Disability-Adjusted Life Years: An Indicator to Measure Burden of Disease in Québec

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Measures and Methods

Disability-Adjusted Life Years: An Indicator to Measure Burden of Disease in Québec

Vice-présidence aux affaires scientifiques

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PREFACE

For the past few years at Institut national de santé publique du Québec, we have been exploring measures of disease burden and working to adapt methodologies developed by other organizations to make available indicators that more completely describe the health status of Quebecers, while favouring the use of available data. What makes these measures of particular interest resides in the fact that they enable us to better understand the impact of different health conditions while also taking into account, through calculations, the people who suffer (functional health) and those who die from these health conditions.

Our initial efforts led to the publication of two documents that present the results of health-adjusted life expectancy in the absence of certain chronic health conditions. These first results gave a general idea of the scope of effects of certain chronic health conditions on functional health and on mortality.

This document is part of our ongoing work. It was produced in collaboration with the Public Health Agency of Canada, which had also expressed an interest in these measures of disease burden. Over the past year, links have been made with colleagues from the Agency who have produced Canadian estimates based on the indicator we are presenting here: *disability-adjusted life years*

For this exploratory exercise, ten health conditions were selected to generate the first estimates using this measure of burden. The refinement of the methods used for calculating disability-adjusted life years and the possibilities of extending the use of this indicator to other issues lead us to believe that this work constitutes only a fraction of what could be produced in the field of burden of disease.

We are confident that the results produced with this new indicator will bring about additional knowledge that will be used to better inform decision making and to formulate objectives for the future.

SUMMARY

In the early 1990s the indicator *disability-adjusted life years* (DALY) was developed in response to a need for data used in health decision-making on an international scale. Since then, a number of countries have used this indicator to produce territorial estimates.

This indicator is of interest insofar as it considers both mortality and loss of functional health. It also allows for comparison of estimates produced for various health conditions and to rank their impacts on the health of a population under study. The impacts of disease on mortality are measured using *years of life lost* (YLL) and loss of functional health is estimated using *years lost due to disability* (YLD). DALYs are calculated as the sum of YLL and YLD.

The objectives of this report are to:

- introduce the indicator disability-adjusted life years and its components;
- describe the estimation methods used and the main methodological limitations; and
- present the first Québec estimates of DALYs for certain health conditions having a high prevalence or mortality rate in Québec.

DALYs and their components were computed for suicide and nine chronic diseases as well as for all causes in Québec for the period 2002-2006. Results show that the health conditions selected represent 59% of DALYs in Québec. Tumours, mental and behavioural disorders and ischemic heart disease cause the highest burden. Suicide, ischemic heart disease, tumours, hypertensive disease and cerebrovascular disease have a greater impact on mortality whereas osteoarthritis, asthma and mental and behavioural disorders have a greater effect on functional health. For both sexes, suicide is an important cause of premature death, as are tumours in women. Suicide and mental and behavioural disorders are important causes of burden among young people aged 15 to 29.

DALYs provide an alternative way to present a comprehensive profile of the population's health status with information derived from a variety of sources. One advantage of this indicator is that it breaks down information not only by disease, sex and age in an interesting manner, but also by distinct mortality and functional health elements. Moreover, its international use ensures that the methodology constantly improves. DALYs can also be used to assess the burden of a wide array of health problems, risk factors and some socioeconomic characteristics of the population.

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Indicators

DALY	Disability-adjusted life years
YLD	Years lost due to disability
YLL	Years of life lost

Health conditions

IHD	Ischemic heart disease
COPD	Chronic obstructive pulmonary disease
CVD	Cerebrovascular disease
MBD	Mental and behavioural disorders

Others

AMR-A	Americas Region – A
ICD	International Statistical Classification of Diseases and Related Health Problems
CLAMES	Classification and Measurement System of Functional Health
GBD	Global Burden of Disease
MSSS	Ministère de la Santé et des Services sociaux
WHO	World Health Organization

INTRODUCTION

In the early 1990s, the World Bank and the World Health Organization (WHO) implemented the Global Burden of Disease Study – GBD. Their goal was to meet the urgent need for data to be used for health decision-making on an international scale. The general goal of the project was to provide an objective and comparable assessment of health status using what was available at that time concerning onset of disease and injuries (Murray and Lopez, 1996a). More specifically, the project aimed to address three major gaps in the available information pertaining to the scope of health problems on a worldwide scale:

- The lack of availability of objective information on health conditions
- The need for information on health outcomes other than mortality
- The difficulty in gathering and using information on all aspects of burden of disease to conduct cost-effectiveness analyses which would in turn be used to identify intervention priorities.

With the use of the disability-adjusted life years indicator, which considers both mortality and loss of functional health caused by various health conditions, it thus became possible to compare estimates produced for each disease and to rank their impacts on the health of the population under study. Findings were published in a World Bank report (1993) and in Bulletins of the WHO, which were later reproduced in a book (Murray and Lopez, 1994).

Since then, several countries have used disability-adjusted life years to produce estimates specific to their territories for different health conditions (for examples, see Lapostolle et al., 2007; McKenna et al., 2005; Bradshaw et al., 2003). With the publication of this document, Québec can now be added to this list. The document has two main objectives: introduce the indicator disability-adjusted life years and adapt the calculation method for this indicator to produce estimates for Québec.

To accomplish these objectives, we will first define the concepts used. We will also describe the health conditions selected and the methodology used for this exploratory exercise. We will then present the first Québec estimates for disability-adjusted life years. Finally, we will address the advantages and disadvantages of our approach, as well as factors to consider and analyses to be undertaken in response to this study.

1 DEFINITIONS OF CONCEPTS

1.1 BURDEN

The term burden, as used in this study, quantifies in terms of years of life lost for the population under study the impacts of specific health conditions on functional health and mortality. We are not referring to the measure of economic burden, although the results presented here could serve as a basis to estimate indirect costs linked to mortality and loss of functional health.

1.2 DISABILITY

The concept of disability underlies the indicator disability-adjusted life years. Therefore, we must first make a distinction between the definition of the concept used for the purpose of the indicator and that elaborated in international and Québec protocols concerning functioning and disability. The definition of disability proposed by the authors of the original study on burden of disease (Murray and Lopez, 1996b) is based on an individual's capacity to perform certain tasks relating to his or her mobility, cognition, or other aspects. According to some experts (Fougeyrollas, 2010; WHO, 2001), the capacity of people to interact in the context of their daily lives must also be considered when determining how they perform in activities of daily living and in their social roles. Based on the terminology developed by Verbrugge and Jette (1994), the authors of the burden of disease study (Murray and Lopez) refer mostly to *functional limitations* rather than to *disability* as such. In the current report, we have made an effort to refer to the *functional health* component. However, when we discuss the indicators themselves, the term *disability* was chosen to respect the terminology used in the original WHO study.

1.3 DISABILITY-ADJUSTED LIFE YEARS

The disability-adjusted life year, or DALY, is a measure of burden of disease that quantifies not only premature mortality linked to various causes of death but also the gap between the current functional health of a population and a hypothetical ideal that we hope to attain (Lopez et al., 2006). This ideal constitutes a level from which it is generally considered no longer possible, at the time it is determined, to prolong life or improve functional health.

More specifically, a DALY is equal to one year of healthy life lost due to disability or death. Therefore this indicator is not limited to years of life lost due to mortality; it also includes years of healthy life lost by individuals who are in poor health or disabled (Murray and Lopez, 1996b). These two dimensions, mortality and functional health, are estimated respectively using years of life lost and years lost due to disability (Figure 1).

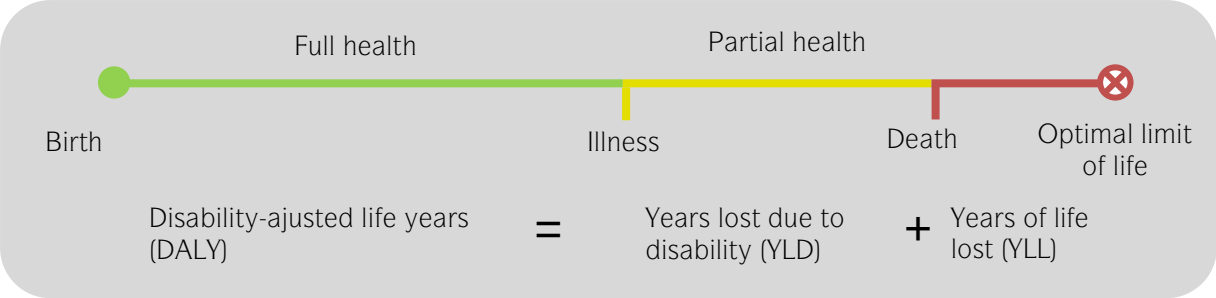


Figure 1 Standard illustration of the concepts of years lost due to disability, years of life lost, and disability-adjusted life years

Note: For illustrative purposes, this figure presents a standard life course which is not necessarily that which is experienced by each individual. Certain individuals will recover from their illness, others will become ill without experiencing a loss in functional health, etc.

Source: Jenkins, 2001.

1.3.1 Years of Life Lost

Years of life lost, or YLL, represent years of life lost through "premature" mortality. In this study, we measure premature mortality based on deaths that occur before a predetermined optimal age limit for each age group.

1.3.2 Years Lost due to Disability

Years Lost due to Disability, or YLD, are years of healthy life lost due to time spent in a less-than-optimal functional health status because of a specific health condition.

2 METHODOLOGY

This section describes the health conditions selected for study. It also includes the methodology used to produce YLL, YLD and, consequently, DALY estimates for Québec for the selected conditions, for the period 2002 to 2006.

2.1 HEALTH CONDITIONS SELECTED

In addition to suicide, nine chronic diseases for which mortality and/or prevalence is high in Québec were selected for this study: malignant neoplasms (cancer), hypertensive disease, ischemic heart disease (IHD), cerebrovascular disease (CVD), chronic obstructive pulmonary disease (COPD), asthma, diabetes, mental and behavioural disorders (MBD), and osteoarthritis. All-cause DALY estimates are also presented, in order to better describe the specific impact of each condition.

The description of the health conditions selected are based on the *International Statistical Classification of Diseases and Related Health Problems – Tenth Revision* (ICD-10) (WHO, 1993) codes listed in Table 1. Given that our estimates for Québec data linked to the functional health component are based on WHO data, we made an effort to use the same codes to ensure that the functional health and mortality components are analogous. The only exception is mental and behavioural disorders which, according to our definition, include all "F" codes for the mortality component, and all "F" codes and a few "G" codes for the functional health component.[1]

Table 1 Description of health conditions being studied by ICD-10 code

Health Conditions	Abbreviation	ICD-10 Code
Malignant neoplasms		C00-97
Diabetes		E10-14
Mental and behavioural disorders	MBD	F01-99
Hypertensive disease		I10-13
Ischemic heart disease	IHD	I20-25
Cerebrovascular disease	CVD	I60-69
Chronic obstructive pulmonary disease	COPD	J40-44
Asthma		J45-46
Osteoarthritis		M15-19
Suicide		X60-84, Y87.0

Note : The ICD-10 codes used for mortality data correspond with those used for the functional health component for all health conditions except MBD. For MBD, the functional health data from WHO contain G codes as well. For more information, consult Appendix 1.

[1] For more information on this topic, see Appendix 1.

2.2 CALCULATION OF DISABILITY-ADJUSTED LIFE YEARS

As noted above, DALYs are composed of YLL and YLD. More specifically, DALYs are calculated as the sum of YLL and YLD.

DALY = YLL + YLD

In Québec, we have the data needed to calculate YLL. However, this is not the case for YLD since the calculation requires information that is currently unavailable for each of the health conditions selected for study. The following subsections describe the methodology and identify the data sources used to estimate YLL and YLD.

We should note, however, that we do not employ two adjustment methods used in some DALY studies: discounting and age weighting (Murray and Lopez, 1996b). In fact, there have been various ethical and methodological criticisms of these two procedures (Lopez et al., 2006; Anand and Hyearson, 1998 and 1997; Barendregt et al., 1996). Moreover, these procedures are better suited to analysis of the economic burden (rather than the health burden) of disease.

2.2.1 Mortality component: Calculation of Years of Life Lost

In this study, YLL calculations are based on the WHO methodology. Generally, YLL are obtained by multiplying the number of deaths for each cause, sex and age group (N) by optimal life expectancy at the average age at which death occurs (L). In this study, optimal life expectancy is that observed in Japan in 2006.[2] YLL for a cause of death (or all causes of death) and by sex are obtained by summing YLL computed for each age group.[3]

YLL = N * L

Data from the Ministère de la Santé et des Services sociaux (MSSS) and WHO were used to compute YLL. MSSS data are from:

- the death registry, for deaths by age (<1, 1-4, 5-9, …, 90 years +[4]), sex and cause of death for Québec for the period 2002-2006;
- estimated and projected population size provided by the Service du développement de l'information,[5] by age group (same age groups as for deaths) and sex for the province as a whole during the period 2002-2006. (These figures are used to calculate average age at death for the open age group 90+ and mortality rates.)

[2] The reasons behind these choices are listed in Section 4.2 (Methodological Limits).

[3] An example of YLL calculation, involving calculation of average age at death and standard life expectancy at average age at death, is given in Appendix 2.

[4] Although the WHO results concern broader age groups, we calculated YLL for Québec for each cause using smaller age groups to obtain more accurate YLL.

[5] The registers that provide population size estimates and projections (2010 edition) can be accessed at the following address: http://www.msss.gouv.qc.ca/statistiques/stats_sss/index.php?population.

We used WHO data on life expectancy in Japan by sex and age for the year 2006. These data were published in Spring 2010 on the WHO website.[6]

To eliminate annual variations in mortality, YLL obtained for Québec constitute an annual average relative to the period 2002 to 2006.

2.2.2 Functional Health Component: Calculation of Years Lost due to Disability

The methodology used by WHO to compute YLD requires the availability of a series of data on the health condition under study, including number of incident cases (new cases), average duration of disability due to the disease and a disability weight that reflects the severity of health statuses associated with the health condition. Disability weights range from 0 (perfect functional health) to 1 (death) and were derived from the evaluation of an expert panel comprised of members from different organizations and different countries. The panel identified preferences between different states of health using "person trade-off techniques"[7] (Murray and Lopez, 1996b). This method for weighting disability is used to consider a disease from its onset until death and to assess the population's preferences for certain health states compared to an ideal. Since this information is generally not available for Québec, the functional health component in the present study is estimated based on data calculated for one of the territories created by WHO for the burden of disease study. This territory, called the AMR-A sub-region,[8] includes Canada, the United States and Cuba.

Two methods are used to estimate YLD for Québec: the YLD/YLL ratio or YLD rate for WHO's AMR-A sub-region for 2004. To choose the calculation method to apply, the YLD/YLL ratio for AMR-A sub-region must first be calculated to identify situations where functional health impacts are relatively more or less important than mortality due to the health condition under study.

In cases where the mortality component is relatively more important in comparison with the functional health component (YLD/YLL ratio for AMR-A <10), the YLD/YLL ratio is multiplied by the YLL computed for Québec for each cause of death, sex and age group. This method assumes that the disability burden of the conditions under study changes in proportion to the mortality burden of a same disease for the regions in question (Somerford and Katzenellenbogen, 2004).

In cases where the functional health component is relatively more important in comparison with the mortality component (YLD/YLL ratio for AMR-A ≥10) or where YLL for AMR-A equal 0, the YLD rate for AMR-A is multiplied by the Québec population size for each disease, sex

[6] More specifically, the mortality table for Japan was found at the following Web address: http://apps.who.int/whosis/database/life_tables/life_tables.cfm. A more recent mortality table is now available.

[7] This method evaluates functional health states where respondents are asked to choose among hypothetical interventions that offer health benefits to groups of individuals in different health states (Lopez et al., 2006).

[8] WHO first divided its member states into six geographical regions and then divided these regions into five mortality strata to obtain 14 sub-regions. The region we use is AMR (Americas) and mortality strata A, that is, very low child and very low adult mortality. For additional details on the regions and mortality strata, go to the following website: www.who.int/whr/2004/annex/topic/en/annex_member_en.pdf.

and age group so that YLD can be assessed for Québec.[9] These cases occurred in both sexes in a few age groups for mental and behavioural disorders, COPD and asthma (all ratios ≥ 10), as well as for suicide (since YLL equalled 0 in the 0-to-4-year-old group for each sex). YLD for osteoarthritis were estimated using YLD rates for all age groups and both sexes (because ratio ≥ 10 or YLL = 0, depending on the age group).

- If the ratio $(YLD/YLL)_{AMR\text{-}A} < 10$:

$$\mathbf{YLD_{Québec} = (YLD/YLL)_{AMR\text{-}A} * YLL_{Québec}}$$

- If the ratio $(YLD/YLL)_{AMR\text{-}A} \geq 10$ or $YLL_{AMR\text{-}A} = 0$:

$$\mathbf{YLD_{Québec} = Rate\ of\ YLD_{AMR\text{-}A} * Population_{Québec}}$$

Finally, YLD for a given condition and by sex can be obtained by adding YLD calculated for each age group.[10]

To estimate YLD in Québec, the population sizes used to calculate YLL as well as YLL calculated previously for Québec for the period 2002 to 2006 are used again. The calculation also requires the YLL and YLD as well as population sizes published by WHO for the AMR-A subregion on its *Global Burden of Disease* website for the year 2004.[11] All this information is available for each individual health condition, for the total of all health conditions, as well as by age group (0-4, 5-14, 15-29, 30-44, 45-59, 60-69, 70-79 and 80 years and over) and sex. Finally, YLD estimates for Québec constitute an annual average since they are based on average annual YLL for the period 2002 to 2006.

[9] This method of estimating YLD has been used in several scientific articles including Lapostolle et al. (2007), Granados et al. (2005), McKenna et al. (2005), Somerford and Katzenellenbogen (2004), Observatoire régional de santé d'Île-de-France (2003), Bradshaw et al. (2003), Kominski et al. (2002), Schopper et al. (2000) and Bowie et al. (1997), but to our knowledge, it has never been used in Canada. This idea of ratio was introduced by Murray and Lopez (1996b) for projected YLD. However, neither they nor any of the other authors listed above justified their choice of a threshold of 10. Other estimation methods can be used to calculate YLD. See Section 4.4 for more information.

[10] An example of YLD calculation is explained in detail in Appendix 3.

[11] The website address is http://www.who.int/healthinfo/global_burden_disease/estimates_regional/en/index.html. A document describing the methodology used to calculate estimates in 2004 and presenting some results is also available (WHO, 2008).

Table 2 Summary of data sources used to calculate years of life lost and years lost due to disability

Variable	Strata	Source
Deaths	All-cause and cause-specific, sex, age group, Québec, 2002-2006	MSSS mortality files
Population (Québec)	By sex and age group, Québec, 2002-2006	Service du développement de l'information du MSSS
"Optimal" life expectancy	By sex and age, Japan, 2006	WHO website
Years of life lost and years lost due to disability	All-cause and cause-specific, sex, age group, WHO AMR-A sub-region, 2004	WHO *Global burden of disease* (2004) website (http://www.who.int/healthinfo/global_burden_disease/estimates_regional/en/index.html)
Population (AMR-A subregion)	By sex and age group, WHO AMR-A sub-region, 2004	

Note: The WHO AMR-A sub-region regroups Canada, United States and Cuba.

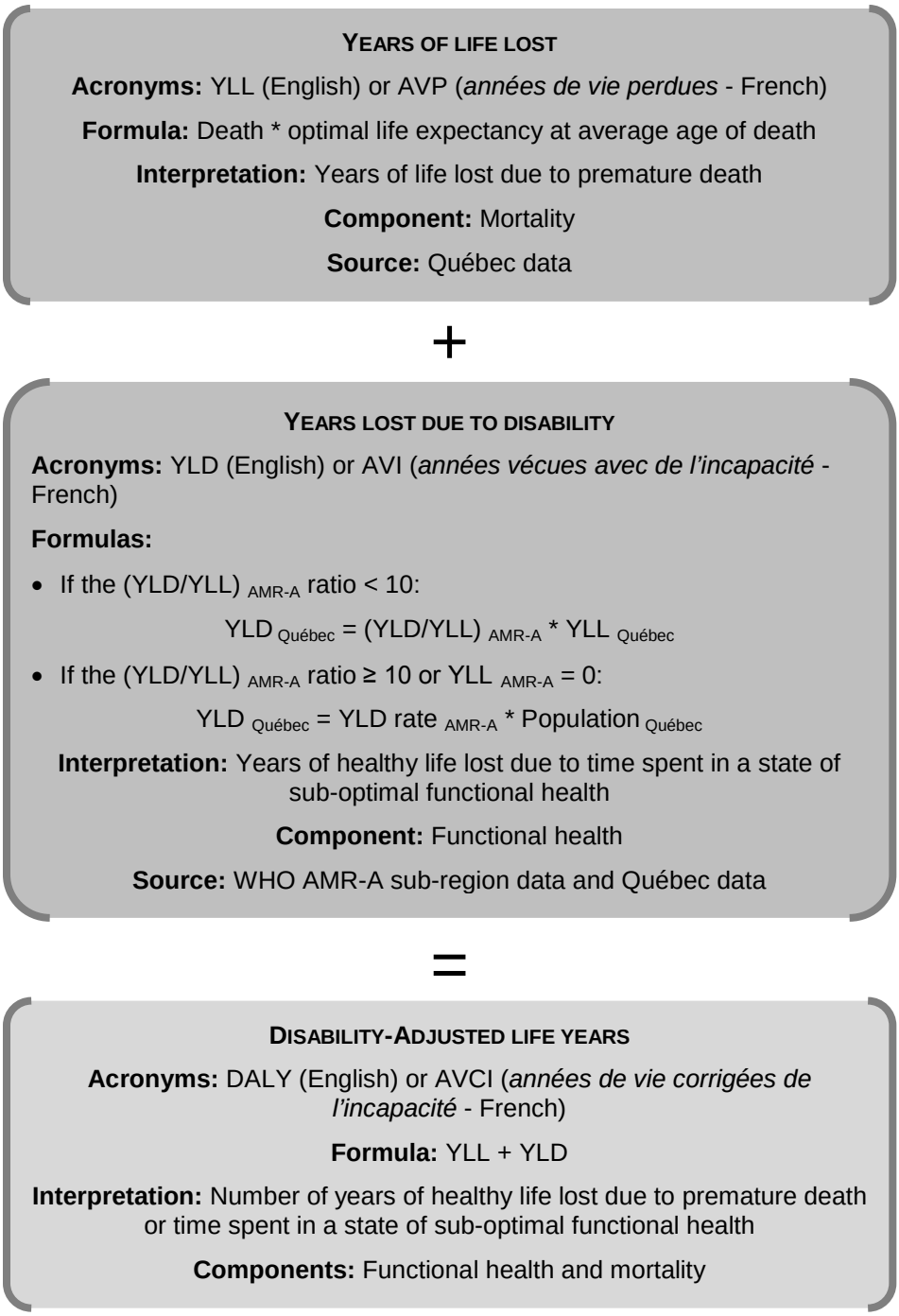


Figure 2 Indicators used at a glance

3 RESULTS

3.1 BURDEN OF DISEASE IN QUÉBEC

3.1.1 Mortality: An Important Part of Burden of Disease in Québec

In Québec, during the period 2002 to 2006, the burden for all health conditions accounted for 1,486,563 disability-adjusted life years (DALYs) on average per year,[12] which equals 197.3 DALYs per 1000 people (Table A.4.1). Mortality explains most of the burden of disease: 57.3% of DALYs are from years of life lost (YLL) (Chart1).

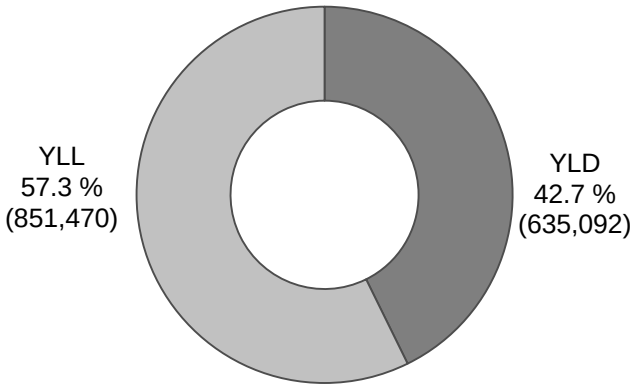


Chart 1 Distribution of years of life lost and years lost due to disability, both sexes, Québec, 2002-2006

3.1.2 Years of Life Lost Are of Greater Importance for Burden of Disease Among Men

DALYs appear to be slightly higher for women than men: 764,739 DALYs (200.7 DALYs per 1000 women) versus 721,824 DALYs (193.8 DALYs per 1000 men) (Tables A.4.2 and A.4.3). If DALYs are broken down into their mortality and functional health components for each sex, we see that for men, YLL are clearly more important than years lived with disability (YLD) (61.5% vs. 38.5%). This trend does not occur among women, for whom distribution of YLL (53.3%) and YLD (46.7%) is more balanced (Chart 2).

[12] A reminder that all data to which we refer correspond to average annual estimates for Québec based on the period 2002 to 2006.

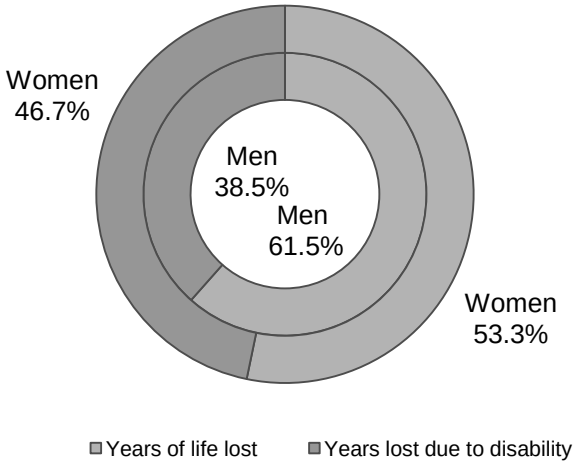


Chart 2 **Distribution of years of life lost and years lost due to disability for each sex, Québec, 2002-2006**

3.1.3 Burden Is Greater Among Older People

In Québec, DALYs, and more specifically DALY rates per 1000 people, increase with age (Chart 3). The trend is similar for YLD and YLL, but is much more pronounced for the latter from 30 years of age on (Chart 3 and Table A.4.1). However, starting at age 45, YLL rates become higher than YLD rates. Prior to this age, functional health seems to have a greater impact on health status.

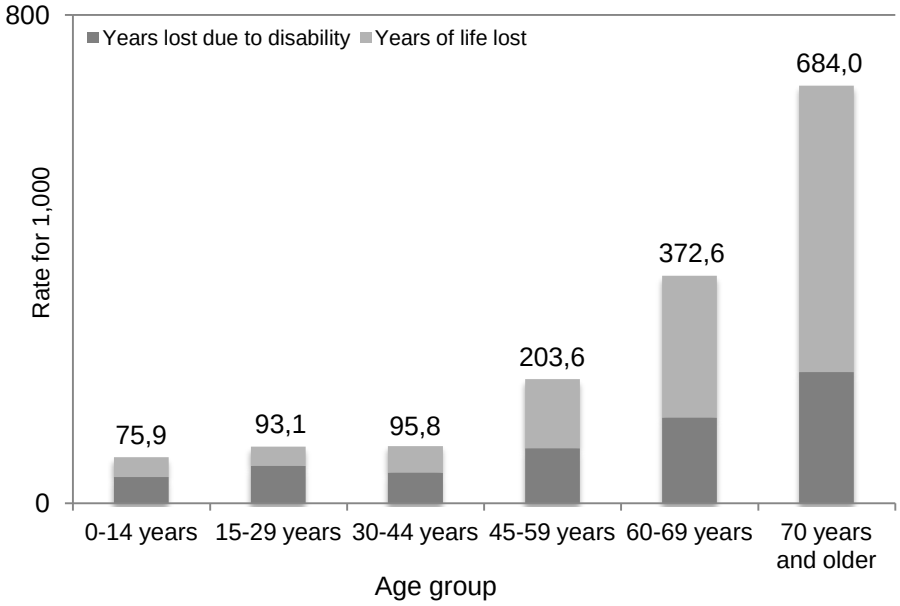


Chart 3 **Average annual rate of years of life lost, years lost due to disability and disability-adjusted life years, by age group, both sexes, Québec, 2002-2006**

3.2 BURDEN OF SELECTED HEALTH CONDITIONS IN QUÉBEC

The ten health conditions selected for this study represent on their own an important proportion of all DALYs in Québec (59.3% of all DALYs; Chart 4), especially as regards YLL (65.9% of all YLL).

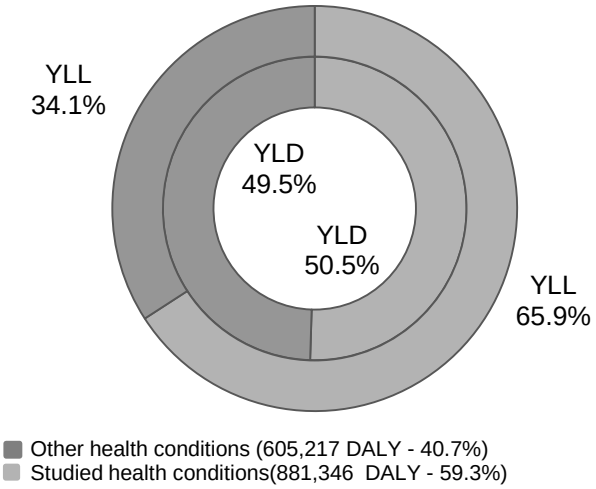


Chart 4 Distribution of years of life lost and years lost due to disability for the ten health conditions studied and all other health conditions, both sexes, Québec, 2002-2006

Among the health conditions studied, DALY numbers are highest for malignant tumours, mental and behavioural disorders and ischemic heart disease (IHD). Conversely, hypertensive disease and asthma present the lowest numbers. If we examine the components separately, we note that mortality accounts for a major portion of DALYs for suicide, IHD, tumours, hypertensive disease and cerebrovascular disease. In contrast, asthma and mental and behavioural disorders stand out because of the large loss of functional health. Finally, the roles of mortality and functional health are equally important in terms of years of life lost for chronic obstructive pulmonary disease (COPD) and diabetes (Table 3).

Table 3 Distribution of years of life lost and years lost due to disability and number of disability-adjusted life years for each health condition, both sexes, Québec, 2002-2006

Health condition	YLLs (%)	YLDs (%)	DALYs (number)
Malignant neoplasms	89.4	10.6	338,722
Mental and behavioural disorders	9.8	90.2	177,143
Ischemic heart disease	92.6	7.4	114,344
Chronic obstructive pulmonary disease	52.5	47.5	56,170
Suicide	95.0	5.0	49,954
Cerebrovascular disease	73.2	26.8	43,398
Osteoarthritis	0.5	99.5	41,987
Diabetes	52.5	47.5	41,557
Asthma	5.9	94.1	13,821
Hypertensive disease	78.5	21.5	4,249
Other health conditions	*48.0*	*52.0*	*605,217*
All causes	**57.3**	**42.7**	**1,486,563**

Note: Table A.4.2 presents these results by sex.

3.2.1 Differences by Sex

For the ten health conditions studied, the same burden profile is generally observed for men and women. By comparing DALYs by sex, however, we see differences in magnitude for three of the conditions studied as a proportion of all health problems: ischemic heart disease, suicide and mental and behavioural disorders. Ischemic heart disease and suicide seem to be more prominent among men than women. Indeed, 9.4% of all DALYs among men versus 6.1% among women are due to IHD, and 5.1% of DALYs are due to suicide among men, compared to 1.7% among women. However, mental and behavioural disorders seem to be more prominent among women: 13.9% of all DALYs versus 9.8% for men (Table A.4.4).

Interestingly, YLD ranking for the ten health conditions studied follows the same order of importance for each sex. However, with regards to YLL, suicide ranks differently for men (3rd versus 5th for women), whereas cerebrovascular disease is higher for women (3rd versus 5th for men) (Charts 5 and 6, and Table A.4.4).

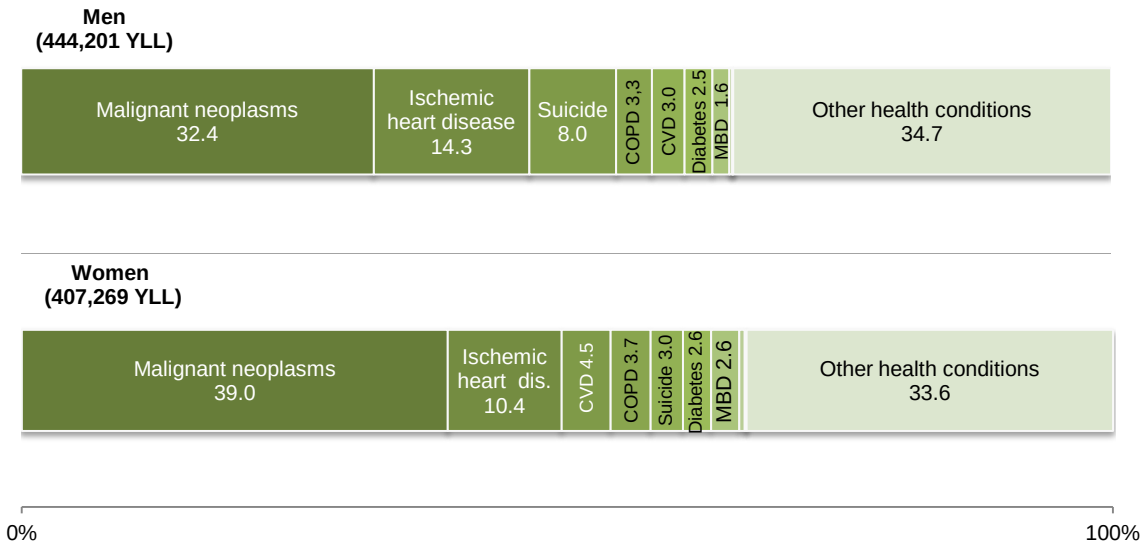


Chart 5 **Distribution of years of life lost by sex and health condition, Québec, 2002-2006**

Note: The proportion of years of life lost caused by hypertensive disease, asthma and osteoarthritis were too small to be visible in the graph. Refer to Table A.4.4 for more detailed information.

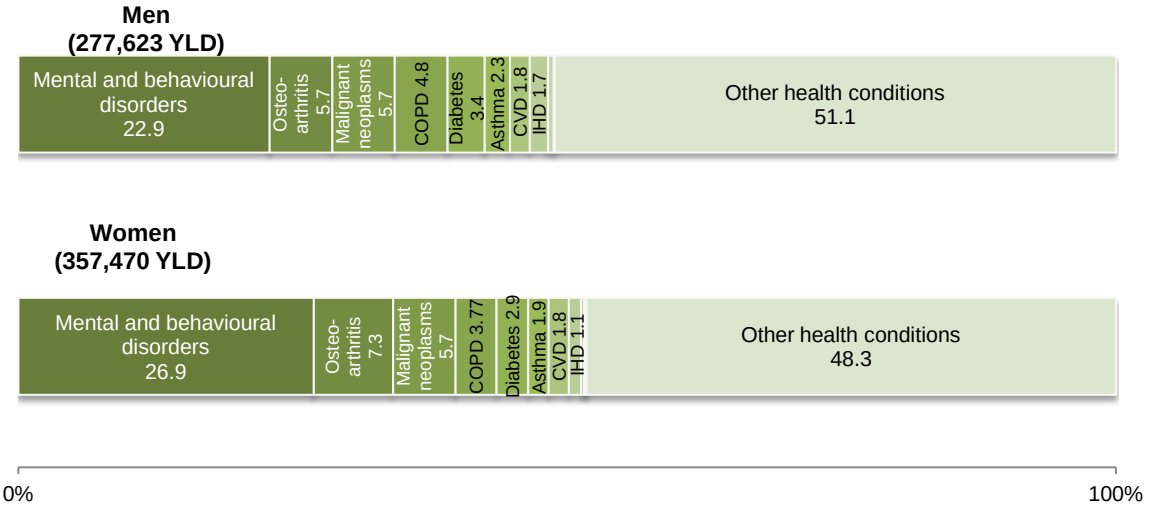


Chart 6 **Distribution of years lost due to disability by sex and health condition, Québec, 2002-2006**

Note: The proportion of years lost due to disability caused by suicide and hypertensive disease were too small to be visible in the graph. Refer to Table A.4.4 for more detailed information.

3.2.2 Premature Mortality Due to Suicide and Malignant Tumours

It is possible to identify causes of mortality that occur at young ages by comparing the proportion of deaths for each cause (among all deaths) to the proportion of YLL (among all YLL). When the proportion of deaths is greater than that of YLL, mortality occurs at older ages; when the reverse is true, deaths associated with the identified cause occur at younger ages. In Québec, we observe premature mortality in women related to malignant tumours (39.0% of YLL versus 30.4% of deaths) and to suicide (3.0% of YLL versus 1.0% of deaths). In men, only suicide stands out as a cause of premature mortality (8.0% of YLL versus 3.5% of deaths) (Chart 7 and Table A.4.4).

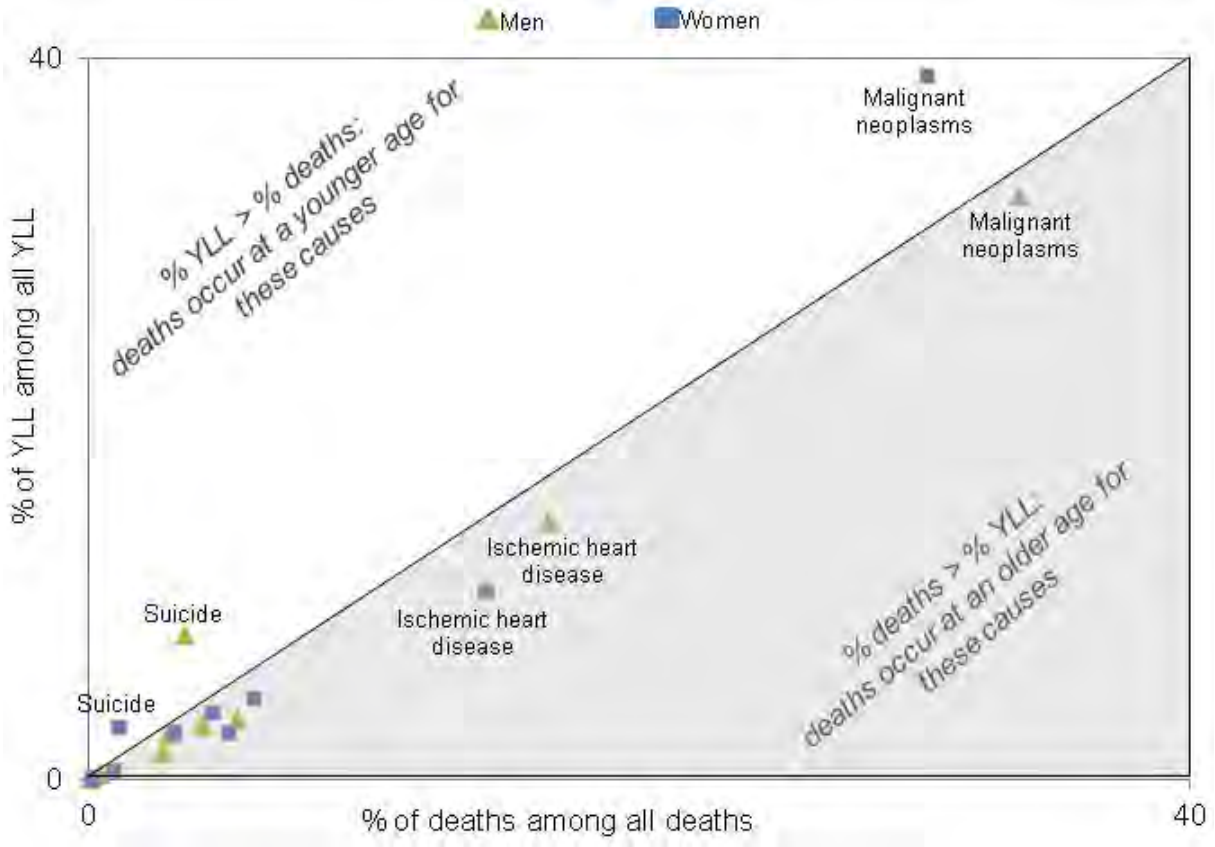


Chart 7 Comparison of proportion of deaths and proportion of years of life lost, by sex and for each health condition, Québec, 2002-2006

3.2.3 Mental Health of Young Adults Is of Concern

If we examine YLL by cause for certain age groups, we note that suicide is responsible for an important number of years of life lost among young people aged 15 to 29, since 9.3 YLL per 1000 persons in this age group are due to this cause compared with 5.6 YLL per 1000 for the rest of the population (Table A.4.3 and calculation not presented for the rest of the population). Among 15- to 29-year-old men, the rate is 14.0 per 1000. We also observe that malignant tumours stand out from the rest for all age groups, even if they do not necessarily do so as notably among people under 45 years old as among persons aged 45 and over (Chart 8). More particularly, the YLL rate for malignant tumours in 30- to 44-year-olds is

11.5 per 1000 people, followed very closely by suicide (10.0 YLL per 1000) (Table A.4.3). As for ischemic heart disease, the YLL rate starts being more noticeable from age 45 onwards and is particularly evident among people aged 70 years and over (76.8 YLL per 1000). Malignant tumours, COPD and cerebrovascular disease also leave their mark on this latter age group. Finally, it is interesting to note that only people aged 70 and over lose years of life due to hypertensive disease.

For YLD, we see that mental and behavioural disorders are undeniably present in each age group (Chart 8). However, the rates are most visible among 15- to 44-year-olds (34.0 YLD per 1000) and people aged 70 and over (48.8 YLD per 1000). In fact, the burden of disability for mental and behavioural disorders is particularly high among 15- to 29-year-olds, with a rate of 55.5 YLD per 1000 persons (Table A.4.3). Indeed, mental and behavioural disorders represent 90.3% of YLD in this age group (Table 4.5). Rates for people aged 80 and over are also high, with YLD due to mental and behavioural disorders at 94.2 per 1000 (Table A.4.3). Among young people, asthma is an important cause of disability, with a rate of 5.5 YLD per 1000 youth aged 0 to 14 years (Chart 8). Another condition that stands out, this time in people 45 to 69 years old, is osteoarthritis, with an average annual rate of 10.6 YLD per 1000 persons.

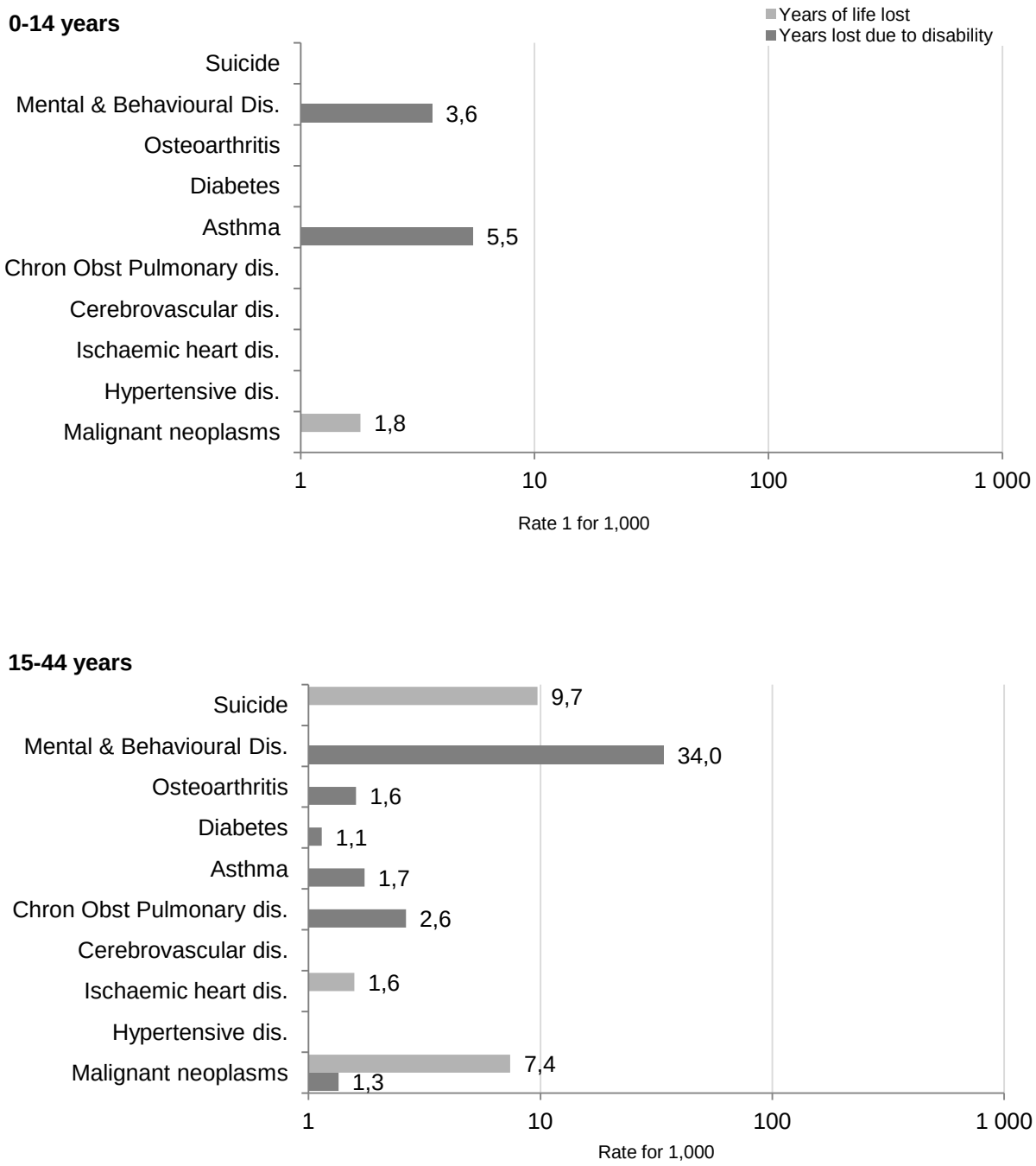
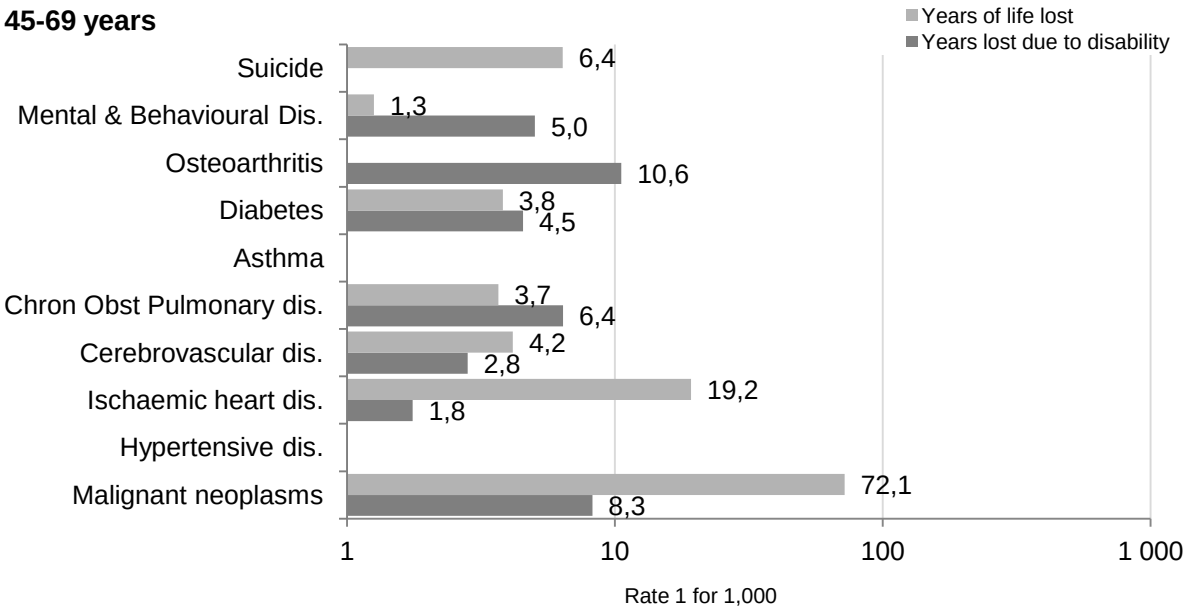


Chart 8 **Average annual rate of years of life lost and years lost due to disability, by age group and health condition, both sexes, Québec, 2002-2006**

Note: These graphs are based on a logarithmic scale and therefore do not present rates from 0 to 1 per 1,000.



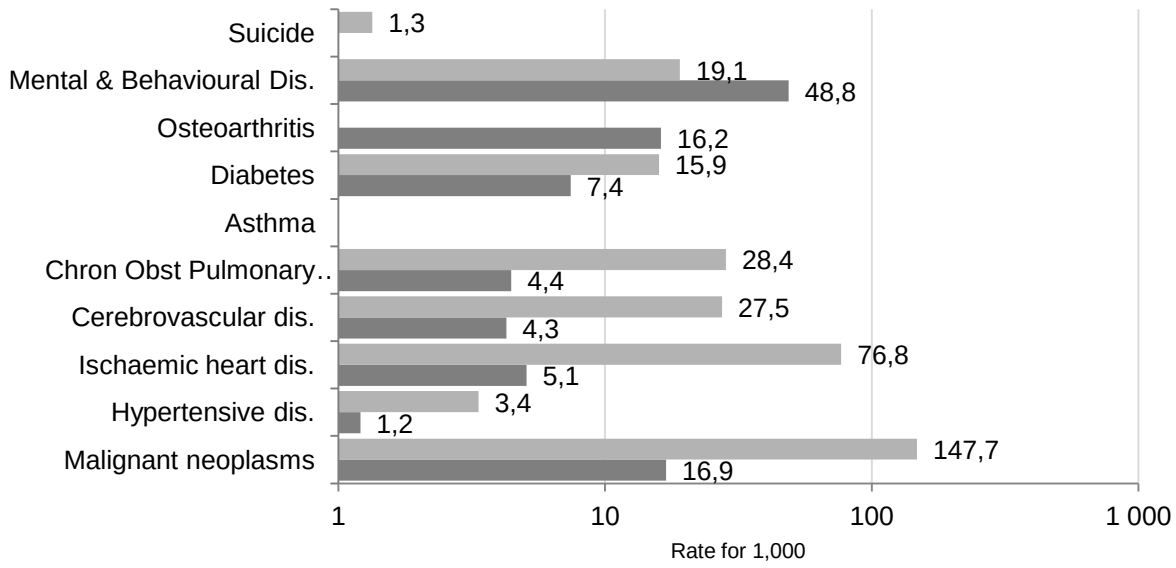


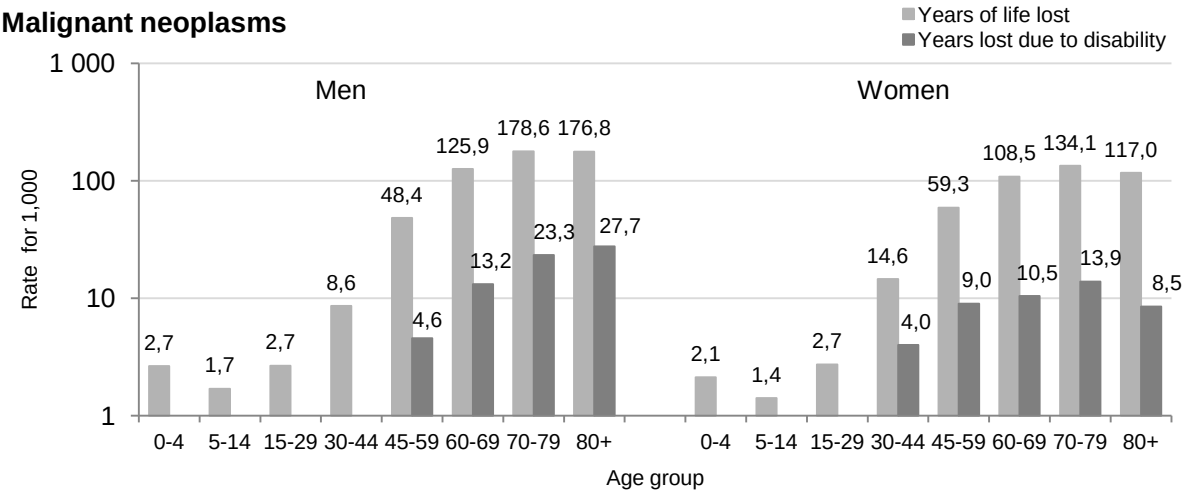
Chart 8 **Average annual rate of years of life lost and years lost due to disability, by age group and health condition, both sexes, Québec, 2002-2006 (continued)**

Note: These graphs are based on a logarithmic scale and therefore do not present rates from 0 to 1 per 1,000.

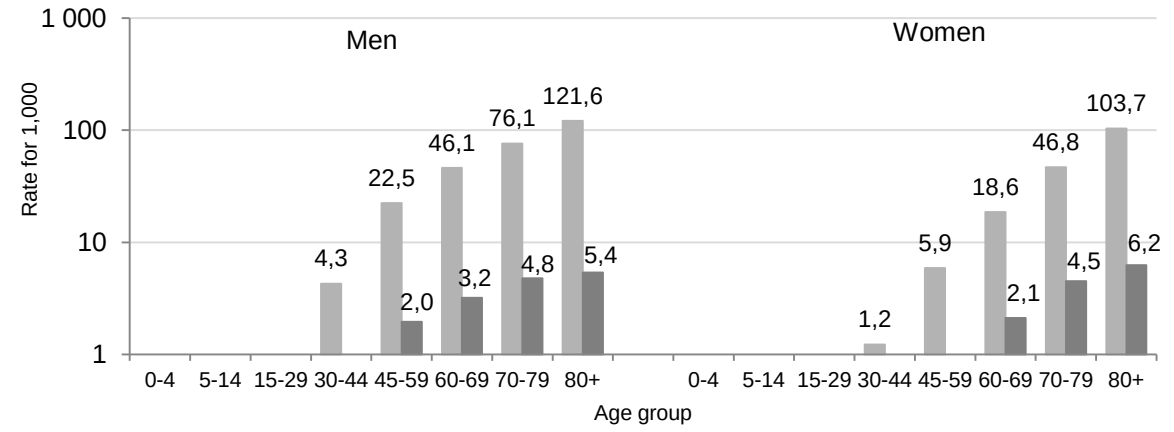
3.2.4 Notable Profiles by Sex and Age for Mental and Behavioural Disorders and Chronic Obstructive Pulmonary Disease

If we look at the evolution of DALYs by age group (Chart 9 and Table A.4.3), we note that the DALY rate (per 1000 persons) generally increases with age, regardless of sex, for hypertensive disease, diabetes, COPD, cerebrovascular disease, ischemic heart disease, tumours and osteoarthritis. When we examine the distribution of YLD and YLL for each condition by age group and sex, notable profiles emerge for some health conditions, including mental and behavioural disorders and COPD. We observe a high rate of YLD for mental and behavioural disorders among young people, followed by a considerable decline among middle-aged individuals and then a rise among older people. It should be noted that women aged 30 to 44 experience more substantial limitations in functional health than men in the same age group: 28.6 YLD per 1000 compared with 2.4 YLD per 1000. With respect to COPD, YLD are more present among people under 60 years old, but YLL gradually replace YLD starting at this age, in both men and women. The rate of YLL due to COPD is higher among men aged 80 and over than among women in this age group: 57.1 YLL per 1000 versus 28.1 per 1000.

Malignant neoplasms



Ischemic heart disease



Cerebrovascular disease

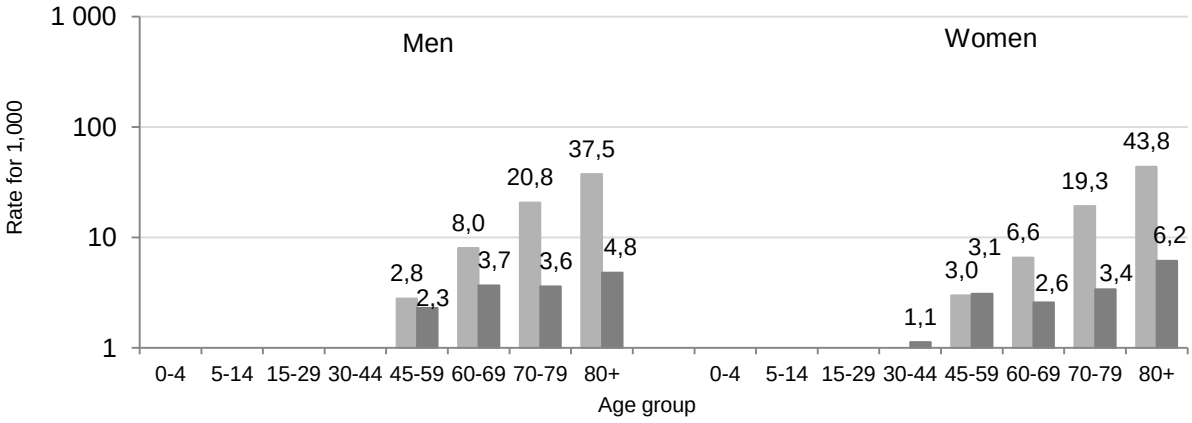


Chart 9 **Average annual rate of years of life lost and years lost due to disability, by health condition, sex and age group, Québec, 2002-2006**

Note: These graphs are based on a logarithmic scale and therefore do not present rates from 0 to 1 per 1000.

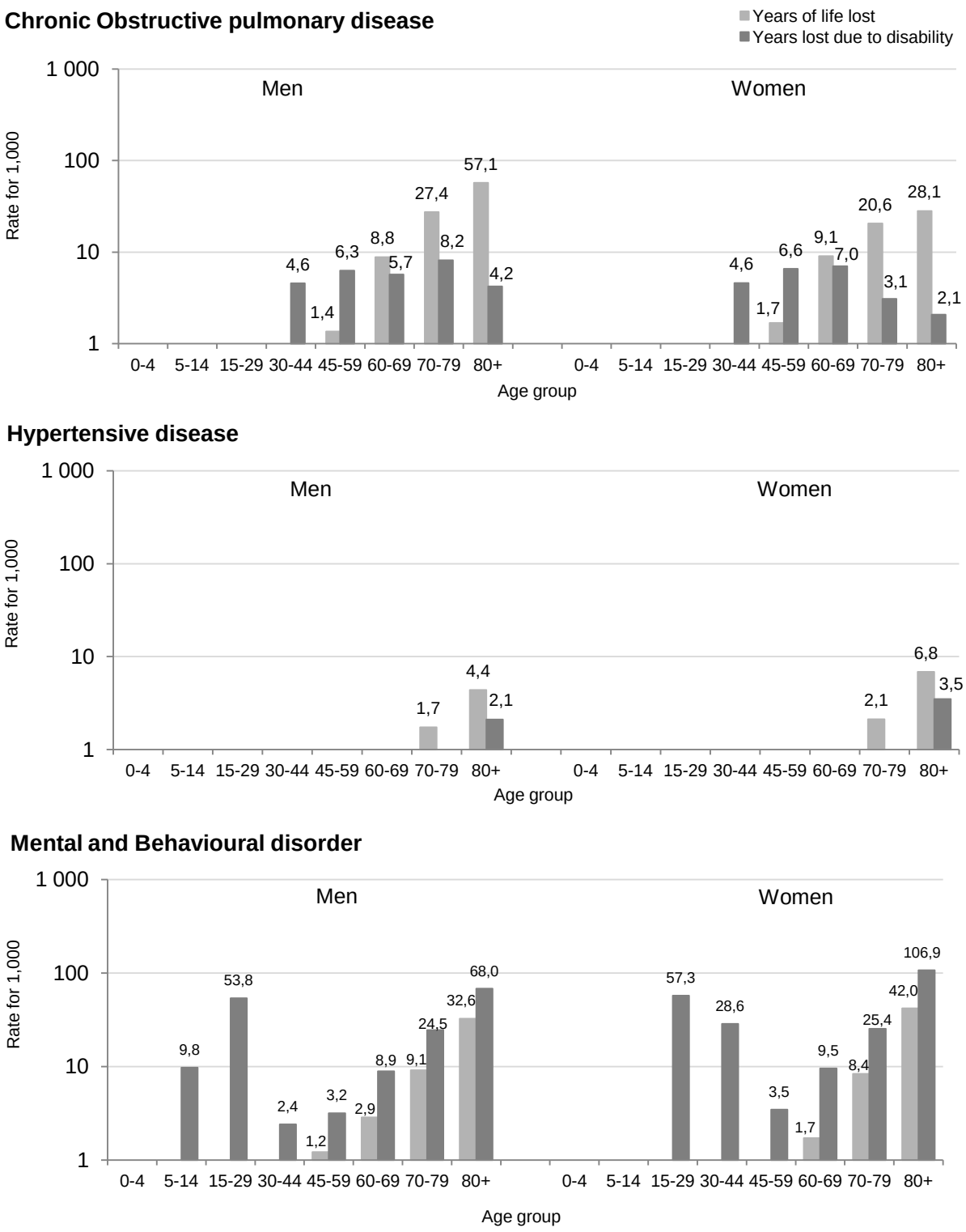
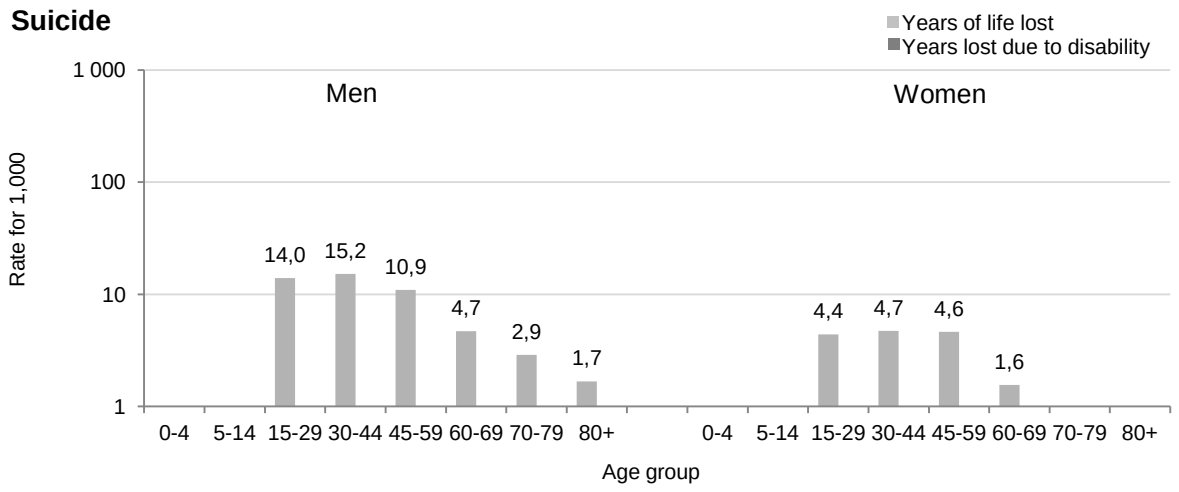
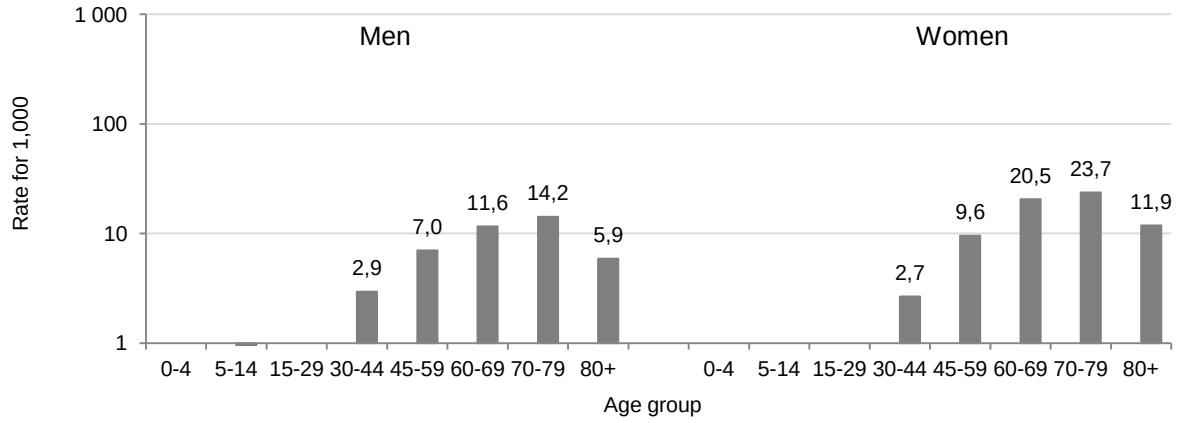


Chart 9 **Average annual rate of years of life lost and years lost due to disability, by health condition, sex and age group, Québec, 2002-2006 (continued)**

Note: These graphs are based on a logarithmic scale and therefore do not present rates from 0 to 1 per 1000.





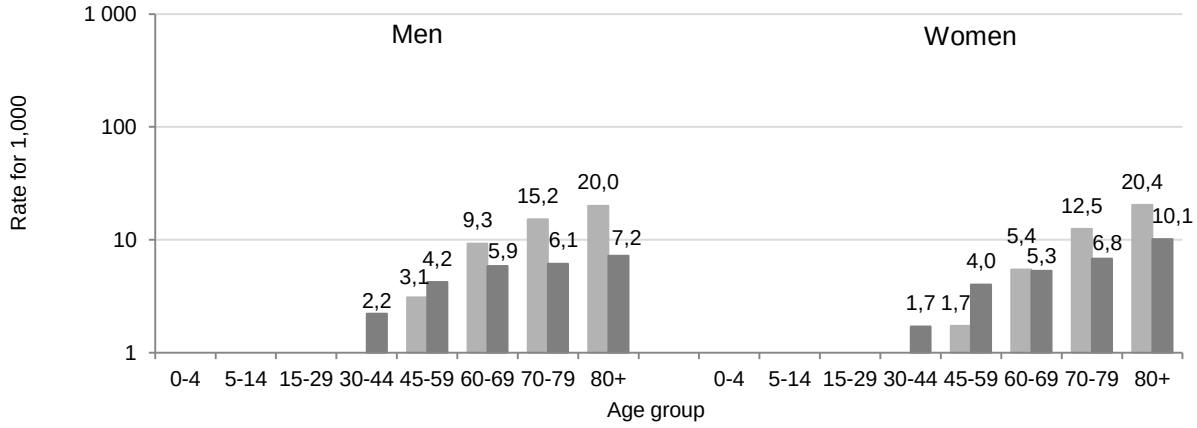


Chart 9 **Average annual rate of years of life lost and years lost due to disability, by health condition, sex and age group, Québec, 2002-2006 (continued)**

Note: These graphs are based on a logarithmic scale and therefore do not present rates from 0 to 1 per 1000.

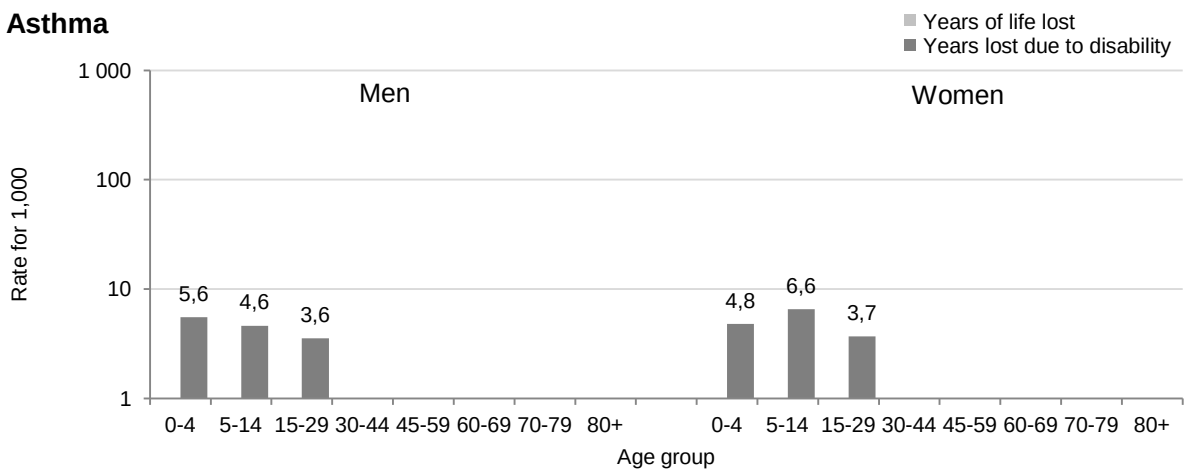


Chart 9 **Average annual rate of years of life lost and years lost due to disability, by health condition, sex and age group, Québec, 2002-2006 (continued)**

Note: These graphs are based on a logarithmic scale and therefore do not present rates from 0 to 1 per 1000.

4 DISCUSSION

This monograph proposes the disability-adjusted life year (DALY) as one of the indicators of the burden of disease in Québec. The burden assessed here can be perceived as a measure of the gap between observed health status and an ideal situation in which everybody lives free of illness or disability to an advanced age (Lopez et al., 2006). For Québec, the calculation of this measure and of its two components—mortality and functional health—is based on work carried out by various authors and on data from various sources, some of which are available at no charge on the WHO website. The results obtained by this study describe how ten specific health conditions affect the collective health status of the population of Québec.

4.1 SYNTHESIS OF THE FINDINGS

By looking at ten specific health conditions we were able to account for more than half of the disease burden in Québec between 2002 and 2006. Globally, mortality accounts for slightly more than half of the burden. The three health conditions that have the most impact on functional health are the same for both men and women. In decreasing order, they are: mental and behavioural disorders; osteoarthritis and; tumours. For years of life lost (YLL), malignant tumours and ischemic heart disease occupy respectively the first and second place for both sexes, while cerebrovascular disease and suicide hold third place for women and men respectively.

Our results also show that mortality accounts for a major portion of the burden of the following health conditions: suicide, ischemic heart disease, malignant tumours, hypertensive disease, and cerebrovascular disease. As well, our results underscore the importance of premature mortality in the case of suicide (for both men and women) and malignant tumours (for women). On the other hand, it is clear that reducing mortality would probably not have an impact on health conditions such as osteoarthritis, asthma and mental and behavioural disorders, since years lost due to disability (YLD) account for 90% of their disease burden.

Finally, we stress that mental health is a particularly troubling issue for Quebecers between 15 and 29 years old. For these young people, compared to other age groups, mental and behavioural disorders are an important cause of loss of functional health, and suicide is responsible for a high number of years of life lost.

4.2 METHODOLOGICAL LIMITATIONS

The methodology used in this study presents certain limitations, some of which are associated with the original methodology developed by the WHO and others with the estimation of YLD for Québec. We note that though these limitations could affect the precision of measurements of disease burden and its components (under- or over-estimation of years), they should not affect the main findings of this report: some health conditions mostly lead to life with limited functional health, while others are more likely to cause premature death.

The first criticism of the WHO methodology concerns the fact that the disability weights are based on the opinions of medical experts rather than on those of persons living with disease-related disabilities (Groce et al., 1999, King and Bertino, 2008). However, by minimizing the intercultural differences in self-evaluations of functional health, this approach has the advantage of facilitating comparisons between different regions of the world (Gold et al., 2002). Similarly, several authors criticize the fact that DALYs emphasize the physical aspect of disability while ignoring the socio-cultural and environmental aspects, not to mention the burden of the disease on those who are close to the affected individual (King and Bertino, 2008; Anand and Hyearson, 1997; Sayers and Fliedner, 1997). Another weighting-related criticism concerns the way in which the "person trade-off" exercise is formulated since it obliges participants to seek consistency in their estimates.[13] This approach could end up diminishing the value of participants' natural choices, and could even force them to give responses that clash with their ethical values (Arnesen and Nord, 1999).

Moreover, the weightings used by the WHO do not take into account disabilities shared due to comorbidity (an individual suffering from several health conditions). It is difficult to evaluate the effect of comorbidity on estimates of the burden linked to certain health conditions. On the one hand, adding together disability weights without adjusting for comorbidity could lead to an overestimation of the burden (Haagsma et al., 2011; Mathers et al., 2006; van Baal et al., 2006). On the other hand, several studies show the possibility of an underestimation in cases where the coexistence of certain chronic diseases has synergistic effects that create a higher risk of disability than could be expected from their separate effects (Mathers et al., 2006). Moreover, the extent of the impact of comorbidity on disease burden is contested (Mathers et al., 2006). However, since a significant increase has been observed in the proportion of Quebecers who report having two or more chronic diseases — from 21% in 2000-2001 to 23% in 2005 (Cazale et al., 2009) — it is quite possible that this limitation affects some of the results of our study.

Finally, given the continual evolution over time of both the methodology and data, in response to criticisms amongst other reasons, it is not possible to make temporal comparisons of estimates derived from WHO data.

Adapting the WHO methodology to produce estimates for Québec constitutes an additional source of methodological limitation. The first limit stems from the use of results for the WHO AMR-A subregion to estimate YLD for Québec. If the real ratios and rates for Québec are substantially different from those used in the analysis, the YLD and DALYs reported here could be over- or under-estimated for certain health conditions (Kominski et al., 2002). This would also be the case if there are differences between the AMR-A subregion and Québec in the incidence, duration and disability weight data on which YLD calculations are based. It is possible that impacts are greater for cases in which disability accounts for a larger proportion of the DALY scores, i.e., for asthma, osteoarthritis and mental and behavioural disorders in which YLD account for 90% or more of DALYs, as well as for cases of COPD and diabetes,

[13] In this exercise, the participant must make two estimates, corresponding to two scenarios, for each state of health evaluated. In the first scenario, the participant is asked to compare the value of extending the life-span of persons with or without limitations to functional health. In the second scenario, the improvement of quality of life for persons with limitations to functional health is compared to the extension of the life-span of persons without such limitations.

in which YLD account for 48% of DALYs. Another disadvantage related to the use of a ratio to estimate YLD is the inability to compare results from Québec to those from other Canadian provinces or, within Québec, to compare results from different regional health authorities. Regional disparity caused by a difference in functional health cannot be determined in these circumstances because the parameters used in all these regions for calculating YLD are the same: those of the AMR-A subregion.

It should be remembered that results obtained for mental and behavioural disorders in Québec do not refer to exactly the same disease-classification codes for YLD and YLL. We estimate, among other things, that this situation has probably led to a more frequent use of the ratio to estimate YLD than would have been the case if the same codes had been used for both the mortality and functional health components[14].

Moreover, in our calculations of YLL we have used life expectancies for Japanese men and women as optimal life expectancies rather than the model life tables used by WHO. Since life expectancy for the Japanese (both sexes combined) is the highest in the world, it corresponds to a limit that is both ideal and actually observed, whereas the WHO life expectancy is based on theoretical estimates that have already been exceeded by life expectancies observed among the Japanese in 2006. A result of this choice is that, compared to the numbers that would have been estimated using WHO figures for optimal life expectancies, the YLL we estimate are higher for women and slightly lower for men. Since YLD is calculated from YLL, it too could have been affected.

In interpreting results from Québec, we cannot confirm if there are statistically significant categorical differences between health conditions, sexes or age groups since confidence intervals were not calculated in this exploratory study. The diversity of data sources and estimation methods used makes it difficult to calculate confidence intervals (Murray and Lopez, 1996b). In recent years, the creators of the DALY indicator have experimented with computerized micro-simulation models to quantify the uncertainty of DALY estimates (Lopez et al., 2006). Since the current study is our first exploration of the indicator, we have chosen not to use this complex method, but we do not exclude the possibility of using it in future analyses.

Finally, we note that, in adapting the methodology to Québec, the burden of only ten specific health conditions was examined. Other health conditions not investigated in this study may also have major impacts on the health of the population of Québec.

4.3 TOWARD AN IMPROVEMENT OF THE DATA BEING USED IN THE MODEL

The current study uses a number of estimates (e.g. WHO weights, results produced for the AMR-A subregion) to measure disability, since the data needed to make the calculations are not available for Québec. Fortunately, new data sources are being developed and could, eventually, allow Québec data to be used in calculating YLD. The Institut national de santé publique du Québec (INSPQ) has been mandated by MSSS to develop and implement a chronic disease surveillance system using a method based on linked administrative data

[14] For more details on this methodological limit, see Appendix 1.

sources. The health conditions to be tracked in this project are diabetes, cardiovascular disease, respiratory diseases, osteoarticular diseases, osteoporosis, and mental disorders as well as Alzheimer's disease and dementia. First measures of prevalence, incidence and mortality based on this methodology have already been produced for diabetes and hypertension (Pigeon and Larocque, 2011; Blais and Rochette, 2011). We are confident that one day, the measures developed from this surveillance system will be used to calculate indicators such as DALY. In the context of the present study, the effect would be to eliminate the need to use an estimation method which would in turn render YLD calculations more representative of the Québec context.

Other work, carried out in Canada, could also allow us to produce information that is better adapted to the Québec context. This work, part of the *Population Health Impact of Disease in Canada* initiative,[15] consists of documenting the consequences[16] of different states of health using the Classification and Measurement System of Functional Health (CLAMES). Scores on this scale are obtained from the general population, including persons from all age groups and suffering, or not, from a wide variety of conditions. It allows for the weighting of years of life for each health state and represents, in the methodology presented here, WHO disability weights which are adapted to the Canadian context. Using these scores could counteract some of the methodological limitations described above. Work has been done using these scores, particularly in Ontario for infectious health conditions (Kwong et al., 2010), and also Canada-wide for neurological illnesses, disorders and traumas (Canadian Institute for Health Information, 2007).

4.4 COMPLEMENTARY STUDY

In light of the limits associated with YLD calculation, we plan to carry out a sensitivity analysis to better define the range of possible results for the functional health component. For this analysis, we will try to quantify the impacts of using the YLD/YLL ratio estimation method and of using WHO weights for a specific health condition. We will also try to measure the impact of using data associated with the AMR-A sub-region rather than data specific to Canada or Québec. We also envisage redoing the present exercise using new weights produced by the WHO[17] to see if this changes the results obtained. Following the sensitivity analysis, and with a better understanding of the various possible methods for estimation of YLD, it will be possible to extend the calculations to other health problems. For instance, we would like to study musculoskeletal disorders and digestive diseases which, according to WHO results (2011), were responsible for an elevated number of DALYs in Canada in 2004.

[15] This initiative concentrates on health conditions and injuries particularly relevant in the Canadian context by applying existing methods to Canadian data and calculating indicators in a Canadian social context. For more information, go to http://www.phac-aspc.gc.ca/phi-isp/index-eng.php.

[16] Includes the consequences of health conditions in everyday life in terms of health-related functioning—physical, mental and social.

[17] Using methodological improvements made over the years and our best understanding of health conditions and risk factors, the WHO is now revising estimates of the burden of disease and recalculating disability weights. All this work should allow more reliable estimates of the burden to be made.

CONCLUSION

This study has introduced, for the first time in Québec, the use of the disability-adjusted life years (DALY) indicator. This indicator of burden of disease is of interest because it produces information not only on premature mortality linked to various causes of death (measured in terms of years of life lost), but also on loss of functional health caused by a health condition (estimated in years lost due to disability). DALY scores are also helpful insofar as they represent an alternative way of presenting information derived from existing sources (Victorian Government Department of Human Services, 2005).

The first estimates for Québec have revealed issues that merit deeper study, such as the substantial loss of functional health among youth with mental and behavioural disorders, as well as premature mortality attributed to suicide and tumours. This further research is all the more important in the case of mental and behavioural disorders and tumours because each of these categories represents a large set of health conditions. A breakdown of years of life lost (YLL) and of years lost due to disability (YLD) by site of tumour and type of mental and behavioural disorder would enable even more precise identification of specific causes of disease burden.

For public health decision makers, this study shows that the burden of certain health conditions lies in YLD while, for others it is more attributable to YLL. This shows that interventions would benefit from being adjusted according to different impacts on the health conditions.

We also demonstrate that some health conditions present very minimal burden. This does not mean that, in these cases, thinking about health promotion or disease prevention is not useful. It is possible that a light burden of disease is attributable to certain alternative factors such as the existence of an effective intervention for the health condition, or the fact that it is on the causal path of other health conditions with heavier burdens. For this reason, it is essential that measures of burden of disease be put into context with a more complete set of information on the importance of the problems under consideration, as well as effectiveness, risks and costs of interventions, and ethical and political choices.

In conclusion, this exploratory study shows the interest of better understanding the work being done elsewhere on burden of disease and thinking about possible ways of adapting methods developed by other organizations or countries in order to get a more complete view of the health of the population. Producing estimates with the DALY indicator allows us to compare results obtained for various health conditions so as to list, in order of severity, their impacts on the functional health and mortality of Quebecers. This is also true for health-adjusted life expectancy, another measure of burden of disease that has been used to quantify the burden of certain chronic diseases in Québec (Garneau and Martel, 2009; Martel and Choinière, 2007). DALY scores have the additional advantage of allowing data to be partitioned according to mortality and functional health components, or according to various modifying variables (such as sex, age, or health condition) so as to draw up a more detailed profile of health and for a larger range of health conditions. Though no concrete comparison of the use of these two indicators has been done for Québec, several aspects, particularly methodological, lead us to believe that the use of diverse measures of burden to characterize

the health of the population of Québec can only help decision making. Unless the proposed DALY sensitivity analysis shows too great a variation in results, plans are to continue exploring these two indicators to arrive at a more complete description of the health status of Quebecers with respect to other health problems, various risk factors, and certain socioeconomic characteristics of the population.

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APPENDIX 1

DEFINITION OF MENTAL AND BEHAVIOURAL DISORDERS AND ITS IMPACT

DEFINITION OF MENTAL AND BEHAVIOURAL DISORDERS AND ITS IMPACT

In terms of mental and behavioural disorders (MBD), the ICD-10 codes used for mortality data (F01-99) do not correspond exactly with those used for the functional health component.

Indeed, for the functional health component, code F02 (*Dementia in other diseases classified elsewhere*) in the ICD-10 chapter entitled *Organic, including symptomatic, mental disorders* is not included in the F codes used by the WHO. With respect to G codes which we consider superfluous to the calculation of the mortality component, they refer mainly to: *Systemic atrophies primarily affecting the central nervous system*; *Other degenerative diseases of the nervous system* (including Alzheimer's disease); *Demyelinating diseases of the central nervous system* (except multiple sclerosis); *Nerve, nerve root and plexus disorders*; *Polyneuropathies and other disorders of the peripheral nervous system*; *Diseases of myoneural junction and muscle*; *Cerebral palsy and other paralytic syndromes*, and; *Other disorders of the nervous system*. More specifically, they are codes G06-12, G23-25, G30-31, G36, G37 and G44-98.

These codes are included in our estimates of years lost due to disability (YLD) since they are integral parts of two subcategories of MBD (*Alzheimer's disease and other dementias* and *Other neuropsychiatric disorders*) defined by WHO that also include F codes. We had the choice of this option or of excluding these subcategories from our definition of MBD to estimate YLD, which would have resulted in a loss of information pertaining to certain F codes.

According to our estimates, removing rather than keeping these two subcategories would have resulted in a more substantial absolute reduction in YLD and a higher relative reduction of years of life lost for the AMR-A subregion. In other words, not considering these two subcategories would have led to higher ratio calculations and, therefore, to more frequent use of rates (rather than ratios) to estimate YLD. We can deduce that, since ratios obtained were higher, YLD estimates for Québec using ratios would also have been higher.

APPENDIX 2

CALCULATION OF THE MORTALITY COMPONENT: YEARS OF LIFE LOST

CALCULATION OF THE MORTALITY COMPONENT: YEARS OF LIFE LOST

Example: Years of life lost (YLL) due to mental and behavioural disorders (MBD), men, all of Québec, from 2002 to 2006.

Sources:
- Death from all causes at age 90 and over, men, Québec, 2002 to 2006
- Size of the population aged 90 and over, men, Québec, 2002 to 2006
- Deaths caused by MBD according to age group, men, Québec, 2002 to 2006
- Life expectancy (LE) in Japan at exact ages, men, 2006

YLL (for a cause, a sex, and a specific age group) is obtained by multiplying deaths for a particular cause, sex, and age group (N) by the standard life expectancy (Japan, 2006) at the average age at death (L).[18]

PART A: AVERAGE AGE AT DEATH AND STANDARD LIFE EXPECTANCY AT AVERAGE AGE AT DEATH

Step 1: Calculation of the average number of years lived in each interval a_x (where x equals the lower boundary of the age interval) for Québec men for the period 2002 to 2006.

It is usually assumed that the average age at death is 0.1 years for the 0- to 1-year-old group, that death occurs halfway through the age-group interval for age groups from 1 to 4 years old to 85 to 89 years old, and that, for the open age group (90 years old and over), it is the inverse of the rate.[19]

Examples

- At age 0 $a_0 = 0.1$ years
- From age 1 to 4: $a_1 = 2.0$ years
- From age 5-9 to age 85-89: $a_x = 2.5$ years
- At age 90: $a_{90} = \frac{1}{M_{90}} = \frac{1}{(\text{death 90+/population 90+})} = \frac{1}{(9{,}623/40{,}579)} = 4.2$ years

[18] This way of calculating implies that there are years of life lost for all ages, even at 100 years of age, since the Japanese life expectancy at this age is not zero.

[19] Wilmoth, J.R. et al., *Methods Protocols for the Human Mortality Database*, Last revised: May 31, 2007 (Version 5), p. 38 (http://www.mortality.org/Public/Docs/MethodsProtocol.pdf).

Step 2: Calculation of average age at death based on average number of years lived in each interval a_x (column B, Table A.2.1)

Formula:

Average age at death = $a_x + x$

Examples

- At age 0:
  Average age at death = 0.1 + 0 = 0.1 years
- At ages 1-4:
  Average age at death = 2.0 + 1 = 3.0 years
- At ages 85-89:
  Average age at death = 2.5 + 85 = 87.5 years
- At age 90:
  Average age at death = 4.2 + 90 = 94.2 years

Step 3: Calculation of optimal life expectancy at average age at death (L) (column C, Table A.2.1)

For this calculation, knowing the life expectancies in Japan for men (2006) at exact ages and the average ages at death (columns A and B, respectively, Table A.2.1), interpolation is used with the spline functions of degree 3 to produce optimal LE interpolated at average ages (column C, Table A.2.1).[20]

PART B: YEARS OF LIFE LOST

Step 1: Calculation of YLL (column E) using deaths for each cause, sex, and age group (N) (column D) by optimal life expectancy (Japan, 2006) at average age at death (L) (column C). (Table A.2.1)

Formula:

YLL = N * L

Example: Calculation of YLL caused by MBD in men. Québec, 2002-2006

- At age 10:

YLL = N * L = 0.2 * 67.0 = 13 years of life lost

[20] This function is available in the SAS, SPSS, and R software applications. Interested readers will find more information in the following reference: Greenland, S. (1995). Dose-Response and Trend Analysis in Epidemiology: Alternatives to Categorical Analysis, *Epidemiology*, Vol. 6, No. 4, pp. 356-365.

Table A.2.1 Optimal life expectancies interpolated for average age at death and years of life lost caused by mental and behavioural disorders, men, Québec, 2002-2006

Age	Optimal life expectancies at exact age, Japan (A)	Average age at death, Québec (B)	Optimal life expectancies interpolated for average age at death (L), Japan (C)	Annual average death caused by MBD (N), Québec (D)	Annual average YLL caused by MBD, Québec (E)
0	79.2	0.1	79.1	0.0	0
1	78.4	3.0	76.5	0.0	0
5	74.5	7.5	72.0	0.0	0
10	69.5	12.5	67.0	0.2	13
15	64.5	17.5	62.1	0.0	0
20	59.7	22.5	57.3	0.0	0
25	54.8	27.5	52.4	0.4	21
30	50.0	32.5	47.6	1.2	57
35	45.2	37.5	42.8	2.8	120
40	40.4	42.5	38.0	5.0	190
45	35.7	47.5	33.4	10.6	354
50	31.2	52.5	29.0	11.6	336
55	26.8	57.5	24.7	13.0	321
60	22.6	62.5	20.6	18.0	371
65	18.7	67.5	16.8	34.2	573
70	14.9	72.5	13.2	59.0	777
75	11.6	77.5	10.1	109.0	1,106
80	8.8	82.5	7.5	166.8	1,258
85	6.4	87.5	5.4	170.8	920
90	4.5	94.2	3.3	143.0	470

APPENDIX 3

CALCULATION OF THE FUNCTIONAL HEALTH COMPONENT: YEARS LOST DUE TO DISABILITY

CALCULATION OF THE FUNCTIONAL HEALTH COMPONENT: YEARS LOST DUE TO DISABILITY

Example: Years lost due to disability (YLD) due to mental and behavioural disorders (MBD), men, Québec, from 2002 to 2006.

Preliminary:
- Years of life lost (YLL) (annual averages) caused by MBD according to age group, men, Québec, 2002 to 2006 (see Appendix 2)

Data:
- YLL and YLD caused by MBD according to age group, men, World Health Organization (WHO) AMR-A subregion, 2004
- Population size according to age group, men, WHO AMR-A subregion, 2004
- Population size according to age group, men, Québec, 2002-2006

Step 1: Calculation of the YLD/YLL ratio for each age group, MBD, men, AMR-A subregion, 2004 (column A/column B = column C, Table A.3.1)

Examples
- At ages 0-4: YLD/YLL ratio = 238,101/29,520 = 8.07
- At ages 5-14: YLD/YLL ratio = 236,806/22,684 = 10.44

Table A.3.1 Calculation of YLD/YLL ratio for AMR-A sub-region in 2004 and estimation of YLD (annual average) by age group for the period 2002-2006, Québec, for cases where the ratio < 10, mental and behavioural disorders, men

Age group	YLD, AMR-A, 2004 (A)	YLL, AMR-A, 2004 (B)	YLD/YLL ratio, AMR-A, 2004 (C)	Annual average YLL, Québec, 2002-2006 (D)	Annual average YLD, Québec, 2002-2006 (E)
0	238,101	29,520	8.07	0	0
5	236,806	22,684	**10.44**	13	n.a.
15	1,942,450	93,727	**20.72**	21	n.a.
30	1,023,516	180,128	5.68	367	2,086
45	577,624	221,539	2.61	1,011	2,637
60	291,812	93,879	3.11	945	2,937
70	330,490	122,673	2.69	1,884	5,074
80	308,413	147,769	2.09	2,648	5,528

n.a. - Non applicable since the ratio is higher or equal to 10.

Step 2: Estimation of YLD annual averages for MBD, men, Québec, 2002-2006

The following formula is used in cases where the ratio < 10, (Table A.3.1):

YLD $_{\text{Québec, 2002-2006}}$ annual averages (column E) =
YLD/YLL ratio $_{\text{AMR-A, 2004}}$ (C) * YLL $_{\text{Québec, 2002-2006}}$ annual averages (D)

Example, ages 30-44
YLD $_{\text{Québec, 2002-2006}}$ = 5.68 * 367 = 2,086 years lost due to disability

The following formula is used in cases where the ratio ≥ 10, or if YLL $_{\text{AMR-A, 2004}}$ = 0 (Table A.3.2):

YLD $_{\text{Québec, 2002-2006}}$ annual averages =
YLD $_{\text{AMR-A, 2004}}$ rate * average population size $_{\text{Québec, 2002-2006}}$

First part:

Calculation of the YLD $_{\text{AMR-A, 2004}}$ rate for age groups concerned (column G) =
YLD $_{\text{AMR-A,2004}}$ for each age group (A)/Population $_{\text{AMR-A, 2004}}$ for each age group (F)

Example, ages 5-14
YLD $_{\text{AMR-A, 2004}}$ rate = 236,806 /24,276,827 = 0.009754

Second part:

Calculation of YLD $_{\text{Québec, 2002-2006}}$ annual averages (column I) =
YLD $_{\text{AMR-A, 2004}}$ rate for age groups concerned (G) *
Average population $_{\text{Québec, 2002-2006}}$ of age groups concerned (H)

Example, ages 5-14
YLD $_{\text{Québec, 2002-2006}}$ = 0.009754 * 463,846 = 4,525 years lost due to disability

Table A.3.2 Calculation of YLD rate for AMR-A sub-region in 2004 and estimation of YLD (annual average) by age group for the period 2002-2006, Québec, for cases where the ratio ≥ 10, mental and behavioural disorders, men

Age group	YLD, AMR-A, 2004 (A)	Population, AMR-A, 2004 (F)	YLD ratio, AMR-A, 2004 (G)	Average population, Québec, 2002-2006 (H)	Annual average YLD Québec, 2002-2006 (I)
5-14	236,806	24,276,827	0.009754	463,846	4,525
15-29	1,942,450	36,106,561	0.053798	758,217	40,790

APPENDIX 4

COMPLEMENTARY TABLES

COMPLEMENTARY TABLES

Table A.4.1 Estimated number and average annual rate of disability-adjusted life years, years of life lost and years lost due to disability by age group, both sexes, Québec, 2002-2006

Age group	DALY (number)	YLL (number)	YLD (number)	Average population 2002-2006	DALY (rate for 1,000)	YLL (rate for 1,000)	YLD (rate for 1,000)
0-14	97,020	41,779	55,241	1,278,924	75.9	32.7	43.2
15-29	137,743	46,802	90,941	1,479,665	93.1	31.6	61.5
30-44	162,328	76,549	85,779	1,694,305	95.8	45.2	50.6
45-59	341,637	189,929	151,709	1,678,062	203.6	113.2	90.4
60-69	254,421	158,266	96,154	682,901	372.6	231.8	140.8
70 years and older	493,414	338,145	155,269	721,403	684.0	468.7	215.2
Total	1,486,563	851,470	635,092	7,535,261	197.3	113.0	84.3

Table A.4.2 Distribution of years of life lost and years lost due to disability and estimated number of disability-adjusted life years for each health condition, by sex, Québec, 2002-2006

	Men			Women		
Health condition	YLL (%)	YLD (%)	DALY (number)	YLL (%)	YLD (%)	DALY (number)
Malignant neoplasms	90.1	9.9	159,514	88.7	11.3	179,207
Mental and behavioural disorders	9.8	90.2	70,466	9.8	90.2	106,677
Ischemic heart disease	93.2	6.8	67,980	91.6	8.4	46,365
Chronic obstructive pulmonary disease	52.1	47.9	27,873	52.9	47.1	28,296
Suicide	96.1	3.9	36,831	91.7	8.3	13,123
Cerebrovascular disease	72.6	27.4	18,490	73.6	26.4	24,908
Osteoarthritis	0.2	99.8	15,911	0.6	99.4	26,076
Diabetes	54.5	45.5	20,685	50.5	49.5	20,872
Asthma	4.2	95.8	6,590	7.5	92.5	7,232
Hypertensive disease	83.6	16.4	1,509	75.7	24.3	2,740
Other health conditions	*52.0*	*48.0*	*295,975*	*44.2*	*55.8*	*309,242*
All causes	61.5	38.5	721,824	53.3	46.7	764,739

Table A.4.3 Average annual rates for years of life lost, years lost due to disability and disability-adjusted life years by sex, age group and health condition, Québec, 2002-2006

	Malignant neoplasms	Hypertensive disease	Ischemic heart disease	Cerebro-vascular disease	Chronic obstructive pulmonary disease	Asthma	Diabetes	Osteo-arthritis	Mental and behavioural disorders	Suicide	All causes
MEN											
Years of life lost (rate for 1,000)											
0-4 years	2.7	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	94.3
5-14 years	1.7	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.7	9.7
15-29 years	2.7	0.0	0.3	0.3	0.0	0.0	0.2	0.0	0.0	14.0	43.0
30-44 years	8.6	0.1	4.3	0.9	0.2	0.1	0.9	0.0	0.4	15.2	55.1
45-59 years	48.4	0.3	22.5	2.8	1.4	0.1	3.1	0.0	1.2	10.9	127.5
60-69 years	125.9	0.7	46.1	8.0	8.8	0.1	9.3	0.0	2.9	4.7	268.8
70-79 years	178.6	1.7	76.1	20.8	27.4	0.2	15.2	0.0	9.1	2.9	447.2
80 years and older	176.8	4.4	121.6	37.5	57.1	0.3	20.0	0.3	32.6	1.7	671.3
Total	38.6	0.3	17.0	3.6	3.9	0.1	3.0	0.0	1.8	9.5	119.2
Years lost due to disability (rate for 1,000)											
0-4 years	0.1	0.0	0.0	0.0	0.0	5.6	0.1	0.0	0.0	0.0	85.9
5-14 years	0.0	0.0	0.0	0.0	0.0	4.6	0.0	0.0	9.8	0.8	25.5
15-29 years	0.1	0.0	0.0	0.2	0.4	3.6	0.2	0.4	53.8	0.6	52.4
30-44 years	0.5	0.0	0.5	0.7	4.6	0.2	2.2	2.9	2.4	0.4	47.4
45-59 years	4.6	0.0	2.0	2.3	6.3	0.2	4.2	7.0	3.2	0.2	79.9
60-69 years	13.2	0.0	3.2	3.7	5.7	0.1	5.9	11.6	8.9	0.1	136.6
70-79 years	23.3	0.2	4.8	3.6	8.2	0.1	6.1	14.2	24.5	0.1	188.0
80 years and older	27.7	2.1	5.4	4.8	4.2	0.1	7.2	5.9	68.0	0.0	227.4
Total	4.2	0.1	1.2	1.4	3.6	1.7	2.5	4.3	17.1	0.4	74.5
Disability-adjusted life years (rate for 1,000)											
0-4 years	2.8	0.0	0.0	0.2	0.0	5.6	0.1	0.0	0.0	0.0	180.2
5-14 years	1.7	0.0	0.0	0.2	0.0	4.7	0.1	0.0	9.8	1.5	35.3
15-29 years	2.8	0.0	0.3	0.5	0.4	3.6	0.4	0.4	53.8	14.6	95.3
30-44 years	9.1	0.1	4.8	1.6	4.8	0.2	3.1	2.9	2.8	15.6	102.5
45-59 years	53.0	0.3	24.4	5.1	7.6	0.3	7.3	7.0	4.4	11.1	207.4
60-69 years	139.1	0.8	49.4	11.7	14.6	0.2	15.1	11.6	11.8	4.8	405.4
70-79 years	202.0	2.0	80.9	24.4	35.6	0.2	21.3	14.2	33.7	3.0	635.2
80 years and older	204.6	6.5	127.0	42.3	61.3	0.4	27.3	6.1	100.5	1.7	898.8
Total	42.8	0.4	18.2	5.0	7.5	1.8	5.6	4.3	18.9	9.9	193.8

Table A.4.3 Average annual rates for years of life lost, years lost due to disability and disability-adjusted life years by sex, age group and health condition, Québec, 2002-2006 (continued)

	Malignant neoplasms	Hypertensive disease	Ischemic heart disease	Cerebro-vascular disease	Chronic obstructive pulmonary disease	Asthma	Diabetes	Osteoarthritis	Mental and behavioural disorders	Suicide	All causes
WOMEN											
Years of life lost (rate for 1,000)											
0-4 years	2.1	0.0	0.0	0.4	0.1	0.1	0.0	0.0	0.0	0.0	90.0
5-14 years	1.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.6	6.5
15-29 years	2.7	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	4.4	19.7
30-44 years	14.6	0.0	1.2	0.9	0.1	0.1	0.4	0.0	0.2	4.7	34.9
45-59 years	59.3	0.2	5.9	3.0	1.7	0.2	1.7	0.0	0.5	4.6	99.1
60-69 years	108.5	0.5	18.6	6.6	9.1	0.1	5.4	0.0	1.7	1.6	197.2
70-79 years	134.1	2.1	46.8	19.3	20.6	0.3	12.5	0.1	8.4	0.7	346.1
80 years and older	117.0	6.8	103.7	43.8	28.1	0.6	20.4	0.6	42.0	0.3	592.0
Total	41.7	0.5	11.1	4.8	3.9	0.1	2.8	0.0	2.8	3.2	106.9
Years lost due to disability (rate for 1,000)											
0-4 years	0.1	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	97.3
5-14 years	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.3	0.5	21.0
15-29 years	0.6	0.0	0.0	0.2	0.4	3.7	0.2	0.1	57.3	0.6	71.0
30-44 years	4.0	0.0	0.2	1.1	4.6	0.0	1.7	2.7	28.6	0.3	54.0
45-59 years	9.0	0.0	0.9	3.1	6.6	0.1	4.0	9.6	3.5	0.2	100.7
60-69 years	10.5	0.0	2.1	2.6	7.0	0.2	5.3	20.5	9.5	0.1	144.7
70-79 years	13.9	0.2	4.5	3.4	3.1	0.3	6.8	23.7	25.4	0.0	181.4
80 years and older	8.5	3.5	6.2	6.2	2.1	0.3	10.1	11.9	106.9	0.0	296.9
Total	5.3	0.2	1.0	1.7	3.5	1.8	2.7	6.8	25.2	0.3	93.8
Disability-adjusted life years (rate for 1,000)											
0-4 years	2.2	0.0	0.0	0.4	0.1	4.9	0.0	0.0	0.0	0.0	187.2
5-14 years	1.4	0.0	0.0	0.1	0.0	6.6	0.1	0.0	0.4	1.1	27.5
15-29 years	3.3	0.0	0.1	0.4	0.5	3.8	0.3	0.1	57.3	5.0	90.7
30-44 years	18.6	0.0	1.4	2.0	4.7	0.1	2.1	2.7	28.8	5.0	88.9
45-59 years	68.3	0.2	6.7	6.1	8.3	0.2	5.7	9.6	4.0	4.8	199.9
60-69 years	119.0	0.5	20.7	9.2	16.1	0.3	10.7	20.5	11.3	1.6	342.0
70-79 years	148.0	2.4	51.3	22.7	23.7	0.6	19.3	23.8	33.8	0.8	527.5
80 years and older	125.5	10.4	110.0	50.0	30.1	0.9	30.5	12.5	148.9	0.3	888.9
Total	47.0	0.7	12.2	6.5	7.4	1.9	5.5	6.8	28.0	3.4	200.7

Table A.4.3 Average annual rates for years of life lost, years lost due to disability and disability-adjusted life years by sex, age group and health condition, Québec, 2002-2006 (continued)

	Malignant neoplasms	Hypertensive disease	Ischemic heart disease	Cerebro-vascular disease	Chronic obstructive pulmonary disease	Asthma	Diabetes	Osteo-arthritis	Mental and behavioural disorder	Suicide	All causes
BOTH SEXES											
Years of life lost (rate for 1,000)											
0-4 years	2.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	92.2
5-14 years	1.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.6	8.1
15-29 years	2.7	0.0	0.2	0.2	0.0	0.1	0.1	0.0	0.0	9.3	31.6
30-44 years	11.5	0.1	2.8	0.9	0.1	0.1	0.6	0.0	0.3	10.0	45.2
45-59 years	53.9	0.2	14.1	2.9	1.5	0.1	2.4	0.0	0.9	7.8	113.2
60-69 years	116.9	0.6	31.9	7.3	9.0	0.1	7.3	0.0	2.3	3.1	231.8
70-79 years	153.6	2.0	59.6	20.0	23.6	0.2	13.7	0.1	8.7	1.7	390.3
80 years and older	136.6	6.0	109.6	41.7	37.6	0.5	20.3	0.5	38.9	0.7	618.0
Total	40.2	0.4	14.0	4.2	3.9	0.1	2.9	0.0	2.3	6.3	113.0
Years lost due to disability (rate for 1,000)											
0-4 years	0.1	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0	91.4
5-14 years	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0	5.2	0.7	23.3
15-29 years	0.3	0.0	0.0	0.2	0.4	3.6	0.2	0.2	55.5	0.6	61.5
30-44 years	2.2	0.0	0.4	0.9	4.6	0.1	2.0	2.8	15.3	0.4	50.6
45-59 years	6.8	0.0	1.4	2.7	6.4	0.1	4.1	8.3	3.3	0.2	90.4
60-69 years	11.8	0.0	2.6	3.1	6.4	0.1	5.6	16.2	9.2	0.1	140.8
70-79 years	18.0	0.2	4.6	3.5	5.3	0.2	6.5	19.6	25.0	0.1	184.3
80 years and older	14.8	3.0	6.0	5.7	2.8	0.2	9.2	9.9	94.2	0.0	274.1
Total	4.8	0.1	1.1	1.5	3.5	1.7	2.6	5.5	21.2	0.3	84.3
Disability-adjusted life years (rate for 1,000)											
0-4 years	2.5	0.0	0.0	0.3	0.0	5.2	0.1	0.0	0.0	0.0	183.6
5-14 years	1.6	0.0	0.0	0.2	0.0	5.6	0.1	0.0	5.2	1.3	31.5
15-29 years	3.0	0.0	0.2	0.5	0.4	3.7	0.3	0.2	55.5	9.9	93.1
30-44 years	13.8	0.1	3.2	1.8	4.7	0.2	2.6	2.8	15.6	10.4	95.8
45-59 years	60.7	0.2	15.5	5.6	7.9	0.3	6.5	8.3	4.2	7.9	203.6
60-69 years	128.7	0.6	34.5	10.4	15.3	0.3	12.9	16.2	11.5	3.1	372.6
70-79 years	171.6	2.2	64.2	23.4	28.9	0.4	20.2	19.6	33.7	1.7	574.6
80 years and older	151.4	9.1	115.5	47.5	40.4	0.7	29.5	10.4	133.0	0.7	892.1
Total	45.0	0.6	15.2	5.8	7.5	1.8	5.5	5.6	23.5	6.6	197.3

Table A.4.4 Distribution of deaths, years of life lost, years lost due to disability and disability-adjusted life years by sex and health condition, Québec, 2002-2006

	MEN				WOMEN				BOTH SEXES			
Health condition	**Deaths** (%)	**YLL** (%)	**YLD** (%)	**DALY** (%)	**Décès** (%)	**YLL** (%)	**YLD** (%)	**DALY** (%)	**Deaths** (%)	**YLL** (%)	**YLD** (%)	**DALY** (%)
Malignant neoplasms	33.8	32.4	5.7	22.1	30.4	39.0	5.7	23.4	32.1	35.5	5.7	22.8
Mental and behavioural disorders	2.7	1.6	22.9	9.8	5.1	2.6	26.9	13.9	3.9	2.0	25.2	11.9
Ischemic heart disease	16.7	14.3	1.7	9.4	14.4	10.4	1.1	6.1	15.5	12.4	1.3	7.7
Suicide	3.5	8.0	0.5	5.1	1.0	3.0	0.3	1.7	2.3	5.6	0.4	3.4
Chronic obstructive pulmonary disease	5.4	3.3	4.8	3.9	4.5	3.7	3.7	3.7	4.9	3.5	4.2	3.8
Diabetes	2.9	2.5	3.4	2.9	3.1	2.6	2.9	2.7	3.0	2.6	3.1	2.8
Cerebrovascular disease	4.1	3.0	1.8	2.6	6.0	4.5	1.8	3.3	5.1	3.7	1.8	2.9
Osteoarthritis	0.0	0.0	5.7	2.2	0.1	0.0	7.3	3.4	0.0	0.0	6.6	2.8
Asthma	0.0	0.1	2.3	0.9	0.1	0.1	1.9	0.9	0.1	0.1	2.0	0.9
Hypertensive disease	0.4	0.3	0.1	0.2	0.9	0.5	0.2	0.4	0.6	0.4	0.1	0.3
Autres maladies	*30.4*	*34.7*	*51.1*	*41.0*	*34.6*	*33.6*	*48.3*	*40.4*	*32.5*	*34.1*	*49.5*	*40.7*
All causes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A.4.5 Years of life lost and years lost due to incapacity by sex, age group and health condition, Québec, 2002-2006

	Malignant neoplasms	Hypertensive disease	Ischemic heart disease	Cerebro-vascular disease	Chronic obstructive pulmonary disease	Asthma	Diabetes	Osteo-arthritis	Mental and behavioural disorder	Suicide	All causes
MEN											
Years of life lost (number)											
0-4 years	508	0	0	32	0	0	15	0	0	0	18,069
5-14 years	788	0	0	96	13	27	13	0	13	322	4,512
15-29 years	2,021	10	193	201	0	32	124	0	21	10,616	32,573
30-44 years	7,421	57	3,698	768	158	50	737	0	367	13,102	47,539
45-59 years	40,203	234	18,658	2,323	1,127	76	2,575	7	1,011	9,094	105,922
60-69 years	41,470	245	15,196	2,647	2,912	34	3,048	3	945	1,547	88,514
70-79 years	36,929	359	15,744	4,300	5,674	32	3,138	7	1,884	597	92,466
80 years and older	14,384	356	9,893	3,049	4,645	24	1,629	21	2,648	136	54,606
Total	143,724	262	63,383	13,416	14,529	276	11,280	37	6,889	35,413	444,201
Years lost due to disability (number)											
0-4 years	29	0	0	2	0	1,065	10	0	0	0	16,455
5-14 years	21	0	0	1	0	2,149	18	2	4,525	372	11,848
15-29 years	100	0	20	158	271	2,701	148	276	40,790	458	39,700
30-44 years	428	1	464	647	3,947	153	1,919	2,535	2,086	389	40,945
45-59 years	3,790	8	1,627	1,912	5,211	184	3,517	5,819	2,637	152	66,319
60-69 years	4,339	16	1,056	1,217	1,879	33	1,933	3,826	2,937	28	44,983
70-79 years	4,827	50	990	745	1,693	19	1,270	2,938	5,074	16	38,877
80 years and older	2,257	171	439	392	344	9	589	477	5,528	3	18,497
Total	15,791	247	4,596	5,074	13 345	6,314	9,405	15,874	63,576	1,419	277,623

Table A.4.5 Years of life lost and years lost due to incapacity by sex, age group and health condition, Québec, 2002-2006 (continued)

	Malignant neoplasms	Hypertensive disease	Ischemic heart disease	Cerebro-vascular disease	Chronic obstructive pulmonary disease	Asthma	Diabetes	Osteo-arthritis	Mental and behavioural disorder	Suicide	All causes
WOMEN											
Years of life lost (number)											
0-4 years	386	0	0	67	17	17	0	0	0	0	16,340
5-14 years	624	0	0	46	0	0	16	0	15	251	2,858
15-29 years	1,976	25	94	163	49	102	75	0	25	3,173	14,229
30-44 years	12,114	30	1,019	732	74	49	316	0	182	3,913	29,010
45-59 years	50,220	147	4,986	2,537	1,427	142	1,465	13	419	3,914	84,007
60-69 years	38,378	165	6,587	2,330	3,209	52	1,924	9	607	550	69,752
70-79 years	35,691	563	12,450	5,136	5,487	81	3,330	35	2,230	193	92,133
80 years and older	19,554	1,144	17,334	7,323	4,691	95	3,408	99	7,014	42	98,939
Total	158,943	2,074	42,469	18,334	14,955	539	10,533	156	10,491	12,035	407,269
Years lost due to disability (number)											
0-4 years	12	0	0	5	0	871	0	0	0	0	17,665
5-14 years	14	0	0	0	0	2,902	13	0	141	242	9,273
15-29 years	409	1	10	155	302	2,667	129	72	41,343	401	51,241
30-44 years	3,339	1	173	939	3,825	14	1,423	2,206	23,762	259	44,834
45-59 years	7,652	4	724	2,620	5,565	54	3,396	8,097	2,943	147	85,389
60-69 years	3,714	9	749	915	2,477	67	1,875	7,252	3,374	23	51,172
70-79 years	3,699	65	1,196	907	825	70	1,812	6,309	6,756	11	48,279
80 years and older	1,427	586	1,043	1,031	347	47	1,692	1,984	17,868	4	49,616
Total	20,264	666	3 896	6,574	13,341	6,692	10,340	25,920	96,186	1,088	357,470

Table A.4.5 Years of life lost and years lost due to incapacity by sex, age group and health condition, Québec, 2002-2006 (continued)

	Malignant neoplasms	Hypertensive disease	Ischemic heart disease	Cerebrovascular disease	Chronic obstructive pulmonary disease	Asthma	Diabetes	Osteo-arthritis	Mental and behavioural disorder	Suicide	All causes
BOTH SEXES											
Years of life lost (number)											
0-4 years	894	0	0	98	17	17	15	0	0	0	34,409
5-14 years	1,412	0	0	142	13	27	29	0	28	572	7,370
15-29 years	3,997	35	288	364	49	135	199	0	46	13,788	46,802
30-44 years	19,534	87	4,717	1,501	232	100	1,053	0	549	17,015	76,549
45-59 years	90,423	381	23,644	4,860	2,554	219	4,040	20	1,430	13,008	189,929
60-69 years	79,848	411	21,782	4,978	6,121	86	4,972	12	1,551	2,097	158,266
70-79 years	72,621	922	28,194	9,436	11,162	113	6,467	42	4,114	790	184,600
80 years and older	33,938	1,500	27,227	10,372	9,336	119	5,037	120	9,662	178	153,545
Total	302,667	3,336	105,852	31,750	29,484	815	21,812	193	17,380	47,448	851,470
Years lost due to disability (number)											
0-4 years	40	0	0	7	0	1,936	10	0	0	0	34,119
5-14 years	35	0	0	1	0	5,052	31	2	4,665	614	21,121
15-29 years	509	1	30	313	573	5,369	278	349	82,133	859	90,941
30-44 years	3,767	2	637	1,586	7,771	167	3,342	4,741	25,848	647	85,779
45-59 years	11,442	12	2,351	4,533	10,776	238	6,913	13,916	5,580	299	151,709
60-69 years	8,052	26	1,806	2,132	4,356	100	3,808	11,079	6,311	51	96,154
70-79 years	8,526	116	2,186	1,652	2,518	88	3,082	9,247	11,830	28	87,156
80 years and older	3,684	757	1,482	1,424	690	57	2,281	2,461	23,396	8	68,113
Total	36,055	913	8,492	11,648	26,686	13,006	19,745	41,794	159,762	2,506	635,092

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