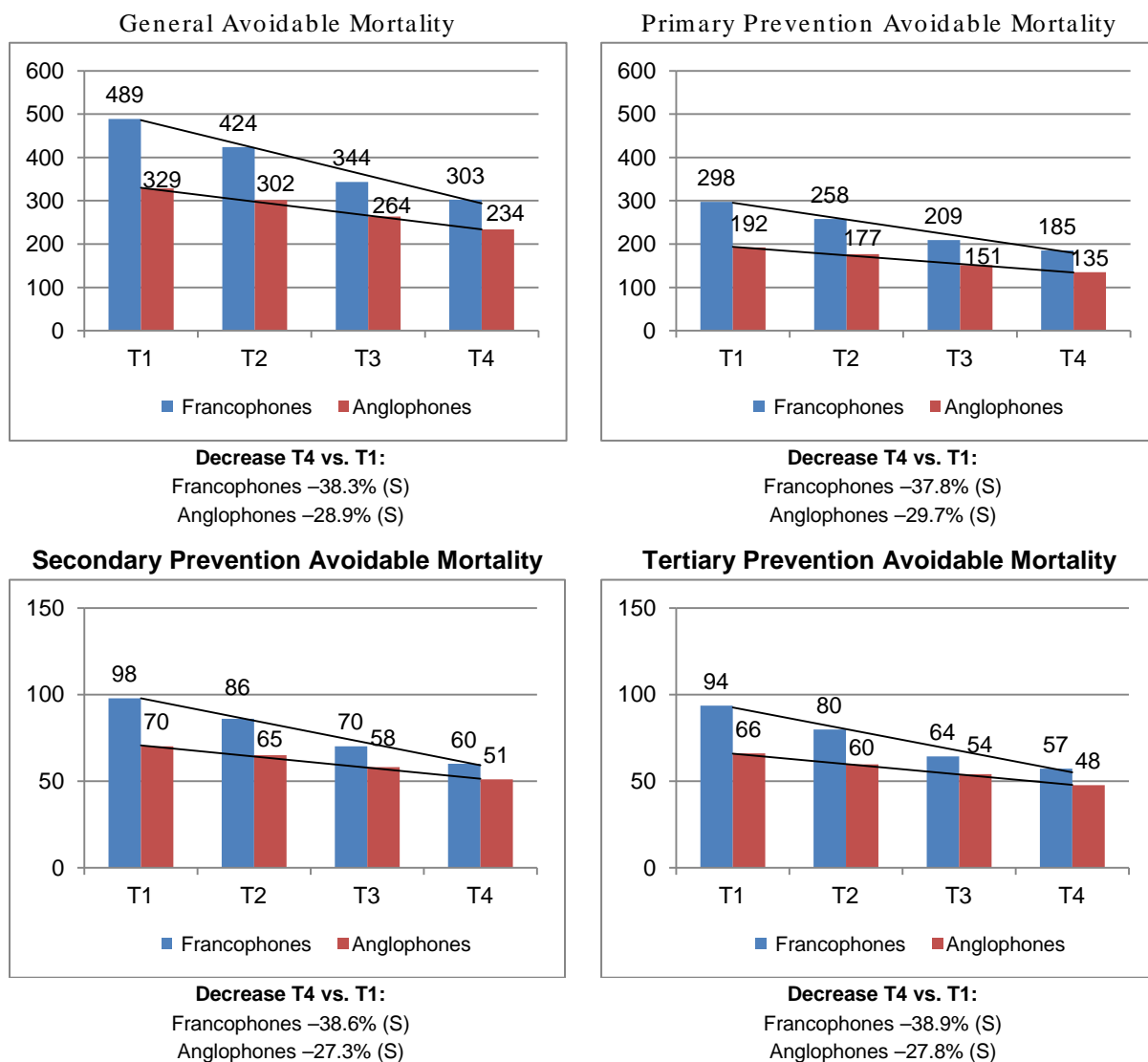
<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. In this table, all differences between francophones and anglophones are statistically significant.

<sup>††</sup> A Z-test on the log-transformed rates was performed separately for francophones and anglophones to compare the rates in the first period (T1) to those in the last period (T4). In this table, all decreases over time are statistically significant.

<sup>34</sup> General avoidable mortality refers to all avoidable deaths regardless of prevention type.

The following figures enable the reader to visualize part of the data in the above table more easily. The lines in the figures are linear trendlines; they appear in all the figures in this document.<sup>35</sup>

To simplify the figures, T1 indicates 1990–1994, T2 indicates 1995–1999, and so on.



**Figure 2** General, primary, secondary, and tertiary avoidable mortality rates in francophone and anglophone men in Québec (adjusted rates per 100,000 inhabitants)

<sup>35</sup> A linear trendline is a best-fit straight line that is used with simple linear data sets. Data is linear if the pattern in its data points resembles a line. A linear trendline usually shows that something is increasing or decreasing at a steady rate. Source: Microsoft Office.

Whether we consider the decrease in general avoidable mortality or the decreases closely associated with one of the three prevention types, the picture is the same: a clear decrease in francophone men but rates that remain significantly higher than in anglophones.

### 2.1.2 Major causes of avoidable deaths

To guide the analysis of specific causes, Table 3 presents causes accounting for more than 1,000 avoidable deaths from 2005 to 2007.

**Table 3 The eight major causes of avoidable deaths in Québec men from 2005 to 2007**

	Total number of avoidable deaths	%	Primary prevention	%	Secondary prevention	%	Tertiary prevention	%
<b>MEN</b>								
Ischemic heart disease	6,075	20.6	3,038	16.9	1,519	25.7	1,519	26.9
Lung cancer	6,044	20.5	5,742	32.0	0	0.0	302	5.3
Suicide and intentional injuries	2,769	9.4	1,661	9.3	831	14.0	277	4.9
Colorectal cancer	1,959	6.6	784	4.4	980	16.6	196	3.5
Traffic accidents	1,289	4.4	773	4.3	0	0.0	516	9.1
Cerebrovascular disease	1,155	3.9	347	1.9	578	9.8	231	4.1
Chronic obstructive pulmonary disease	1,119	3.8	895	5.0	112	1.9	112	2.0
Diabetes	1,108	3.8	332	1.9	665	11.2	111	2.0
Other causes	8,011	27.1	4,386	24.4	1,233	20.8	2,389	42.3
Total for all avoidable causes	29,529	100	17,958	100	5,918	100	5,653	100

The main causes of avoidable deaths in Québec men for this period were ischemic heart disease (6,075 deaths) and lung cancer (6,044 deaths), with suicides (2,769 deaths) and colorectal cancer (1,959 deaths) following far behind. These four causes account for nearly 60% of avoidable deaths.

If we were to organize these causes according to the potential of primary, secondary, or tertiary interventions to prevent them, the order would change somewhat, but the dominant cause would still be ischemic heart disease. The other main causes are more closely associated with primary prevention (lung cancer and suicide) and secondary prevention (suicide and colorectal cancer). In the case of tertiary prevention, ischemic heart disease dominates, but there other many other causes of associated avoidable deaths.

The following table shows how these causes of death are distributed between anglophones and francophones.

**Table 4** Standardized rates of avoidable mortality due to certain specific causes in men by mother tongue<sup>†</sup> and period<sup>††</sup> in Québec as a whole (adjusted rates per 100,000 inhabitants)

Avoidable mortality	Linguistic group	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T4 vs. T1 %	P value
Ischemic diseases	Francophone	146.3	116.3	79.9	61.9	-58	S
	Anglophone	108.9	92.1	72.1	54.2	-50	S
Lung cancer	Francophone	96.6	84.5	72.0	64.1	-34	S
	Anglophone	54.4	48.8	42.6	37.3	-31	S
Suicides and intentional injuries	Francophone	32.9	37.3	32.6	28.9	-12	S
	Anglophone	13.2	15.6	13.3	13.5	+2	NS
Colorectal cancer	Francophone	24.0	23.0	21.0	19.8	-18	S
	Anglophone	17.0	16.2	15.7	19.4	+14	NS
Traffic accidents	Francophone	19.7	15.3	12.8	13.6	-30	S
	Anglophone	9.1*	6.4*	5.1 *	5.3*	-42	NS
Cerebrovascular disease	Francophone	23.7	19.8	14.2	11.7	-51	S
	Anglophone	15.8	17.8	13.6	10.7*	-33	NS
COPD	Francophone	26.3	21.2	15.5	12.3	-53	S
	Anglophone	12.1	11.9	8.5*	6.4*	-47	S
Diabetes	Francophone	13.4	14.0	13.5	11.1	-17	S
	Anglophone	12.2	12.0	14.1	9.9*	-19	NS

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

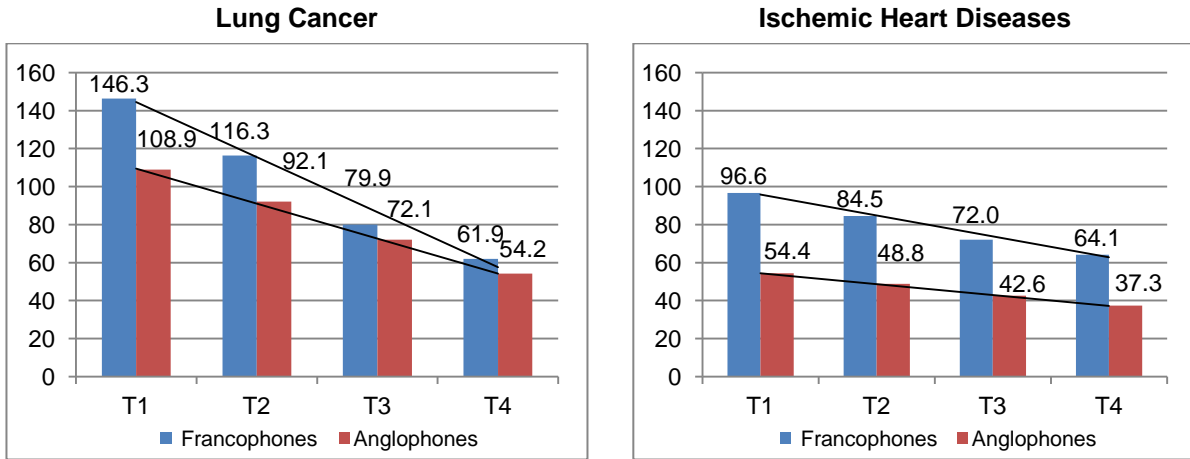
<sup>††</sup> A Z-test on the log-transformed rates was performed separately for francophones and anglophones to compare the rates in the first period (T1) to those in the last period (T4). ("S" indicates a statistically significant decrease and "NS" a non-significant decrease).

\* Indicates a coefficient of variation higher than 16.66% and lower or equal to 33.33%. In these cases, the rate should be interpreted with caution.

The two leading causes in terms of number of deaths, and for which the decrease is largely due to primary prevention (lung cancer and ischemic heart disease), evolved similarly in both groups. There was a significant decrease in rates for both causes between 1990–1994 and 2005–2007, a decrease that was slightly more pronounced among francophones. Due to the converging rates, the difference between anglophone and francophone men with respect to mortality rates due to ischemic heart disease disappeared during the 2005–2007 period. The difference persisted for lung cancer, however.

Figure 3 clearly illustrates these variations.





**Decrease T4 vs. T1**  
 Francophones -33.7% (S)  
 Anglophones -31.4% (S)

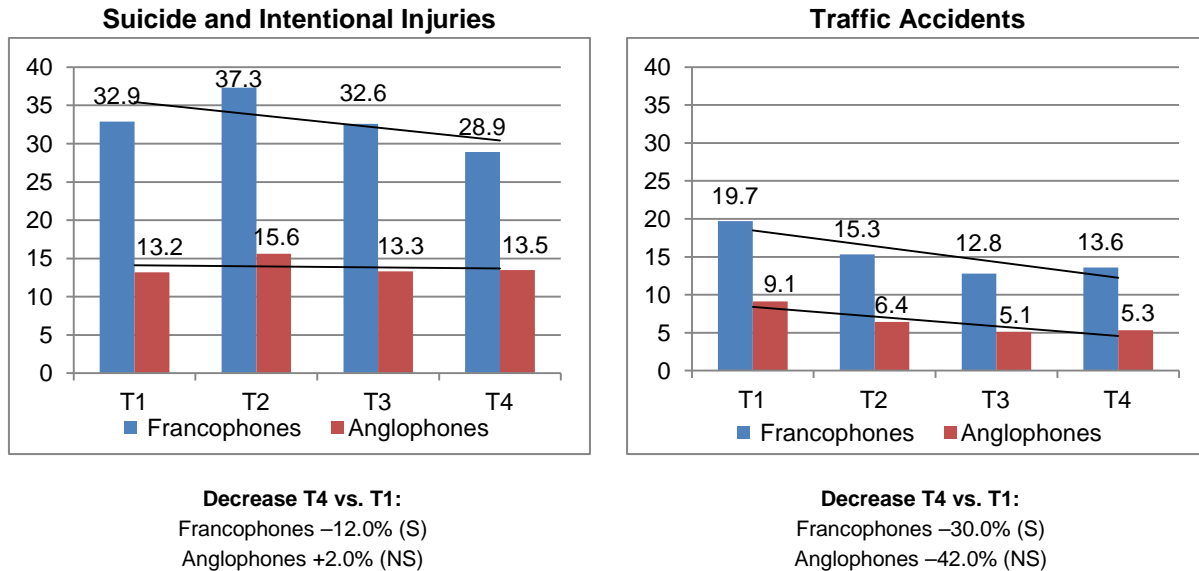
**Decrease T4 vs. T1**  
 Francophones -57.7% (S)  
 Anglophones -50.2% (S)

**Figure 3** Avoidable mortality rates due to lung cancer and ischemic heart disease in francophone and anglophone men in Québec (adjusted rates per 100,000 inhabitants)

The situation is similar for suicide, which is sensitive mainly to primary (60%) and secondary prevention (30%). There was a significant reduction in avoidable mortality due to suicide in francophones, while the rate for anglophones changed very little over the years. Nonetheless, the mortality rate in francophone men is still at least double that of anglophones. Québec has always had high suicide rates, and as we see here, the difference is particularly notably among francophones.

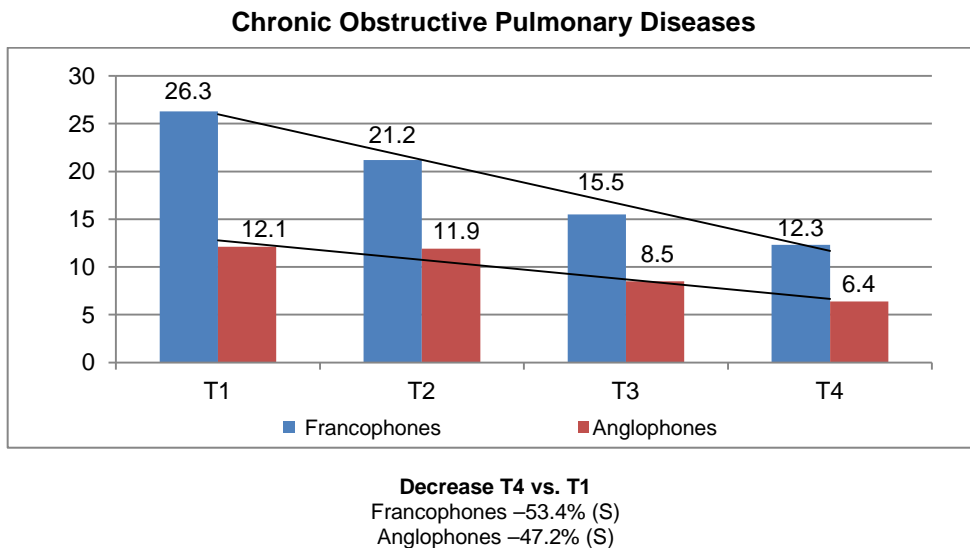
The situation is very similar for deaths due to traffic accidents, which decreased considerably for francophone men and decreased in a statistically nonsignificant way for in anglophones. The rates for francophone men are still more than double that of anglophones. Mortality due to traffic accidents could be reduced mainly through primary (60%) and tertiary (40%) prevention.

Figure 4 illustrates these variations.



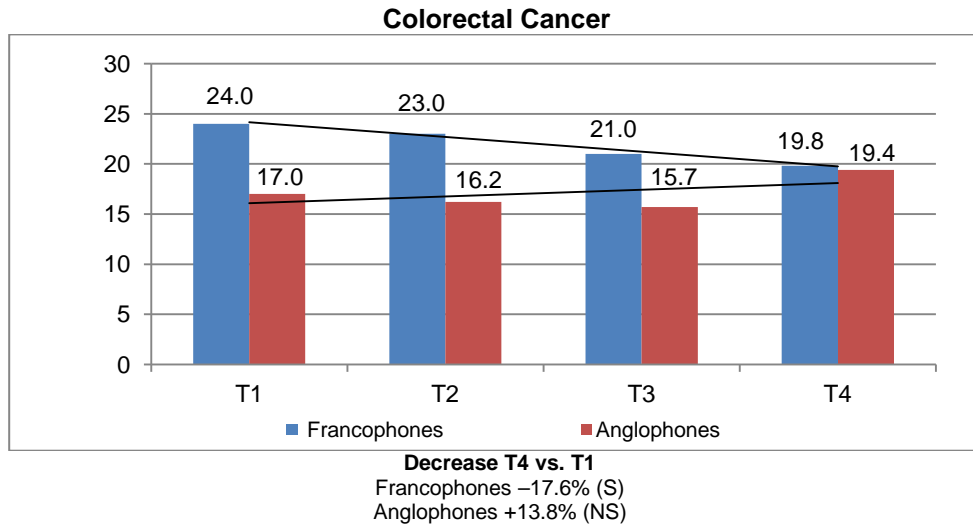
**Figure 4** Avoidable mortality rates due to suicide, intentional injuries, and traffic accidents in francophone and anglophone men in Québec (adjusted rates per 100,000 inhabitants)

Deaths due to chronic obstructive pulmonary disease, which is mainly associated with primary prevention, are also of interest, particularly because of their association with smoking. There was a significant and relatively similar decrease in mortality rates for both linguistic groups between 1990 and 2007: -53.4% in francophones and -47.2% in anglophones. However, the rate for francophones was double that of anglophones, throughout the four study periods (Figure 5).



**Figure 5** Avoidable mortality rates due to chronic obstructive pulmonary disease in francophone and anglophone men in Québec (adjusted rates per 100,000 inhabitants)

Mortality due to colorectal cancer is also of interest given its importance among avoidable causes. This type of cancer is sensitive to both primary and secondary prevention, which could have respectively averted 40% (784 cases) and 50% (980 cases) of deaths over the period studied. The avoidable mortality rate for this cancer decreased significantly in francophones (-18.0 %) from T1 to T4 but remained stable in anglophones (Figure 6). Thus in 20 years, colorectal cancer rates in francophone men dropped to the same level as in their anglophone counterparts (Table 4).



**Figure 6** Avoidable mortality rates due to colorectal cancer in francophone and anglophone men in Québec (adjusted rates per 100,000 inhabitants)

## 2.2 SITUATION IN THE VARIOUS AREAS

The analysis by area is more complex because the reductions in number of deaths had coefficients of variation that were too high to draw any significant conclusions about specific causes. However, some observations can be made.

**Table 5 Standardized rates of avoidable mortality (general and by prevention type) in MEN by area, mother tongue<sup>†</sup> and period<sup>††</sup> (adjusted rates per 100,000 inhabitants)**

	Area	Language	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T4 vs T1 %	P value
<b>General</b>	MTL CMA	French	519.6	441.7	350.8	310.3	-0.3	S
		English	326.6	300.2	266.1	238.6	-6.9	S
	Other CMA	French	469.7	407.6	327.9	281.5	-0.1	S
		English	284.6	267.9	207.7	139.0	-1.2	S
	Non-CMA	French	461.2	415.7	347.1	309.3	-32.9	S
		English	347.4	326.9	289.0	283.2	-18.5	NS
<b>Through primary prevention</b>	MTL CMA	French	317.9	269.0	212.6	189.2	-40.5	S
		English	189.8	174.7	152.3	136.5	-28.1	S
	Other CMA	French	285.2	249.2	199.7	171.8	-39.8	S
		English	173.7	167.1	125.0	85.2	-51.0	S
	Non-CMA	French	279.1	252.3	211.6	190.1	-31.9	S
		English	207.0	193.1	163.9	167.3	-19.2	NS
<b>Through secondary prevention</b>	Québec	French	105.0	91.3	73.2	62.1	-40.8	S
		English	70.6	65.8	59.0	53.6	-24.1	S
	Other CMA	French	95.7	82.9	67.9	57.7	-39.7	S
		English	56.8*	52.1*	41.9*	26.6*	-53.1	S
	Non-CMA	French	90.6	83.0	69.2	59.8	-33.9	S
		English	70.9	67.6	65.3	55.2	-22.1	NS
<b>Through tertiary prevention</b>	MTL CMA	French	96.8	81.4	65.0	59.0	-39.0	S
		English	66.1	59.7	54.9	48.5	-26.6	S
	Other CMA	French	88.7	75.6	60.3	52.0	-41.4	S
		English	54.0	48.8	40.8	27.2	-49.7	S
	Non-CMA	French	91.5	80.4	66.3	59.4	-35.1	S
		English	69.4	66.2	59.8	60.7	-12.6	NS

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

<sup>††</sup> A Z-test on the log-transformed rates was performed separately for francophones and anglophones to compare the rates in the first period (T1) to those in the last period (T4). ("S" indicates a statistically significant decrease and "NS" a non-significant decrease).

\* Indicates a coefficient of variation higher than 16.66% and lower or equal to 33.33%. In these cases, the rate should be interpreted with caution.

The trends observed for Québec as a whole were also found in the Montréal CMA. General avoidable mortality and mortality sensitive to primary, secondary, and tertiary prevention decreased in both areas. The differences between T1 and T4 were all significant, but were also more pronounced in francophone men than in anglophones. However, avoidable mortality rates remain significantly lower in anglophones than in francophones.

Similar decreases were observed in the other CMAs, but more so in anglophone men, so that the difference between the two linguistic groups was in fact accentuated. Mortality rates in francophones are still significantly higher than those of anglophones.

In non-CMAs, the decrease in general avoidable mortality and avoidable mortality attributable to the three prevention types is significant in francophone men. However, the small sample size for anglophones made it impossible to reach the required statistical threshold, even though the rates also seem to have decreased. It is interesting to note that the rates for francophones were all significantly higher than those for anglophones for the first two periods (T1 and T2), regardless of prevention type, but this difference disappeared for all prevention types in the last period (T4). The reduced rates in both francophone and anglophone men were not as pronounced in non-CMAs as in the two other areas.

The analysis by area also allows us to draw conclusions about several specific causes of avoidable mortality. Ischemic heart disease, the biggest cause of avoidable mortality, followed the same trends in the Montréal CMA and the other CMAs as it did in Québec as a whole, namely a significant decrease over time and higher rates for francophones than anglophones. However, no significant difference between anglophone and francophone men in non-CMAs was observed over the four study periods, and mortality rates were similar in the last two periods. Decreases in avoidable death rates from T1 to T4 were considerable and statistically significant for both francophone and anglophone men (-55.4% and -43.8% respectively).

The number of deaths due to lung cancer, the second greatest cause of avoidable mortality, was not high enough to draw conclusions, except in the Montréal CMA, where the decrease over time was significant for both linguistic groups, albeit a little less pronounced in francophone men. However, once again, the avoidable mortality rate for the latter group remained higher than in anglophone men. The situation was similar for chronic obstructive pulmonary diseases in that all rates dropped throughout Québec, but the decreases were significant only for francophones.

**Table 6** Standardized rates of avoidable mortality due to certain specific causes in men by area, mother tongue<sup>†</sup>, and period<sup>††</sup> (adjusted rates per 100,000 inhabitants)

Avoidable mortality	Area	Linguistic group	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T1 vs T4	P value
Ischemic heart	Montréal CMA	Francophone	146.3 <sup>†</sup>	116.3	79.9	61.9	-58.0	S <sup>††</sup>
		Anglophone	108.9	92.1	72.1	54.2	-50.0	S
	Other CMAs	Francophone	142.7	110.6	74.3	56.4	-60.5	S
		Anglophone	102.6	73.5	62.4	36.5	-64.4	S
	Non-CMAs	Francophone	135.5	109.7	75.7	60.5	-55.4	S
		Anglophone	111.3	92.2	80.1	62.5*	-43.8	S
Lung cancer	Montréal CMA	Francophone	100.0	86.9	71.9	65.0	-35.0	S
		Anglophone	52.6	47.7	43.7	37.7	-28.2	S
	Other CMAs	Francophone	93.6	82.2	69.5	58.3	-37.7	S
		Anglophone	52.0*	53.1*	37.8*	29.3**	-43.6	NS
	Non-CMAs	Francophone	93.1	83.5	73.3	66.3	-28.8	S
		Anglophone	62.0*	50.8*	39.2*	40.1*	-35.2	NS
COPD	Montréal CMA	Francophone	25.4	20.7	15.0	12.3	-51.6	S
		Anglophone	10.9*	11.3*	7.7*	6.2*	-43.5	NS
	Other CMAs	Francophone	28.4	21.2	15.8	12.4	-56.2	S
		Anglophone	15.3**	11.7**	8.2**	6.4**	-58.5	NS
	Non-CMAs	Francophone	25.6	21.6	15.7	12.2	-52.5	S
		Anglophone	15.8**	14.6**	12.7**	8.4**	-46.7	NS
Colorectal cancer	Montréal CMA	Francophone	26.1	24.7	22.5	19.9	-23.7	S
		Anglophone	16.9	16.7	16.8	20.7	+22.2	NS
	Other CMAs	Francophone	25.1	21.9	20.4	20.3	-19.2	NS
		Anglophone	9.8**	16.6**	8.7**	9.9**	+2.0	NS
	Non-CMAs	Francophone	21.6	21.8	20.0	19.5	-9.7	NS
		Anglophone	19.5*	13.8**	15.2**	17.5*	-9.9	NS

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

<sup>††</sup> A Z-test on the log-transformed rates was performed separately for francophones and anglophones to compare the rates in the first period (T1) to those in the last period (T4). ("S" indicates a statistically significant decrease and "NS" a non-significant decrease).

\* Indicates a coefficient of variation higher than 16.66% and lower or equal to 33.33%. In these cases, the rate should be interpreted with caution.

### 3 AVOIDABLE MORTALITY AMONG ANGLOPHONE AND FRANCOPHONE WOMEN IN QUÉBEC FOR THE PERIOD 1990 TO 2007

#### 3.1 SITUATION FOR QUÉBEC AS A WHOLE

##### 3.1.1 Avoidable mortality in general and by prevention type

Table 7 summarizes the evolution of avoidable mortality among women in Québec as a whole. The profile is very similar to the one for men. The general avoidable mortality rates and the avoidable mortality rates for the three prevention types (primary, secondary, and tertiary) decreased in both linguistic groups. This gain is statistically significant for the periods 1990–1994 (T1) and 2005–2007 (T4). Generally speaking, the avoidable mortality rates for anglophone women are significantly lower than the rates for francophone women, except for periods T3 and T4 for avoidable mortality through secondary prevention and period T3 for avoidable mortality through tertiary prevention. These rates, highlighted in green in the table, are not statistically different between anglophone and francophone women.

**Table 7 Standardized rates of avoidable mortality (general and by prevention type) in women by mother tongue<sup>†</sup> and period<sup>††</sup> for Québec as a whole (adjusted rates per 100,000 inhabitants)**

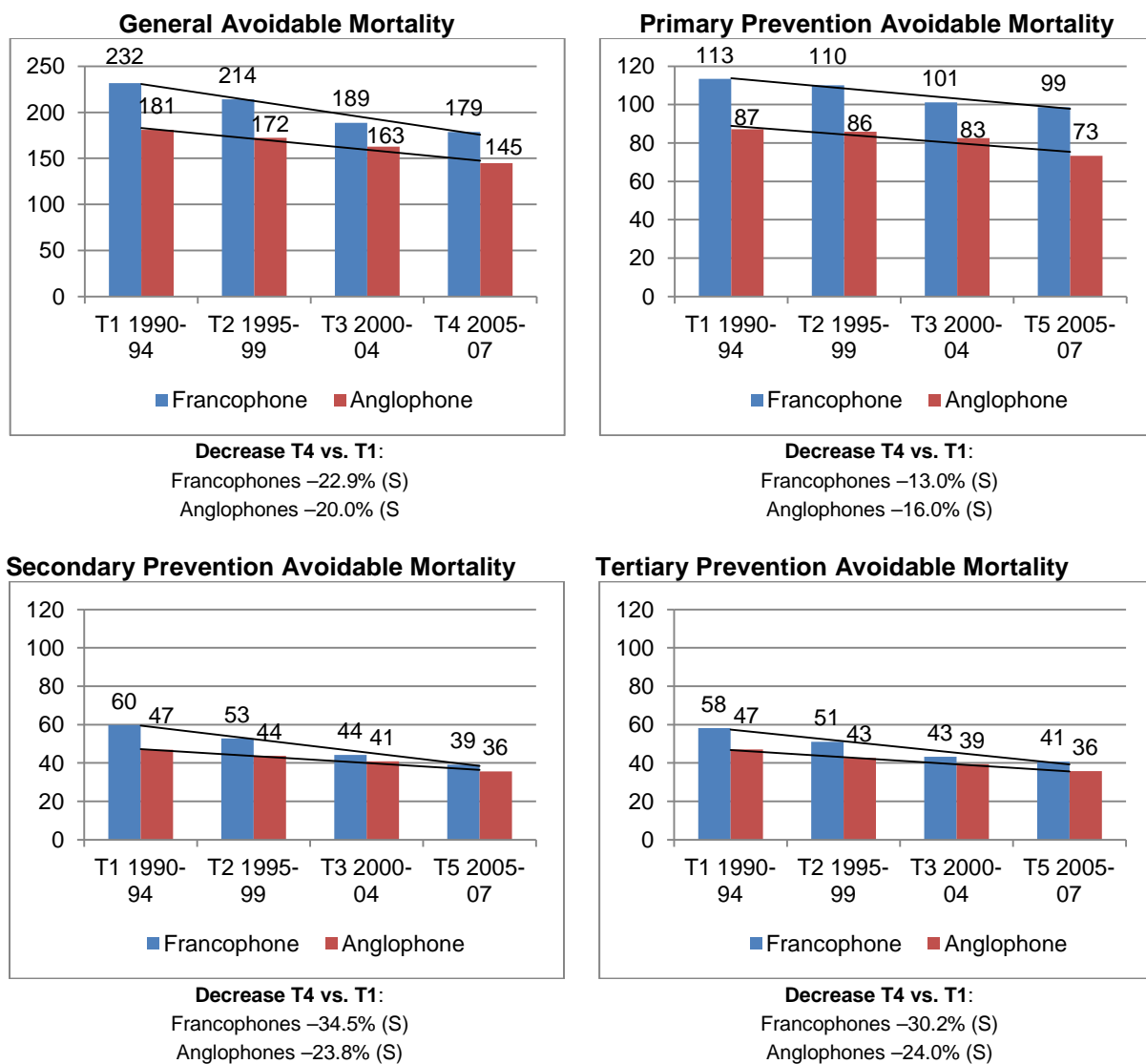
	Linguistic group	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T1 vs. T4 %	P value
<b>General avoidable mortality</b>	Francophone	231.5	214.0	188.5	178.6	-22.9	S
	Anglophone	181.1	172.3	162.7	144.7	-20.0	S
<b>Through primary prevention</b>	Francophone	113.4	110.1	101.1	98.7	-13.0	S
	Anglophone	87.2	85.9	82.5	73.3	-16.0	S
<b>Through secondary prevention</b>	Francophone	59.8	52.8	44.2	39.2	-34.5	S
	Anglophone	46.9	43.7	40.9	35.7	-23.8	S
<b>Through tertiary prevention</b>	Francophone	58.2	51.1	43.3	40.7	-30.2	S
	Anglophone	47.0	42.7	39.4	35.8	-24.0	S

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

<sup>††</sup> A Z-test on the log-transformed rates was performed to compare the rates for the first period (T1) to those in the last period (T4), separately for francophones and anglophones (“S” indicates a statistically significant decrease and “NS” a non-significant decrease).

Figure 7 illustrates the downward trends and differences that exist between the avoidable mortality rates of anglophone and francophone women. The drop in avoidable mortality through primary prevention, which accounts for twice as many avoidable deaths as the other two types of prevention, was much smaller than the decrease recorded for the other two types of prevention for both linguistic groups.

No reduction was observed in the gap between anglophone and francophone women for rates of avoidable mortality through primary prevention. However, the gap seems to be narrower for rates of avoidable mortality through secondary and tertiary prevention.



**Figure 7** Avoidable mortality rates (general and through primary, secondary, and tertiary prevention) among francophone and anglophone women in Québec (adjusted rates per 100,000 inhabitants)

Note: The scales in the figures are not all identical.

### 3.1.2 Major causes of avoidable mortality

To guide the analysis of specific causes, Table 3 presents causes accounting for more than 500 avoidable deaths from 2005 to 2007. We are using a threshold of 500 deaths among women instead of the threshold of 1,000 deaths among men because the number of avoidable deaths is much lower among women.



**Table 8** The nine major causes of avoidable deaths among Québec women from 2005 to 2007

<b>WOMEN</b>	<b>Total number of avoidable deaths</b>	<b>%</b>	<b>Primary prevention</b>	<b>%</b>	<b>Secondary prevention</b>	<b>%</b>	<b>Tertiary prevention</b>	<b>%</b>
Lung cancer	4,451	24.3	4,228	42.1	0	0.0	223	5.3
Breast cancer	2,309	12.6	346	3.5	808	19.8	1,155	27.4
Ischemic heart disease	2,115	11.5	1,058	10.5	529	12.9	529	12.5
Colorectal cancer	1,212	6.6	485	4.8	606	14.8	121	2.9
Chronic obstructive pulmonary disease	1,004	5.5	803	8.0	100	2.5	100	2.4
Cerebrovascular disease	878	4.8	263	2.6	439	10.7	176	4.2
Suicide and intentional injuries	823	4.5	494	4.9	247	6.0	82	2.0
Diabetes	590	3.2	177	1.8	354	8.7	59	1.4
Traffic accidents	499	2.7	299	3.0	0	0.0	200	4.7
Other causes	4,457	24.3	1,881	18.8	1,003	24.6	1,572	37.3
<b>Total for all avoidable causes</b>	<b>18,338</b>	<b>100</b>	<b>10,034</b>	<b>100</b>	<b>4,086</b>	<b>100</b>	<b>4,217</b>	<b>100</b>

The main causes of avoidable deaths among Québec women for this period were lung cancer (4,451 deaths), breast cancer (2,309 deaths), ischemic heart disease (2,115 deaths), and colorectal cancer (1,212 deaths), followed closely by chronic obstructive pulmonary disease (1,004 deaths). These five causes account for nearly 61% of avoidable deaths among women.

Lung cancer is the main cause that can be prevented through primary prevention, while breast cancer mortality rates are influenced more by secondary and tertiary prevention. As for deaths caused by ischemic heart disease, 50% could theoretically be prevented through primary prevention interventions, 25% through secondary prevention, and 25% through tertiary prevention.

**Table 9** Standardized rates of avoidable mortality due to certain specific causes among women, by mother tongue<sup>†</sup> and period<sup>††</sup> for Québec as a whole (adjusted rates per 100,000 inhabitants)

Avoidable mortality	Linguistic group	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T1 vs. T4 %	P value
<b>Lung cancer</b>	Francophone	33.9	38.3	42.1	44.6	+31.5	S
	Anglophone	27.5	30.5	29.9	28.0	+2.1	NS
<b>Breast cancer</b>	Francophone	31.5	27.0	24.4	22.1	-29.6	S
	Anglophone	26.7	23.5	22.1	20.3	-24.0	NS
<b>Ischemic diseases</b>	Francophone	50.3	39.7	25.7	20.1	-60.1	S
	Anglophone	36.8	29.9	24.7	19.5	-47.1	S
<b>Colorectal cancer</b>	Francophone	15.8	14.5	12.5	11.4	-27.4	S
	Anglophone	12.1	11.7	11.6	12.0	-0.9	NS
<b>COPD</b>	Francophone	10.1	10.9	10.4	10.1	-0.5	NS
	Anglophone	6.3*	7.5*	8.1*	6.0*	-4.6	NS
<b>Cerebrovascular disease</b>	Francophone	15.5	13.6	10.4	8.5	-45.0	S
	Anglophone	11.5	11.7	8.9*	6.0*	-47.4	S
<b>Suicide</b>	Francophone	8.3	10.4	9.4	8.6	+15.5	NS
	Anglophone	3.6*	4.4*	5.0*	4.2*	+3.4	NS
<b>Diabetes</b>	Francophone	8.6	7.7	7.1	5.6	-35.3	S
	Anglophone	6.9*	7.0*	8.1*	5.8*	-16.1	NS
<b>Traffic accidents</b>	Francophone	8.4	6.9	5.3	5.3	-36.4	S
	Anglophone	3.9*	2.7*	2.4**	2.0**	-51.4	NS

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

<sup>††</sup> A Z-test on the log-transformed rates was performed to compare the rates in the first period (T1) to those in the last period (T4), separately for francophones and anglophones ("S" indicates a statistically significant decrease and "NS" a non-significant decrease).

\* Indicates a coefficient of variation higher than 16.66% and lower than or equal to 33.33%. In these cases, the rate value should be interpreted with caution.

The rate of avoidable mortality due to lung cancer showed a statistically significant increase among francophone women while remaining stable among anglophone women. This widened the gap between francophones and anglophones during the 18 year period studied. Starting with comparable rates during the first period of the study (1990–1994), we have since observed significantly higher rates among francophone women. The increase in smoking among women during the past 30 or 40 years is the most likely explanation.

It is difficult to find data on smoking in Québec for the 1960s, but according to various more recent population surveys, the rate among women varied between 32% and 38% from 1985 to 1994<sup>36</sup>. Data for France indicates an increase in smoking among women, from 9% in 1952 to 21% in 1995<sup>37</sup>. The 1995 “Survey on Smoking in Canada” reveals that 35% of francophone women smoked compared to 24% of anglophone women.<sup>38</sup>

Smoking is also a risk factor for developing ischemic heart disease.<sup>39</sup> The rate of avoidable mortality attributable to this disease followed a similar pattern in both linguistic groups, i.e., significant decreases of 60% among francophone women and 47% among anglophone women. The sharper drop among francophone women closed the gap with anglophones during the last period (T4).

It would therefore seem that secondary interventions (control of cholesterol and hypertension, medication) and tertiary interventions (angioplasty, bypass), which can prevent 50% of avoidable deaths due to ischemic disease, counteracted the adverse effects of smoking.

It should also be kept in mind that our study only considered deaths before the age of 75. The fact that lung cancer develops at an earlier age than ischemic heart disease is also a likely factor contributing to this trend difference.<sup>40</sup>

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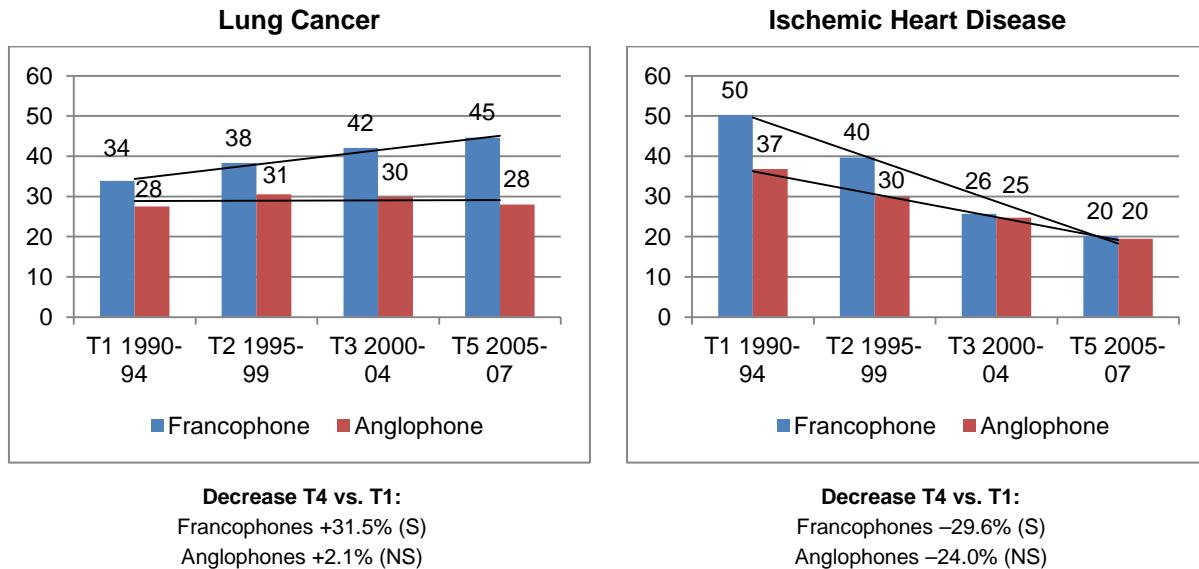
<sup>36</sup> Aubin, J. and Caouette, L. “L’usage de la cigarette au Québec de 1985 à 1994 : une comparaison avec le Canada.” *Canadian Journal of Public Health* 89, 1 (Jan.–Feb. 1998): 22–27.

<sup>37</sup> *Bulletin épidémiologique hebdomadaire*. Institut de veille sanitaire, France. No. 21–22/2005.

<sup>38</sup> “Survey on Smoking in Canada. Cycles 1 to 4, 1994–1995.” Health Canada Publications.

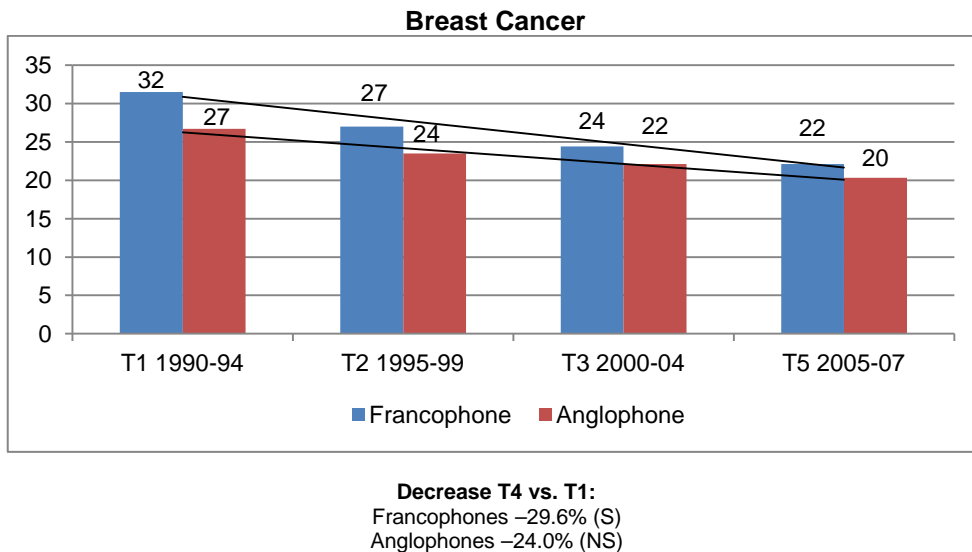
<sup>39</sup> <http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/risk-risques-eng.php>.

<sup>40</sup> Québec mortality rates for both sexes per 100,000 inhabitants for lung, tracheal, and bronchial cancer and for ischemic heart disease from 2005 to 2008 were respectively 79 vs. 57 (age 45–64), 293 vs. 234 (age 65–74), and 424 vs. 1,077 (age 75 and over). Source: *Pour guider l’action - Portrait de santé du Québec et de ses régions*, INSPQ, 2011.



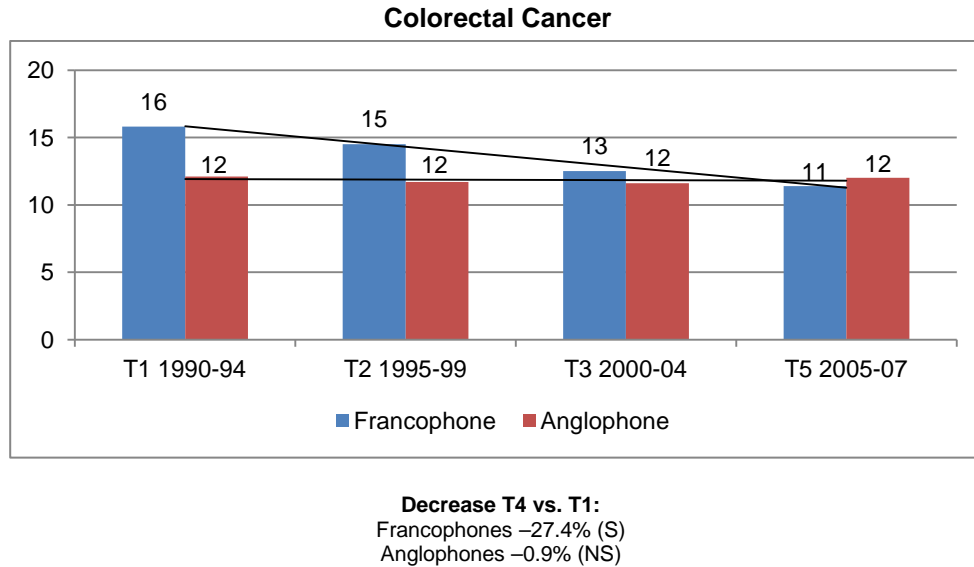
**Figure 8** General rates of avoidable mortality due to lung cancer and ischemic heart disease in francophone and anglophone women in Québec (adjusted rates per 100,000 inhabitants)

The second highest cause of avoidable death among women is breast cancer (2,309 deaths). During the four periods studied, avoidable mortality rates for francophone and anglophone women showed no significant differences, although the rates were always a little higher among francophones. Avoidable mortality rates for francophone women dropped significantly between periods T1 and T4. The drop in avoidable mortality due to breast cancer in anglophone women seems equally substantial, but is not statistically significant.



**Figure 9** General rates of avoidable mortality due to breast cancer and ischemic heart disease in francophone and anglophone women in Québec (adjusted rates per 100,000 inhabitants)

We believe it is important to present the rate of avoidable mortality attributable to colorectal cancer even though there was no significant difference between francophone and anglophone women during the four periods studied. Divergent temporal trends can be observed in the two groups between periods T1 and T4: the avoidable mortality rate among francophone women experienced a statistically significant decrease of 27.4%, while it remained stable among anglophone women.



**Figure 10** General rates of avoidable mortality due to colorectal cancer and ischemic heart disease in francophone and anglophone women in Québec (adjusted rates per 100,000 inhabitants)

### 3.2 SITUATION IN THE VARIOUS AREAS

The high number of deaths in the Montréal CMA allows us to draw certain conclusions for this area. The general rate of avoidable mortality among francophone and anglophone women and the avoidable mortality rate for the three types of prevention dropped significantly between 1990 and 2007. Once again, this decrease was more pronounced among francophones, except with respect to primary intervention, where the rate among anglophone women decreased more quickly.

For avoidable mortality through secondary and tertiary interventions, francophone women appear to have caught up with anglophone women between 1990 and 2008; the gap, which was significant at the beginning, closed during the last two periods. Despite the disappearance of significant differences in some cases, absolute rates among francophone women remained higher than those among anglophone women.

Because of the small number of deaths in other CMAs and non-CMAs, the differences in avoidable mortality rates observed between anglophone and francophone women were rarely significant (Table 10, green boxes). Although a decrease was recorded between

periods T1 and T4 among both groups, it was only statistically significant for francophone women.

One thing is worth pointing out regarding the drop in avoidable mortality through primary intervention in non-CMAs. The decrease among francophones and the increase among anglophones were not significant, suggesting no real change between 1990 and 2007. When discussing primary prevention, smoking obviously comes to mind. We will come back to this in our conclusions.

In the other CMAs, however, avoidable mortality seems to have decreased more quickly among anglophone than francophone women. The differences between anglophones and francophones in T4 were nevertheless not significant, except for mortality that could be reduced through primary intervention. In such cases, the avoidable mortality rate was significantly higher among francophone women.

**Table 10** Standardized rates of avoidable mortality (general and by prevention type) among women, by mother tongue<sup>†</sup> and period<sup>††</sup> (adjusted rates per 100,000 inhabitants)

	Area	Language	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T1 vs. T4 %	P value
<b>General</b>	MTL CMA	French	247.5	230.2	200.0	187.3	-24.3	S
		English	182.6	173.6	166.4	144.7	-20.7	S
	Other CMAs	French	217.5	202.5	175.9	170.2	-21.8	S
		English	149.6*	128.2*	124.1*	108.9*	-27.2	NS
	Non-CMAs	French	216.6	203.2	184.7	175.5	-19.0	S
		English	178.9	188.1	168.8	166.6	-6.9	NS
<b>Through primary prevention</b>	MTL CMA	French	124.1	120.2	107.5	104.1	-16.1	S
		English	88.6	84.3	83.6	71.3	-19.6	S
	Other CMAs	French	104.3	103.7	94.1	93.4	-10.5	S
		English	69.6*	70.3*	68.6*	58.7*	-15.7	NS
	Non-CMAs	French	104.5	103.1	98.8	97.0	-7.3	NS
		English	83.4	102.4	86.5	93.1	+11.6	NS
<b>Through secondary prevention</b>	MTL CMA	French	63.1	56.4	47.1	41.3	-34.5	S
		English	46.7	45.1	42.2	36.8	-21.2	S
	Other CMAs	French	57.5	50.8	41.4	38.1	-33.7	S
		English	41.2*	31.5*	27.8*	25.3*	-38.6	NS
	Non-CMAs	French	56.2	50.1	42.9	37.8	-32.8	S
		English	48.5	41.9	42.2	36.1	-25.6	NS
<b>Through tertiary prevention</b>	MTL CMA	French	60.3	53.6	45.4	41.9	-30.5	S
		English	47.4	44.2	40.6	36.7	-22.5	S
	Other CMAs	French	55.7	48.0	40.4	38.7	-30.5	S
		English	38.8*	26.4*	27.8*	24.9*	-35.8	NS
	Non-CMAs	French	55.8	50.0	43.0	40.7	-27.1	S
		English	46.9	43.8	40.2	37.4	-20.3	NS

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

<sup>††</sup> A Z-test on the log-transformed rates was performed to compare the rates for the first period (T1) to those for the last period (T4), separately for francophones and anglophones ("S" indicates a significant statistical decrease and "NS" a non-significant decrease).

\* Indicates a coefficient of variation higher than 16.66% and lower than or equal to 33.33%. In these cases, the rate value should be interpreted with caution.

Similarly, few significant differences were observed in terms of specific causes of avoidable mortality, aside from higher rates among francophone women in the Montréal CMA for lung cancer and, during periods T1 and T2 only, for ischemic heart disease.

Variations between 1990 and 2007 (T1 vs. T4) were not significant among anglophone women, with one exception (ischemic heart disease in the Montréal CMA). It is important to point out the significant increase in avoidable mortality rates for lung cancer among francophone women all across Québec. There also seems to be an increase among

anglophone women in other CMAs and in non-CMAs for the same cause, but these increases are not statistically significant.

**Table 11 Standardized rates of avoidable mortality due to certain specific causes in women by area, mother tongue<sup>†</sup>, and period<sup>††</sup> (adjusted rates per 100,000 inhabitants)**

Avoidable mortality	Area	Linguistic group	T1 1990–94	T2 1995–99	T3 2000–04	T4 2005–07	T1 vs. T4	P value
<b>Lung cancer</b>	Montréal CMA	Francophone	39.2	44.8	45.7	48.7	+24	S
		Anglophone	28	29.8	30.8	25.9	-7.4	NS
	Other CMAs	Francophone	31.6	34.9	40.1*	41.5**	+31.6	S
		Anglophone	21.4**	22.9**	28.1**	25.7**	+20.5	NS
	Non-CMAs	Francophone	29	33.6	39.7	42.4	+46.2	S
		Anglophone	24.8*	37.3*	26.4*	39.8*	+60.5	NS
<b>Breast cancer</b>	Montréal CMA	Francophone	33.7	29.5	26.8	22.8	-32.3	S
		Anglophone	27.5	25.5	24.3	22.4	-18.3	NS
	Other CMAs	Francophone	31.6	25.7	23.1	22.1	-30	S
		Anglophone	19.2**	7.4**	10.6**	10.0**	-47.8	NS
	Non-CMAs	Francophone	28.6	25.2	22.6	21.5	-24.9	S
		Anglophone	24.4*	21.5*	16.8**	14.8**	-39.2	NS
<b>Ischemic disease</b>	Montréal CMA	Francophone	56.1	46	29.6	22	-60.7	S
		Anglophone	37.9	30.6	25.1	20.2	-46.7	S
	Other CMAs	Francophone	45.2	35.1	21.2	18.4	-59.3	S
		Anglophone	28.4**	26.2**	23.5**	13.1**	-53.8	NS
	Non-CMAs	Francophone	45.9	35.6	24.5	19.1	-58.5	S
		Anglophone	33.4*	27.9*	24.2*	19.4*	-41.9	NS
<b>Colorectal disease</b>	Montréal CMA	Francophone	16	14.6	12.6	11.7	-26.7	S
		Anglophone	12.1*	11.9*	11.8*	12.1*	-0.3	NS
	Other CMAs	Francophone	15.1	13.9	12.6	11.9	-21	NS
		Anglophone	12.9**	9.5**	8.7**	12.4**	-4.4	NS
	Non-CMAs	Francophone	15.6	14.7	12.5	10.9	-30.4	S
		Anglophone	10.5**	11.6**	11.8**	11.6**	+10.7	NS

<sup>†</sup> A Z-test on the log-transformed rates was performed to compare francophone and anglophone rates for each period. Boxes where the differences between francophones and anglophones are not statistically significant are colored green.

<sup>††</sup> A Z-test on the log-transformed rates was performed to compare the rates for the first period (T1) to those for the last period (T4), separately for francophones and anglophones ("S" indicates a significant statistical decrease and "NS" a non-significant decrease).

\* Indicates a coefficient of variation higher than 16.66% and lower than or equal to 33.33%. In these cases, the rate value should be interpreted with caution.



## 4 THE MAIN FINDINGS ABOUT THE HEALTH STATUS OF QUÉBEC'S ANGLOPHONE MINORITY

The results obtained for avoidable mortality indicate that considerable progress has been made in recent years. There was a marked decrease in avoidable mortality among both anglophones and francophones. General avoidable mortality decreased by 38% among francophone men and 28% among anglophone men, and by 23% among francophone women and 20% among anglophone women. It appears that efforts in health promotion and disease and injury prevention, combined with progress in screening, diagnostic, and care methods, have been largely successful in the past 20 years.

A gap in avoidable mortality between the two linguistic communities is still perceptible. Although this gap remains favorable to anglophones, it has significantly narrowed since the early 1990s, primarily due to the sharper drop in mortality among francophones. This trend is not indicative of a step backward for anglophones, but rather of a step forward for francophones, who had significantly higher adjusted mortality rates than anglophones in the early 1990s. Among men, the rates of general avoidable mortality dropped from 489 to 303 per 100,000 among francophones and from 329 to 234 per 100,000 among anglophones. Among women, these rates fell from 231 to 179 per 100,000 among francophones and from 181 to 145 per 100,000 among anglophones.

The sometimes smaller death counts in the anglophone group did not always allow us to draw conclusions for specific causes. However, for **anglophone men**, we noticed a significant drop in avoidable mortality due to ischemic heart disease in Québec as a whole and in the three areas analyzed. The gains varied according to area, but were always significant (decreases between 44% and 64%). The situation was the same for lung cancer, with a significant decrease in Québec as a whole and in the Montréal CMA (a 28% decrease in the Montréal CMA and an insignificant downward trend in the other two areas). The profile for chronic obstructive pulmonary disease (COPD) was identical to that for lung cancer, with a significant decrease (48%) for Québec and the Montréal CMA.

In all these cases, the gains among anglophones were almost as great as those among francophones, and we can conclude that primary, secondary, and tertiary prevention measures implemented in the past 20 years have had a similar, significant impact among men in both linguistic groups.

We took a closer look at colorectal cancer because it was a leading avoidable cause of death. The mortality rate for this cause dropped significantly among francophones across Québec and in the Montréal CMA, while there was no significant change among anglophone men. For all anglophone men in Québec, the rate for T4 was higher than for T1 (19.4 vs. 17 per 100,000, which is not a significant difference), in contrast to francophones, among whom the decrease was more marked (-18%). Despite the lack of statistical significance among anglophones, we believe this differing trend warrants further examination.

For **anglophone women**, lung cancer was the most alarming cause of avoidable mortality. The rate of avoidable mortality attributable to this type of cancer appears to have remained stable for Québec as a whole, whereas it should have decreased, as it did in men, had the

public health measures implemented to reduce smoking enjoyed the same success. This relative stability is nevertheless positive if we compare it to the significant increase observed among francophone women across Québec (+32%) and the general trend in Canada, which shows an increase in the rate of death due to lung cancer among women, from 28 deaths per 100,000 in 1990 to 40 per 100,000 in 2007<sup>41</sup>. Despite the lack of significant differences between T1 and T4 among anglophone women in Québec (27.5 per 100,000 in T1 and 28 in T4), we nevertheless believe we have detected a difference in the trend for those living in the Montréal CMA and those living elsewhere in Québec.

There is little detailed data on smoking based on language, but the 2009–2010 “Canadian Community Health Survey” (CCHS) indicates that 14.8% of women in Montréal who spoke English at home were smokers versus 24.6% of women who spoke French.

The rates of avoidable mortality due to ischemic heart disease decreased significantly among anglophone women (–47%) and francophone women (–60%) in Québec as a whole and in the Montréal CMA (there was also a large but not significant drop elsewhere in Québec).

The rates for breast cancer also dropped in both linguistic groups, but not significantly among anglophone women (–30% and –25% respectively).

Lastly, as for observations made for men, avoidable mortality rates for colorectal cancer evolved differently among anglophone women compared to francophone women. The rate among francophones decreased significantly just about everywhere across Québec (between –21% and –30%), but did not change significantly among anglophones.

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<sup>41</sup> Canadian Cancer Society and National Cancer Institute of Canada. *Canadian Cancer Statistics, 2007*. Toronto, Canada, April 2007, ISSN 0835-2976 AND National Cancer Institute of Canada, *Canadian Cancer Statistics, 1990*, Toronto, Canada, April 1990, ISSN 0835-2984. Note: All deaths are included here, rather than only those before age 75.

## CONCLUSION

With all the parameters that were analyzed, it is impossible to draw a simple conclusion that would apply to the entire anglophone population of Québec. A more refined geographic analysis would have undoubtedly yielded a more detailed understanding of the problems specific to the anglophone minority, but low numbers make such an undertaking difficult.

The socioeconomic status of anglophones and francophones should be included among the parameters of any future analysis. Other work conducted as part of our project<sup>42</sup> suggests that part of the anglophone population is growing poorer, and points to a widening gap between rich and poor anglophones in Québec – a gap wider than the one among francophones. New analysis could further qualify some of our results.

Some divergent findings between men and women raise a few questions. This is the case for example of the lung cancer for which mortality rates decreased markedly among men, but remained fairly stable among women. This difference certainly reflects different historical patterns between men and women smoking. But it concerns also the efforts of prevention in public health and in particular smoking cessation programs that might have paid dividends according to the kind.

Our analyses also revealed a marked decrease mortality from colorectal cancer among francophones (men and women) but non-Anglophones for whom rates remained fairly stable. It is important to point out that in 1990-1994 (period T1) the mortality rate of francophones were significantly higher than those of anglophones, while this gap is completely closed during the most recent period 2005-2007 (Q4). This undoubtedly reflects a catch-up of francophone for this cause of death. The question that lingers is whether the anglophone community could register a decrease in rates, although lighter, in this same period of time rather than the observed stagnation? That said, the rate of English-speaking women and men represent a difficult to cross, threshold already reached in their cases from the period T1?

Aside from these few characteristics, we can conclude that primary, secondary, and tertiary measures are producing the expected results among both anglophones and francophones and that the health status among both linguistic groups is improving. Québec's francophone population has caught up considerably in 20 years with regard to avoidable mortality. The task now is to ensure that both linguistic communities continue to evolve in step with each other.

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<sup>42</sup> Lussier, M-H. *La situation socioéconomique des anglophones du Québec*. Institut national de santé publique du Québec, December 2011.



## **APPENDIX 1**

### **CLASSIFICATION OF PREVENTABLE CAUSES OF DEATH BY HUNTER NEW ENGLAND NSW HEALTH**



CLASSIFICATION OF PREVENTABLE CAUSES OF DEATH BY HUNTER NEW ENGLAND NSW HEALTH							
	Group	Cause of death	ICD-9 codes	ICD-10 codes	Preventable mortality through primary prevention	Preventable mortality through secondary prevention	Preventable mortality through tertiary prevention
1	Enteritis and other diarrheal diseases	Diarrheal diseases	001–009	A00–A09	0.7	0.1	0.2
2	Infection	Tuberculosis	010–018, 137	A15–A19, B90	0.6	0.35	0.05
3	Childhood vaccine-preventable disease	Diphtheria, whooping cough, tetanus, polio, Hib, measles, rubella	032–033, 036.0, 037, 041.2, 041.5, 045, 052, 055–056	A35–A37, A49.1, A49.2, A80, B01, B05–B06, J11	0.9	0.05	0.05
4	Infection	Selected invasive bacterial and protozoal infections	034–035, 038, 084, 320, 481–482, 485, 681–682	A38–A41, A46, A48.1, B50–B54, G00, G03, J13–J15, J18, L03	0.3	0.4	0.3
5	Sexually transmitted diseases, except HIV/AIDS		090–099, 614.0–614.5, 614.7–616.9, 633	A50–A64, M02.3, N34.1, N70–N73, N75.0, N75.1, N76.4, N76.6, O00	0.8	0.1	0.1
6	Infection	HIV/AIDS	042, 279.10	B20–B24	0.9	0.05	0.05
7	Infection	Hepatitis	070	B15–B19	0.7	0.1	0.2
8	Infection	Viral pneumonia and influenza	480, 487	J10, J12, J17.1, J21	0.4	0.5	0.1
9	Neoplasms	Lip, oral cavity, and pharynx	140–149	C00–C14	0.8	0.1	0.1
10	Neoplasms	Esophagus	150	C15	0.95	0	0.05
11	Neoplasms	Stomach	151	C16	0.4	0.2	0.4
12	Neoplasms	Colorectal	153, 154	C18–C21	0.4	0.5	0.1
13	Neoplasms	Liver	155	C22	0.7	0.1	0.2
14	Neoplasms	Lung	162	C33–C34	0.95	0	0.05
15	Neoplasms	Melanoma of skin	172	C43	0.6	0.1	0.3
16	Neoplasms	Nonmelanotic skin	173	C44	0.6	0.1	0.3
17	Neoplasms	Breast (females only)	174	C50	0.15	0.35	0.5
18	Neoplasms	Uterus	179, 182	C54–C55	0.1	0.4	0.5
19	Neoplasms	Cervix	180	C53	0.3	0.5	0.2
20	Neoplasms	Bladder	188	C67	0.5	0.25	0.25
21	Cancer of testis	Cancer of testis	186	C62	0	0.3	0.7
22	Eye cancer	Eye cancer	190	C69	0	0	1
23	Neoplasms	Thyroid	193	C73	0.1	0.2	0.7

CLASSIFICATION OF PREVENTABLE CAUSES OF DEATH BY HUNTER NEW ENGLAND NSW HEALTH							
	Group	Cause of death	ICD-9 codes	ICD-10 codes	Preventable mortality through primary prevention	Preventable mortality through secondary prevention	Preventable mortality through tertiary prevention
24	Neoplasms	Hodgkin's disease	201	C81	0	0.1	0.9
25	Neoplasms	Leukemia (age < 44 only)	204–208	C91.0, C91.1	0.05	0.05	0.9
26	Neoplasms	Benign	210–229	D10–D36	0	0	1
27	Nutritional deficiency anemia		280–281	D50–D53	1	0	0
28	Nutritional, endocrine, and metabolic	Thyroid disorders	240–246	E00–E07	0.1	0.7	0.2
29	Nutritional, endocrine, and metabolic	Diabetes	250	E10–E14	0.3	0.6	0.1
30	Adrenal disorders	*	255.0, 255.4	E24, E27			
31	Newborn screening conditions	Congenital hypothyroidism, CAH, PKU, galatosemia	255.2, 270.1, 271.1	E25, E70.0, E74.2	0	0.8	0.2
32	Drug use disorders	Alcohol-related disease	291, 303, 305.0, 425.5, 535.3, 571.0–571.3	F10, I42.6, K29.2, K70	0.9	0	0.1
33	Drug use disorders	Illicit drug use disorders	292, 304, 305.2–305.9	F11–F16, F18–F19	0.9	0	0.1
34	Neurological disorders	Epilepsy	345	G40–G41	0	0.9	0.1
35	Cardiovascular diseases	Rheumatic and other valvular heart disease	390–398	I01–I09	0.3	0.6	0.1
36	Cardiovascular diseases	Hypertensive heart disease	402	I11	0.3	0.65	0.05
37	Cardiovascular diseases	Ischemic heart disease	410–414	I20–I25	0.5	0.25	0.25
38	Cardiovascular diseases	Cerebrovascular diseases	430–438	I60–I69	0.3	0.5	0.2
39	Cardiovascular diseases	Aortic aneurysm	441	I71	0.3	0.3	0.3
40	Genitourinary disorders	Nephritis and nephrosis	403, 580–589, 591	I12–I13, N00–N09, N17–N19	0.1	0.2	0.7
41	Genitourinary disorders	Obstructive uropathy and prostatic hyperplasia	592, 593.7, 594, 598, 599.6, 600	N13, N20–N21, N35, N40, N99.1	0.3	0.3	0.3
42	Respiratory diseases	DVT with pulmonary embolism	415.1, 451.1	I26, I80.2	0.3	0.3	0.3
43	Respiratory diseases	COPD	490–492, 496	J40–J44	0.8	0.1	0.1



CLASSIFICATION OF PREVENTABLE CAUSES OF DEATH BY HUNTER NEW ENGLAND NSW HEALTH							
	Group	Cause of death	ICD-9 codes	ICD-10 codes	Preventable mortality through primary prevention	Preventable mortality through secondary prevention	Preventable mortality through tertiary prevention
44	Respiratory diseases	Asthma	493	J45–J46	0.1	0.7	0.2
45	Upper respiratory tract infection		382–383, 460–465	J00–J06, H66, H70	0.4	0.5	0.1
46	Digestive disorders	Peptic ulcer disease	531–534	K25–K28	0.05	0.75	0.2
47	Digestive disorders	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	540–543, 550–553, 574–577	K35–K38, K40–K46, K80–K83, K85–K86, K91.5	0	0	1
48	Digestive disorders	Chronic liver disease (excluding alcohol-related disease)	571.4–571.9	K73, K74	0.7	0.1	0.2
49	Osteomyelitis and other osteopathies of bone	Skin, bone, and joint infections	730	M86, M89–M90	0.2	0.5	0.3
50	Maternal and infant	Birth defect	237.70, 740–760	H31.1, P00, P04, Q00–Q99	0.1	0.2	0.7
51	Complication of pregnancy, labor, or the puerperium	Complications of pregnancy	630–632, 634–676	O01–O99	0.2	0.5	0.3
52	Maternal and infant	Complications of perinatal period	764–779	P03, P05–P95	0.3	0.2	0.5
53	Sudden infant death syndrome	SIDS	798.0	R95	1	0	0
54	Unintentional injuries	Road traffic injuries, other transport injuries	E810–E819	V01–V04, V06, V09–V80, V87, V89, V99	0.6	0	0.4
55	Unintentional injuries	Accidental poisonings	E850–E869	X40–X49	0.6	0	0.4
56	Unintentional injuries	Falls	E880–E886, E888	W00–W19	0.6	0	0.4
57	Unintentional injuries	Fires, burns	E890–E899	X00–X09	0.8	0	0.2
58	Unintentional injuries	Drownings (swimming)	E910	W65–W74	0.8	0	0.2
59	Intentional injuries	Suicide and self-inflicted injuries	E950–E959, E980–E989	X60–X84, Y87.0, Y10–Y34	0.6	0.3	0.1
60	Intentional injuries	Violence	E960–E969	X85–Y09, Y87.1	1	0	0

CLASSIFICATION OF PREVENTABLE CAUSES OF DEATH BY HUNTER NEW ENGLAND NSW HEALTH							
	Group	Cause of death	ICD-9 codes	ICD-10 codes	Preventable mortality through primary prevention	Preventable mortality through secondary prevention	Preventable mortality through tertiary prevention
61	War		E990–E999	Y36	1	0	0
62	Iatrogenic conditions	Complications of treatment	E870 – E879	Y60–Y84	0	0.2	0.8

*Hunter New England Population Health: Health in Hunter New England, ICD Codes – Potentially Avoidable Mortality.* Hunter New England Area Health Service, 2007. Available at [http://www2.hnehealth.nsw.gov.au/hneph/HHNE/toc/app\\_icd\\_avm.htm](http://www2.hnehealth.nsw.gov.au/hneph/HHNE/toc/app_icd_avm.htm). Accessed July 22, 2013.

“Adrenal disorders” (cause 30) was not included in our analyses given the small number of deaths.

## **APPENDIX 2**

### **MORTALITY RATES FOR DETAILED CAUSES OF PREVENTABLE MORTALITY BY LANGUAGE AND GENDER IN QUÉBEC AS A WHOLE AND IN INDIVIDUAL AREAS, 1990–2007**



**Table 12 Mortality rates for detailed causes of preventable mortality by language in men in Québec as a whole and in individual areas, 1990–2007**

		1990–1994	1995–1999	2000–2004	2005–2007	1990–1994	1995–1999	2000–2004	2005–2007
		Francophones				Anglophones			
Men in Québec									
1	Diarrheal diseases			1	1.7				
2	Tuberculosis	0.6							
4	Selected invasive bacterial and protozoal infections	3.3	2.8	5.3	5.9	3.5	2.9	5.7	6
6	HIV/AIDS	11.2	7.5	3	2.7	10.5	6.7	2.9	
7	Hepatitis	0.5	0.8	0.8	1				
9	Lip, oral cavity, and pharynx	7.7	5.6	4.5	3.6	3.9	5.3	3.4	4.2
10	Esophagus	4.5	5.3	5	5.3	4.8	5.5	4.4	4.4
11	Stomach	8.7	7.9	6.4	5.6	6.4	6	6.3	6
12	Colorectal	24	23	21	19.8	17	16.2	15.7	19.4
13	Liver	4.1	4.5	4.6	4.9	3.8	4.2	5	5.8
14	Lung	96.6	84.5	72	64.1	54.4	48.8	42.6	37.3
15	Melanoma of skin	1.8	2	1.9	2				2.9
16	Nonmelanotic skin	0.6	1	0.5	0.5				
20	Bladder	4.4	3.9	3.7	3.6	3.3		3.5	3.1
24	Hodgkin's disease	0.8	0.6	0.5	0.5				
25	Leukemia (age < 44 only)	0.9	0.9						
26	Benign		0.4						
29	Diabetes	13.4	14	13.5	11.1	12.2	12	14.1	9.9
32	Alcohol-related disease	8.9	8.4	7.6	6.7	5.6	7.7	7.1	5.2
34	Epilepsy	1.2	1.1	1.2	1.2				
35	Rheumatic and other valvular heart disease	1.2	1	0.8	0.5				
36	Hypertensive heart disease	0.5							
37	Ischemic heart disease	146.3	116.3	79.9	61.9	108.9	92.1	72.1	54.2
38	Cerebrovascular diseases	23.7	19.8	14.2	11.7	15.8	17.8	13.6	10.7
39	Aortic aneurysm	6.7	5.3	4.3	3.5	5.1	4.1	3.3	3.5
40	Nephritis and nephrosis	5.6	5.1	4.8	4.2	3.5	4.3	4.6	3
42	DVT with pulmonary embolism	1.8	1.8	1.7	1.3				
43	COPD	26.3	21.2	15.5	12.3	12.1	11.9	8.5	6.4
44	Asthma	0.8	0.5						
46	Peptic ulcer disease	1.5	1.1	0.6	0.5				
47	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	2.4	2	1.8	1.6				
48	Chronic liver disease (excluding alcohol-related disease)	6.8	5.2	4.6	4.1	5.6	3.8	4.1	
50	Birth defect	3.9	3.1	2.7	2.5		3.1		2.7
52	Complications of perinatal period	2.2	1.7	2.1	2.5				2.6
53	SIDS	0.8	0.5						

**Table 12 Mortality rates for detailed causes of preventable mortality by language in men in Québec as a whole and in individual areas, 1990-2007 (cont'd)**

		1990– 1994	1995– 1999	2000– 2004	2005– 2007	1990– 1994	1995– 1999	2000– 2004	2005– 2007
		Francophones				Anglophones			
54	Road traffic injuries, other transport injuries			12.8	13.6			5.1	5.3
55	Accidental poisonings			3.2	3.8				4
56	Falls			2.9	3.1				3
57	Fires, burns			0.7	0.7				
58	Drownings (swimming)			1.1	1.1				
59	Suicide and self-inflicted injuries			32.6	28.9			13.3	13.5
60	Violence			2	1.5				2.8
62	Complications of treatment			0.4					
<b>Men in Montreal CMA</b>									
1	Diarrheal diseases			1.5	2.2				
4	Selected invasive bacterial and protozoal infections	4.4	3.1	5.7	6.4	4.2		6.4	6.3
6	HIV/AIDS	21.6	13.1	5.2	5	7.9			
7	Hepatitis		1.3	1.3	1.3				
9	Lip, oral cavity, and pharynx	9	6.5	5.1	3.5	5.4		4.4	
10	Esophagus	5.3	5.7	4.8	5.6	5.5	4.1	3.9	
11	Stomach	9	7.3	6.3	6	6.9	6.2	6.4	6.9
12	Colorectal	26.1	24.7	22.5	19.9	16.9	16.7	16.8	20.7
13	Liver	5.3	5	5.4	5.8	4.2	5.5	6.6	
14	Lung	100	86.9	71.9	65	47.7	43.7	37.7	
15	Melanoma of skin	2.1	1.8	2.1	2.3				
16	Nonmelanotic skin		1.1						
20	Bladder	4.7	4.4	4.3	3.9		3.9		
25	Leukemia (age < 44 only)	0.9	1						
29	Diabetes	15.6	16.7	14.9	12.1	12	11.4	14.6	11.2
32	Alcohol-related disease	10.3	9.5	8.1	7.2	7.5	7.2	5.4	
34	Epilepsy	1.3	1.3	1.1	1.5				
35	Rheumatic and other valvular heart disease	1.4	1.2						
37	Ischemic heart disease	157	126.6	87.8	66.7	93.6	71.5	55.1	
38	Cerebrovascular diseases	24.3	20.6	14.7	12	15.5	18.5	14	11.8
39	Aortic aneurysm	7.6	5.2	4.7	4	5.5	4		
40	Nephritis and nephrosis	6.1	5.5	4.9	4.8	3.8	4.5	4.9	
42	DVT with pulmonary embolism	2.1	1.4	1.6	1.5				
43	COPD	25.4	20.7	15	12.3	11.3	7.7	6.2	
44	Asthma								
46	Peptic ulcer disease	2.3	1.6						
47	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	2.3	2.4	1.9	2.1				
48	Chronic liver disease (excluding alcohol-related disease)	8.1	6.1	5.1	4.8	4.1	4.2		
50	Birth defect	3.9	3	2.5	2.7		2.9		
52	Complications of perinatal period	2.5	1.9	2.2	2.5				
53	SIDS	1							

**Table 12 Mortality rates for detailed causes of preventable mortality by language in men in Québec as a whole and in individual areas, 1990-2007 (cont'd)**

		1990– 1994	1995– 1999	2000– 2004	2005– 2007	1990– 1994	1995– 1999	2000– 2004	2005– 2007
		Francophones				Anglophones			
54	Road traffic injuries, other transport injuries			7.5	8.9			4	3.7
55	Accidental poisonings			3.7	4.3				4.2
56	Falls			2.9	3.2				
58	Drownings (swimming)			0.9					
59	Suicide and self-inflicted injuries			26.7	23.7			11.8	12.4
60	Violence			2.6	2.1				
61	War								
<b>Men in other CMAs</b>									
4	Selected invasive bacterial and protozoal infections	2.5	2.9	4.7	5.3				
6	HIV/AIDS	6.5	5.5	2.3	1.9				
9	Lip, oral cavity, and pharynx	8.6	5.8	4.8	3				
10	Esophagus	5	5.6	5.1	5.5				
11	Stomach	7.9	6.9	5.4	4.9				
12	Colorectal	25.1	21.9	20.4	20.3				
13	Liver	3.9	5	4.6	5.5				
14	Lung	93.6	82.2	69.5	58.3	53.1	37.8		
15	Melanoma of skin		2.4	1.7	1.8				
20	Bladder	4.9	4.1	3.2	3.1				
29	Diabetes	13.5	13.8	13.3	10.8				
32	Alcohol-related disease	8.7	9.5	8.1	7				
37	Ischemic heart disease	142.7	110.6	74.3	56.4	73.5	62.4	36.5	
38	Cerebrovascular diseases	23.1	19	13.6	11.3				
39	Aortic aneurysm	6.9	5.6	4.8	3.2				
40	Nephritis and nephrosis	5.8	4.6	5.6	3.8				
42	DVT with pulmonary embolism		2.1						
43	COPD	28.4	21.2	15.8	12.4				
48	Chronic liver disease (excluding alcohol-related disease)	7.1	5.4	4.9	3.7				
50	Birth defect	3.7	2.5	2.7	2.1				
52	Complications of perinatal period	2.3	2	2	2.6				
53	SIDS								
54	Road traffic injuries, other transport injuries			9.6	9.7				
55	Accidental poisonings			3.3	3.7				
56	Falls			2.8	2.5				
59	Suicide and self-inflicted injuries			32.7	29.5				
<b>Men in non-CMAs</b>									
1	Diarrheal diseases				1.4				
4	Selected invasive bacterial and protozoal infections	2.8	2.4	5.2	5.8				
6	HIV/AIDS	3.2	2.8	1.2					
9	Lip, oral cavity, and pharynx	5.9	4.7	3.8	4				
10	Esophagus	3.5	4.6	5.1	4.9				
11	Stomach	8.7	8.9	7.2	5.7				
12	Colorectal	21.6	21.8	20	19.5	19.5			17.5
13	Liver	3.1	3.8	3.8	3.7				
14	Lung	93.1	83.5	73.3	66.3	50.8	39.2	40.1	

**Table 12 Mortality rates for detailed causes of preventable mortality by language in men in Québec as a whole and in individual areas, 1990-2007 (cont'd)**

		1990– 1994	1995– 1999	2000– 2004	2005– 2007	1990– 1994	1995– 1999	2000– 2004	2005– 2007
		Francophones				Anglophones			
15	Melanoma of skin	1.5	2	1.7	1.8				
20	Bladder	3.8	3.3	3.5	3.5				
25	Leukemia (age < 44 only)	1							
29	Diabetes	11.2	11.8	12.4	10.4				
32	Alcohol-related disease	7.6	6.9	6.9	6.2				
34	Epilepsy	1.1	1.2	1.2	1				
35	Rheumatic and other valvular heart disease	1.1	1						
37	Ischemic heart disease	135.5	109.7	75.7	60.5	92.2	80.1	62.5	
38	Cerebrovascular diseases	23	19.4	14.1	11.6				
39	Aortic aneurysm	5.8	5.4	3.8	3.3				
40	Nephritis and nephrosis	5.1	5	4.5	3.9				
42	DVT with pulmonary embolism	1.5	2	1.8	1.2				
43	COPD	25.6	21.6	15.7	12.2				
46	Peptic ulcer disease	1.1							
47	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	2.5	1.9	2	1.4				
48	Chronic liver disease (excluding alcohol-related disease)	5.4	4.3	4	3.6				
50	Birth defect	3.9	3.5	2.9	2.6				
52	Complications of perinatal period	1.9	1.4	2.2	2.3				
53	SIDS	0.6							
54	Road traffic injuries, other transport injuries			20.1	21.2				
55	Accidental poisonings			2.6	3.5				
56	Falls			3	3.3				
57	Fires, burns			1	1				
58	Drownings (swimming)			1.4	1.6				
59	Suicide and self-inflicted injuries			38.7	34.5			25.1	27.2
60	Violence			1.8	1.5				

Values with a coefficient of variation higher than 16.66% and lower than or equal to 33.33% are in red and should be interpreted with caution.

Values with a coefficient of variation higher than 33.33% are not presented.

Readers can refer to Appendix 1 for the list of ICD-9 and ICD-10 codes corresponding to the causes on the list.

Source : Special compilations, INSPQ.



**Table 13 Mortality rates for detailed causes of preventable mortality by language in women in Québec as a whole and in individual areas, 1990–2007**

		1990–1994	1995–1999	2000–2004	2005–2007	1990–1994	1995–1999	2000–2004	2005–2007
		Francophones				Anglophones			
<b>Women in Québec</b>									
1	Diarrheal diseases			<b>0.8</b>	1.3				
2	Tuberculosis								
4	Selected invasive bacterial and protozoal infections	2	1.7	3.3	4.1			<b>3.8</b>	<b>3</b>
6	HIV/AIDS	<b>1.1</b>	<b>0.9</b>	<b>0.6</b>	<b>0.6</b>				
7	Hepatitis		<b>0.3</b>	<b>0.3</b>	<b>0.3</b>				
9	Lip, oral cavity, and pharynx	<b>1.5</b>	1.5	1.3	1.2				
10	Esophagus	<b>1.1</b>	<b>1</b>	<b>0.8</b>	<b>1</b>				
11	Stomach	4	3.5	2.5	2.5	<b>2.9</b>	<b>3.4</b>	<b>2.8</b>	<b>2.8</b>
12	Colorectal	15.8	14.5	12.5	11.4	12.1	11.7	11.6	12
13	Liver	1.9	1.8	1.9	2.1				
14	Lung	33.9	38.3	42.1	44.6	27.5	30.5	29.9	28
15	Melanoma of skin	<b>1.1</b>	<b>1.1</b>	<b>1</b>	<b>1.1</b>				
16	Nonmelanotic skin				<b>0.3</b>				
17	Breast (females only)	31.5	27	24.4	22.1	26.7	23.5	22.1	20.3
18	Uterus	3.3	3	2.5	2.5	<b>3.2</b>	<b>2.9</b>	<b>3</b>	<b>4.5</b>
19	Cervix	2.1	1.9	1.6	1.4				
20	Bladder	<b>1.1</b>	<b>1.2</b>	<b>1</b>	<b>1</b>				
23	Thyroid		<b>0.4</b>		<b>0.3</b>				
24	Hodgkin's disease	<b>0.4</b>			<b>0.4</b>				
25	Leukemia (age < 44 only)	<b>0.7</b>	<b>0.6</b>						
26	Benign	<b>0.5</b>		<b>0.4</b>	<b>0.4</b>				
29	Diabetes	8.6	7.7	7.1	5.6	<b>6.9</b>	<b>7</b>	<b>8.1</b>	<b>5.8</b>
32	Alcohol-related disease	1.7	1.9	1.8	1.6				
34	Epilepsy	<b>0.9</b>	<b>0.7</b>	<b>0.8</b>	<b>0.8</b>				
35	Rheumatic and other valvular heart disease	2	1.8	<b>1.2</b>	<b>1</b>				
37	Ischemic heart disease	50.3	39.7	25.7	20.1	36.8	29.9	24.7	19.5
38	Cerebrovascular diseases	15.4	13.6	10.4	8.5	11.4	11.7	<b>8.9</b>	<b>6</b>
39	Aortic aneurysm	1.9	1.8	1.3	<b>1</b>				
40	Nephritis and nephrosis	3.4	3.1	2.7	2.3		<b>3.6</b>		
42	DVT with pulmonary embolism	<b>1.4</b>	1.6	1.6	1.4				
43	COPD	10.1	10.9	10.4	10.1	<b>6.3</b>	<b>7.5</b>	<b>8.1</b>	<b>6</b>
44	Asthma	<b>1.1</b>	<b>0.7</b>	<b>0.4</b>	<b>0.3</b>				
46	Peptic ulcer disease	<b>0.6</b>	<b>0.5</b>						
47	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	<b>1.1</b>	<b>1.1</b>	<b>1</b>	<b>0.9</b>				
48	Chronic liver disease (excluding alcohol-related disease)	2.9	2.5	2.3	2	<b>2.7</b>			
50	Birth defect	3.3	2.8	2.4	2.5	<b>2.6</b>	<b>2.4</b>		
52	Complications of perinatal period	1.6	1.4	2	2.1				
53	SIDS	<b>0.5</b>	<b>0.3</b>						
54	Road traffic injuries, other transport injuries			5.3	5.3				
55	Accidental poisonings			1.3	1.7				
56	Falls			<b>0.8</b>	<b>0.8</b>				

**Table 13 Mortality rates for detailed causes of preventable mortality by language in women in Québec as a whole and in individual areas, 1990–2007 cont'd)**

		1990–1994	1995–1999	2000–2004	2005–2007	1990–1994	1995–1999	2000–2004	2005–2007
		Francophones				Anglophones			
57	Fires, burns			0.4	0.4				
58	Drownings (swimming)				0.3				
59	Suicide and self-inflicted injuries			9.4	8.6			5	4.1
60	Violence			0.9	0.7				
62	Complications of treatment			0.4					
<b>Women in Montreal CMA</b>									
1	Diarrheal diseases			1.3	1.7				
4	Selected invasive bacterial and protozoal infections	2.5	2	3.3	5			3.9	
6	HIV/AIDS	2.1	1.6	1.1	0.8				
7	Hepatitis								
9	Lip, oral cavity, and pharynx	1.9	1.7	1.4	1.1				
10	Esophagus	1.4	1.3	0.8	1.1				
11	Stomach	3.4	3.1	2.4	2.3		3.6		
12	Colorectal	16	14.6	12.6	11.7	12.1	11.9	11.8	12.1
13	Liver	2.3	1.9	2.3	2.1				
14	Lung	39.2	44.8	45.7	48.7	28	29.8	30.8	25.9
15	Melanoma of skin	1.3	1.2	1	1.3				
16	Nonmelanotic skin								
17	Breast (females only)	33.7	29.5	26.8	22.8	27.5	25.5	24.3	22.4
18	Uterus	3.4	3.4	2.5	2.6				
19	Cervix	2.5	1.7	1.7	1.1				
20	Bladder	1.1	1.3	1.1	1				
29	Diabetes	8.6	8.5	8.1	6.3	6.4	7.1	7.9	5.2
32	Alcohol-related disease	2.1	2	2.1	1.7				
34	Epilepsy	0.9		0.8	0.9				
35	Rheumatic and other valvular heart disease	2.1	2	1.5	1.3				
37	Ischemic heart disease	56.1	46	29.6	22	37.9	30.6	25.1	20.2
38	Cerebrovascular diseases	15.3	14.1	10.3	9.1	10.3	11.4	9.3	6.4
39	Aortic aneurysm	2	1.6	1.4	1.2				
40	Nephritis and nephrosis	3.2	3.3	2.8	2.6		3.8		
42	DVT with pulmonary embolism	1.5	1.6	1.7	1.7				
43	COPD	10.5	12.1	10.7	10.7	6.7	6.7	7.6	5.2
44	Asthma	0.9							
47	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	1.1	1.3	1.2	0.9				
48	Chronic liver disease (excluding alcohol-related disease)	3.5	2.7	2.4	2				
50	Birth defect	3.1	2.4	2.2	2.3				
52	Complications of perinatal period	1.9	1.5	1.9	2.1				
53	SIDS								
54	Road traffic injuries, other transport injuries			3	3.4				
55	Accidental poisonings			1.5	1.8				
56	Falls			0.9	0.8				

**Table 13 Mortality rates for detailed causes of preventable mortality by language in women in Québec as a whole and in individual areas, 1990–2007 cont'd)**

		1990–1994	1995–1999	2000–2004	2005–2007	1990–1994	1995–1999	2000–2004	2005–2007
		Francophones				Anglophones			
58	Drownings (swimming)								
59	Suicide and self-inflicted injuries			8.8	7.6			5	4
60	Violence			8.8					
61	War			1					
<b>Women in other CMAs</b>									
4	Selected invasive bacterial and protozoal infections	1.8		3.4	3.4				
6	HIV/AIDS								
9	Lip, oral cavity, and pharynx				1.4				
10	Esophagus								
11	Stomach	3.8	3.8	2.2	2.4				
12	Colorectal	15.1	13.9	12.6	11.9				
13	Liver		2		2.3				
14	Lung	31.6	34.9	40.1	41.5				
15	Melanoma of skin								
17	Breast (females only)	31.6	25.7	23.1	22.1				
18	Uterus	3.6	2.6	2.5	2.2				
19	Cervix	2	1.8	1.6	1.7				
20	Bladder								
29	Diabetes	8.8	7.9	6.3	5.5				
32	Alcohol-related disease		2.1	2	1.7				
35	Rheumatic and other valvular heart disease	1.8	2						
37	Ischemic heart disease	45.2	35.1	21.2	18.4				
38	Cerebrovascular diseases	15.8	13	9.5	7.5				
39	Aortic aneurysm	1.7	1.9						
40	Nephritis and nephrosis	3.7	3.3	2.5	2.4				
42	DVT with pulmonary embolism			1.8					
43	COPD	9.5	11.7	9.9	9.7				
48	Chronic liver disease (excluding alcohol-related disease)	2.9	2.4	2.3	2.3				
50	Birth defect	3.6	2.7	2.4	2.6				
52	Complications of perinatal period	1.5	1.3	2.5	2.2				
53	SIDS			4.1					
54	Road traffic injuries, other transport injuries				3.5				
55	Accidental poisonings				1.5				
56	Falls								
59	Suicide and self-inflicted injuries			9.6	9.2				
<b>Women in non-CMAs</b>									
1	Diarrheal diseases				1				
4	Selected invasive bacterial and protozoal infections	1.5	1.6	3.3	3.7				
6	HIV/AIDS								
9	Lip, oral cavity, and pharynx	1.3	1.3	1.2	1.1				
10	Esophagus				0.8				
11	Stomach	4.6	3.8	2.9	2.9				
12	Colorectal	15.6	14.7	12.5	10.9				

**Table 13 Mortality rates for detailed causes of preventable mortality by language in women in Québec as a whole and in individual areas, 1990–2007 cont'd)**

		1990–1994	1995–1999	2000–2004	2005–2007	1990–1994	1995–1999	2000–2004	2005–2007
		Francophones				Anglophones			
13	Liver	1.8	1.6	1.8	2				
14	Lung	29	33.6	39.7	42.4	37.3	26.4	39.8	
15	Melanoma of skin	1	1.1	0.9	0.9				
17	Breast (females only)	28.6	25.2	22.6	21.5	24.4	21.5		
18	Uterus	3	2.8	2.6	2.5				
19	Cervix	1.7	2.2	1.5	1.4				
20	Bladder	1.1	1.1	0.9	0.9				
29	Diabetes	8.4	6.7	6.6	4.9				
32	Alcohol-related disease	1.4	1.8	1.4	1.6				
34	Epilepsy	1							
35	Rheumatic and other valvular heart disease	1.8	1.6	1.1					
37	Ischemic heart disease	45.9	35.6	24.5	19.1	27.9	24.2	19.4	
38	Cerebrovascular diseases	14.9	13.3	10.9	8.5				
39	Aortic aneurysm	2	2	1.2	1				
40	Nephritis and nephrosis	3.1	2.8	2.7	2				
42	DVT with pulmonary embolism	1.1	1.7	1.4	1.2				
43	COPD	9.7	9.3	10.3	9.6				
44	Asthma	1.4							
47	Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	1.2	1	0.9	0.8				
48	Chronic liver disease (excluding alcohol-related disease)	2.1	2.5	2.2	1.8				
50	Birth defect	3.2	3.2	2.6	2.7				
52	Complications of perinatal period	1.3	1.4	1.8	2.2				
53	SIDS								
54	Road traffic injuries, other transport injuries			8.5	8.7				
55	Accidental poisonings			1.2	1.7				
56	Falls				1				
57	Fires, burns								
58	Drownings (swimming)								
59	Suicide and self-inflicted injuries			9.9	9.4				
60	Violence			1					

Values with a coefficient of variation higher than 16.66% and lower than or equal to 33.33% are in red and should be interpreted with caution.

Values with a coefficient of variation higher than 33.33% are not presented.

Readers can refer to Appendix 1 for the list of ICD-9 and ICD-10 codes corresponding to the causes on the list.

Source: Special compilations, INSPQ.







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