Analysis of the impact of air pollutants, $PM_{2.5}$ and O_3, on life expectancy and quality adjusted life-expectancy in Canada

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Abstract

This thesis analyzes the impact of reducing anthropogenic ozone and fine particulate matter ($PM_{2.5}$), on mortality rates and incidence of chronic bronchitis (CB) and nonfatal myocardial infarction (AMI). The outcome measures are life expectancy and quality-adjusted life years. The methodologies used include: life tables, discounting, concentration-response function (CRF), quality of life scores and Monte Carlo simulation. The highest estimates of impact due to ozone and $PM_{2.5}$ across eight Canadian cities are 239 deaths and 3469 life years (95%CI: 3268-3696) and 9032 deaths and 132124 life years (95%CI: 117900-154500) respectively. Impacts on CB and AMI related to elimination in $PM_{2.5}$ exposure are 3235 cases and 16215 QALYs (95%CI: 12690-23310) and 5204 cases and 6279 QALYs (5436-7816) respectively. The most influential parameters in sensitivity analysis are residual life expectancy, discount rate, CRF, and incidence rates. These findings provide alternative measures to monetary valuation in the analysis of air pollution impacts used by policy makers.

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Chapter 1 Introduction and Literature Review

1.1 Background

Air pollution is a major environmental risk factor that has a negative impact on human health. According to the estimates of the global burden of disease (GBD) project, air pollution, both indoor and outdoor, is estimated to cause approximately two million premature deaths annually worldwide and approximately 3.2% of all disability-adjusted life years (DALYs) (WHO, 2002). Exposure to outdoor air pollution is largely governed by public authorities, being dependent upon government regulations. Outdoor air pollution accounts for approximately 0.8 million premature deaths annually and 0.5% of DALYs.

A variety of methods have been used to quantify the impacts of air pollution on health in the context of decision-making related to programs to regulate air pollution, such as cost-benefit analysis, cost-effectiveness analysis, and cost-utility analysis. Cost-benefit analysis (CBA) is an analytical tool that allows the evaluation of alternatives according to both their costs and benefits provided that each alternative is measured in monetary terms. CBA can be used as a tool to rank policies according to their improvement or reduction in well-being. The key advantage of CBA is that it allows us to determine if the given alternative has benefits that exceed its costs. This key advantage of CBA means we can compare programs that have different objectives, provided that their costs and benefits are expressed in monetary values. Among the other advantages of CBA are its transparency, its ability to reveal uncertainty, and its comparability (Krupnick, 2004). However, the disadvantage of CBA lies in the fact that the benefits and costs must be

expressed in monetary terms, which is not always possible to do in "a systematic and rigorous manner" (Levin and Mcewan, 2001).

Cost-effectiveness analysis (CEA) is a subgroup of CBA. CEA is the evaluation of alternatives projects according to both their costs and their effects on the outcome of interest (Levin and Mcewan, 2001). The advantage of CEA is the benefits are not monetized (Krupnick, 2004). Furthermore, this tool determines costs per unit of an effectiveness measure. As a result, CEA is used as an analytical tool to choose between alternative projects to select the project that produces the outcome of interest parsimoniously. In other words, CEA can help rank policies based on their cost-effectiveness. CEA is based on estimation of the costs per unit of benefit, such as lives saved or life years saved. The disadvantage of using CEA is that it only allows the comparisons among alternatives with similar objectives. In other words, using this analytical tool we can only determine if a given alternative is relatively more cost-effective than the other alternatives (Levin and Mcewan, 2001). A similar analytical tool to CEA is the cost-utility analysis (CUA). The key difference between CEA and CUA is that CUA uses utility as the effectiveness measure (Krupnick, 2004). An example of CUA preference-based measures of effectiveness is quality-adjusted life years (QALYs). The advantage of using the CUA over CEA is that CUA is based on QALYs is that the QALYs approach incorporates morbidity impacts along with mortality impacts on measures of life years (Krupnick, 2004).

The most commonly used method for analyses of environmental regulations is cost-benefit analysis (Coyle et al., 2003; EPA, 2008). The advantage of cost-benefit analysis is that it allows for the aggregation of the benefits of reducing mortality or other health risks and other monetized benefits of environmental regulation. One way to summarize the impacts of modifying mortality rates is to forecast the degree to which those changes would change the life-

expectancy of the population of interest. Alternative methods, CEA and CUA, are not the methods of choice in environmental regulations since there are significant non-health benefits associated with air pollution regulation, such as visibility improvement and increases in worker productivity. However, since in many analyses, more than 90% of the quantifiable monetized effects of air pollution are health-related, the use of QALYs analysis is advantageous for the regulation of environmental policies (EPA, 2008).

The quality of life weights (scores) are based on a unique methodology that links the results of health surveys to determinants of quality of life. The scores are derived using several approaches. The most common approaches used in surveys to elicit population preferences for health states are: rating scales (RS), time-trade-off (TTO), person-trade-off (PTO), and standard gamble. In those four approaches, numeric values are assigned to the various health states (Krupnick, 2004). The simplest approach for estimating the weight of quality of life is the RS. In RS, members of the population are given a description of a health state and asked to rate it on a numeric scale according to their preferences. The second approach, TTO, asks members of population to make trade-offs between outcomes that occur with certainty. The third approach, PTO asks member of population to choose between helping different number of people in two different health states. The fourth approach, SG, is a combination between trade-offs and uncertainty over health states (Krupnick, 2004). The results of health surveys are then scored using specific methodology and theories to produce quality of life weights that are based on community preferences.

1.2 Literature Review

Air pollution is a combination of a number of specific pollutants including particulate matter (PM), ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). In this project, we focused on the two most studied air pollutants, $PM_{2.5}$ (particulate matter of median aerodynamic diameter less than 2.5 μm) and ozone (WHO, 2002). There are extensive studies that link air pollution with increased mortality risk as well as studies linking air pollution to increased incidence of certain chronic conditions. This thesis focused on quantifying the impact of air pollutants, specifically fine particulate matter and ozone, on human health. The measures of health outcome that were used in this thesis were life expectancy and quality adjusted life expectancy. The US EPA study had examined the health impacts associated with two pollutants that might accrue from the reduction of two pollutants: namely ambient O_3 and $PM_{2.5}$ (EPA, 2008).

In general, particulate pollution in the air is a mixture of microscopic solids and liquid droplets. Some of these particles are emitted directly and others are formed when other pollutants react together in the atmosphere. These particles range in size; there are those that are less than 10 micrometers in diameter called PM_{10} and those that are less than 2.5 micrometers in diameter called "fine" particles or $PM_{2.5}$. Their very small size allows these particles to get into the lungs, potentially causing serious health problems (WHO, 2002).

According to the World health organization (WHO), the major components of $PM_{2.5}$ are: sulfate, nitrates, ammonia, sodium chloride, carbon, mineral dust and water. These components make complex mixtures of solids and liquid particles (WHO, 2002). The fact that $PM_{2.5}$ is made of different particulate suggests that the proportion of constituents of $PM_{2.5}$ may

vary from city to city (to the extent that the sources of the $PM_{2.5}$ particulate may differ). In terms of chronic health effects, the WHO experts judge that $PM_{2.5}$ is more dangerous than any other air pollutant. In part, this judgement is based on the observation that once $PM_{2.5}$ is inhaled it may travel to the peripheral regions of the bronchioles and interferes with gas exchange. It can cause aggravated asthma, decreased lung function, lung cancer, cardiac problems, and premature death.

$PM_{2.5}$ are very small particles and they are only visible with an electron microscope. A significant source of $PM_{2.5}$ is combustion (e.g. motor vehicles, power plants, industrial processes). The danger of $PM_{2.5}$ is directly linked to its size. Some people in the population, such as people with heart or lung disease and older adults and children, are at a greater risk for harm from $PM_{2.5}$ exposure than the general population. The people with heart or lung diseases are at an increased risk because exposure to particles can aggravate these diseases. Similarly, older adults are at an increased risk because they are at risk of developing or may already have an undiagnosed heart or lung disease. Children are potentially at an increased risk because their lungs are still biologically developing, they spend more time doing high intensity activity levels, and are also at higher risk of having asthma or respiratory diseases than the general population (WHO, 2002).

$PM_{2.5}$ interfere substantially with visibility (i.e. they degrade visibility). This property of $PM_{2.5}$ has been used to measure its concentration in the atmosphere. The concentration is quantified by determining the interference of $PM_{2.5}$ particulate with light by measuring the back-scatter (Bscat) from a beam of light passing through a sample of air in a chamber. A conversion factor is then applied to the Bscat to estimate the concentration of $PM_{2.5}$ in air. Thus, this

property of visibility interference is the principle used by many measuring instruments and tools used to monitor the concentration of this pollutant (Thistle et al. 1999).

There are several epidemiological studies that link short-term and long-term exposure to $PM_{2.5}$ with increased mortality risk and increased incidence of certain chronic conditions (WHO, 2002; Abbey et al., 1995; Cohen et al., 2004; Schwartz, 1993; EPA, 2008). Chronic conditions linked with PM 2.5 include chronic bronchitis (CB), atherosclerosis, and cardiovascular disease (American Lung Association, 2002; Peters et al., 2001; Pope et al., 2002; EPA, 2008). According to the American Lung Association (1999), CB affects approximately 5 percent of the US population; whereas, according to Gershon et al. (2010) CB affects about 9.5% of the Canadian population.

The other pollutant of interest is ozone. Ozone (O_3) is a naturally occurring gas that is composed of three oxygen atoms. Ozone that occurs in the higher atmosphere is sometimes called "good" ozone because it protects the earth from the harmful UV light from the sun. However, ground-level ozone, sometimes called "bad" ozone, is the result of a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) using sunlight energy. Ozone, both the "good" and "bad", has the same chemical structure. The sources of "bad" ozone are similar to those for $PM_{2.5}$; combustion reactions release the precursors NO_x and VOC that react in the presences of sunlight to produce ozone. Since the formation of ozone requires light energy, the concentration fluctuates depending on the season and time of day (WHO, 2002).

Ozone has negative effects on both human health and the environment. Ozone is known to reduce lung function especially in high risk people (i.e. people with lung disease, children, and

older adults). One explanation of how ozone reduces lung function is that it inflames and damages the cells lining the lungs, making it more difficult to breathe. This can aggravate chronic lung diseases, such as chronic obstructive pulmonary disease (COPD), and asthma conditions. There are many studies that link short-term ozone exposure with increases in total mortality risks and respiratory mortality risks (Levy et al., 2005). However, there has been no consistent evidence linking long-term ozone exposure and mortality risks until very recently. A study conducted by Jerrett et al. (2009) found that long-term exposure to ozone is associated with death from respiratory causes. Increased ozone exposure by 10-ppb increment increased the risk of death from respiratory causes by 2.9% in a single pollutant model (i.e. only ozone is considered) and by 4% in a two-pollutant model (i.e. ozone and $PM_{2.5}$ both considered).

In 2008 the Environmental Protection Agency (EPA) commissioned a report that was conducted by Ellen Post, Don McCubbin, Nathan Frey, and Hardee Mahoney. The purpose of the report was to estimate the statistical lives saved, statistical life years saved and quality adjusted life years (QALYs). This report is considered to be a benchmark for health impact analyses done for the air pollutants PM2.5 and ozone.

The EPA (2008) report is the principal guide used to perform the analyses in this thesis. The report analyzes the effect of ozone and $PM_{2.5}$ on life expectancy and quality adjusted life years for the American population. The EPA (2008) study applies its analyses across the United States. The concentrations of the two pollutants are determined based on concentrations obtained from the relevant monitoring stations. The study bases its analyses on the reduction (by a certain absolute amount that will be denoted, Δ) of the current air pollution ambient standard. The difference between the current concentrations and the new standard concentrations gives the

change in air pollution concentration (Δc). For example, the analysis done for ozone is based on the full attainment of the current (0.084ppm) ambient air pollution standard compared to control scenarios of full attainment of 0.079ppm, 0.075ppm, 0.070ppm and 0.065ppm.

The health outcome measures are determined based on estimates of reduction in the incidence related to reduction of the concentration of the given pollutant. The EPA (2008) study used a computer program called BenMap to determine the incidence reductions related to the projected reductions in pollutant levels. This program was specifically designed for the United States and the concentrations it used are based on American monitoring stations. Because the program has been tailored to the US, it is of limited use for our purposes and so we used Canadian data for the concentrations of the pollutants. Otherwise, we follow the same approach as the EPA (2008) report.

The EPA (2008) report estimated statistical lives saved, total life years gained, and QALYs gained from reduction in O_3 and $PM_{2.5}$. An alternative aggregate measure, Morbidity Inclusive Life Years (MILYs) (i.e. it is the sum of life years gained from reduction in premature mortality and the QALYs gained from reduction in chronic morbidity (EPA, 2008)), was used in the report to address some of the concerns regarding aggregation of life extension and quality-of-life impacts. The major concern that those alternative methods addresses is that they do not devalue life extensions in individuals that have pre-existing chronic conditions that reduce the quality of life. Although the MILYs approach does not devalue life extensions in individuals with pre-existing chronic conditions that reduce quality of life, it still gives preference to interventions that reduce mortality and morbidity impacts for individuals with higher residual life

expectancy. The EPA (2008) report also discounted Life years saved in the future to account for society's time preference. The discount rates that they used were 3 percent and 7 percent.

The results that they presented for the illustrative O_3 NAAQS attainment strategy were: lives saved, life years saved, and cost of the regulation per life saved and per life year saved. The EPA (2008) found that the estimates of O_3-related lives saved were affected by the underlying O_3-mortality study used. The estimates of O_3-related lives saved determined in the EPA (2008) report were based on the two O_3-mortalty studies, Bell et al. (2004) and Levy et al. (2005). These are summarized in Table 1.1. The report found that the largest estimate of O_3-related life years saved was obtained when using Levy et al. (2004) study. In fact, the Levy et al. (2005) study consistently gave higher estimates of O_3-related life years saved under the 3 different assumptions of life expectancy of the population, discounting rate, and the change in the concentration of the pollution.

Table 1.1: The estimated O_3-Related Life Years Saved associated with illustrative O_3 NAAQS attainment strategy in year 2020.

Estimate O_3-Related Life Years Saved (95% CI)			
Baseline: Partial Attainment of Current (0.084ppm) Standard; Control Scenario: Partial Attainment of Alternative Standard of 0.070ppm			
Discounting Rate	Mortality Study:	**Bell et al. (2004)**	**Levy et al. (2005)**
3 %	Assuming life expectancies of the general population	1,300 (370-2,200)	6,100 (4,100-8,100)
	Assuming life expectancies of the Sub-population with COPD of Average Severity	980 (208-1,700)	4,700 (3,200-6,300)
	Assuming life expectancies of the Sub-population with Severe COPD	530 (150-910)	2,700 (1,800-3,500)
7%	Assuming life expectancies of the general population	990 (280-1,700)	4,600 (3,100-6,100)
	Assuming life expectancies of the Sub-population with COPD of Average Severity	790 (230-1,400)	3,700 (2,500-4,900)
	Assuming life expectancies of the Sub-population with Severe COPD	450 (130-780)	2,200 (1,500-2.900)

Similarly, the EPA (2008) report estimate of $PM_{2.5}$-related lives saved based on Pope et al. (2002) study and Laden et al. (2006) study are summarized in Table 1.2. The estimates determined based on Laden et al. (2006) are consistently higher than those based on Pope et al. (2002). The EPA (2008) report also determines the QALYs gained determined from $PM_{2.5}$-related reductions in chronic bronchitis (CB) and in acute myocardial infarction (AMI). The

QALYs gained determined from $PM_{2.5}$-related reductions in CB and AMI are summarized in Table 1.3. The estimates of QALYs are higher for CB than AMI.

Table 1.2: The estimated $PM_{2.5}$-Related Life Years Saved associated with illustrative O_3 NAAQS attainment strategy in 2020.

Estimated $PM_{2.5}$-Related Life Years Saved (95% CI)		
Discounting Rate	**Pope et al. (2002)**	**Laden et al. (2006)**
3%	4,400 (1,700-7,000)	9,900 (5,400-14,000)
7%	3,000 (1,200-4,800)	6,700 (3,700-9,800)

Table 1.3: The estimated $PM_{2.5}$-Related Quality Adjusted Life Years associated with illustrative O_3 NAAQS attainment strategy in 2020.

Estimated $PM_{2.5}$-Related Quality Adjusted Life Years (95% CI)		
Chronic Condition (new cases)	**Discounting rate of 3%**	**Discounting rate of 7%**
CB	1,970 (270-4,700)	1,300 (180-3,000)
AMI	870 (220-1,800)	680, (180-1,400)

Similar estimates (to those done in EPA (2008)) of the impact of sulfate on quality-adjusted life years have been generated in Canada (Coyle et al. 2003). The Coyle et al. 2003 study determined the QALY gains due to changes in mortality risks associated with sulfate air pollution changes. The study found that a reduction of one-unit in sulfate air pollution yields an average annual increase in QALYs of 20,960 quality adjusted-life years. They arrived at this estimate by simulating the effect of sulfate air pollution over a 105-year period. The effect

estimate used for the reduction in ambient sulphate air concentration was based on the US population from the Pope et al., (1995) study. The Coyle et al. 2003 study bases the analyses on the Canadian population for the year 2001. They simulated the population under two scenarios, a change of sulfate pollution and no change, and they followed this cohort over time. Their results indicated that reduction in sulfate air pollution has a substantial impact on quality adjusted life expectancy.

In this thesis, we adapt the USA EPA (2008) methods to expand on an earlier study by quantifying life years and QALYs for Canadian data. The two main adaptations that needed to be made on the EPA (2008) methods are to use Canadian life tables and Canadian ambient air pollution concentrations. The ambient air pollution concentration for ozone and $PM_{2.5}$ for certain Canadian cities are obtained for the Canadian analyses performed by Judek et al. (2004). The study determined the daily 1-hour ozone concentrations and every six-day 24-hour Dichotomous Sampler fine particulate matter ($PM_{2.5}$) from data available for the years 1998-2000. This thesis is conducted for the eight Canadian cities that were examined in the Judek et al. (2004) analysis.

This thesis relied upon pre-existing $PM_{2.5}$ epidemiological long-term exposure studies that have long follow-up periods and large cohorts to help specify the response function between exposure levels and health outcomes that were used in our analysis. The estimates of mortality risks associated with $PM_{2.5}$ came primarily from two studies, Laden et. al. (2006) and Pope et al. (2002). These two studies were used to specify the concentration response function (CRF) for $PM_{2.5}$ used in our analysis. Both of these studies used cohort design with large populations and had a long follow-up period. The $PM_{2.5}$ exposure period used in Laden et. al. (2006) was based on annual city-specific $PM_{2.5}$ concentrations measured between years 1974-1989 and 1990-1998

accumulating 111,076 person-years of follow-up. They found an increase in the overall mortality associated with each 10ug/m^3 in the overall mean of $PM_{2.5}$ concentrations; rate ratio of 1.16. The follow-up period was 23 years (cohort size of 8096 participants), but the study lacks continuous monitoring of $PM_{2.5}$ levels during the extended follow-up period. The missing data in the exposure period is estimated using city-specific regression of the original Six Cities $PM_{2.5}$ measurement (Schwartz et al, 1996). Also, Laden et al. (2006) used the baseline characteristics to control for potential confounding factors, such as smoking and BMI. They found that those factors did not substantially confound the relationship with air pollution.

The Pope et al. (2002) study obtained its subjects from the Cancer Prevention II study, which had approximately 1.2 million adults enrolled. The analysis that Pope et al. (2002) applied in the study is the standard Cox proportional hazards model that incorporates a spatial random-effects component. The purpose of incorporating the spatial random-effect in the model is to provide accurate estimates of the uncertainty in the effect estimate. The Pope et al. (2002) study uses the Cox proportional hazards model that includes the random-effect component to estimate an adjusted relative risk ratio for the association of mortality with $PM_{2.5}$ exposure. They controlled for the potential confounders education, marital status, BMI, and alcohol consumption, smoking, diet, and occupational exposure. They found that exposure to $PM_{2.5}$ pollution was associated with all-cause mortality; each 10ug/m^3 increase in $PM_{2.5}$ concentration was associated with a 6% increased risk of all cause mortality.

In this thesis the morbidity effects of $PM_{2.5}$ exposure were based on two conditions, chronic bronchitis (CB) and acute myocardial infarction (AMI). In the case of CB the Abbey et al. (1995) study was relied upon for our specification of the relevant $PM_{2.5}$ concentration response function (CRF). The Abbey et al. (1995) study was based on a cohort of 6340

nonsmoking California Seventh-Day Adventists (SDAs). The $PM_{2.5}$concentrations were estimated for the years 1967-1987 (i.e. for a period of 20 years) from airport visibility data. The study estimated a relative risk from a multivariate model (e.g. the variables included in the model were: age, education, sex, childhood colds, possible symptoms in 1977, years smoked, and years lived with a smoker) of CB to be 1.81 associated with average annual increase of 45 ug/m^3 $PM_{2.5}$. A major limitation of this study is that it cannot truly separate the effects of total suspended particles (TSP), PM_{10}, and $PM_{2.5}$ because the ambient concentrations of $PM_{2.5}$ are indirectly estimated from monitoring TSP and because of the high correlation between the pollutants. The correlation between $PM_{2.5}$ and TSP was determined to be 0.86. Another major limitation is the potential lack of generalizability i.e. non-smoking Seventh-day Adventists living in California.

Additionally, in the case of nonfatal acute myocardial infarction (AMI) the Peters et al. (2001) study was used to determine the CRF to estimate the relationship between $PM_{2.5}$ and nonfatal heart attacks. The Peters et al. (2001) study was based on 772 patients who had myocardial infarction (MI) in the greater Boston area between January 1995 and May 1996. $PM_{2.5}$ concentrations used in the study were measured hourly. The study used a case-crossover design to analyze the data collected and determine the impact of change in $PM_{2.5}$ on AMI. An advantage of using the case-crossover design is that it allows the past exposure experience of each patient to act as its own control information. The study was conducted between 1989 and 1996 in 64 centers in the United States. Using multivariate analyses the study estimated an odds ratio of 1.48 (i.e. adjusted for season, meteorological parameters, and day of the week) associated with an increase of 25 ug/m^3 $PM_{2.5}$.

In the case of ozone, the estimate of the ozone exposure and the associated mortality risk used in the project came primarily from two studies, Bell et al. (2004) and Levy et al. (2005). The Bell et al. (2004) study is a multi-site time-series study based on short-term ozone exposure in 95 US urban communities throughout a 14-year period. The estimates obtained in the study are adjusted for time-varying confounders (i.e. particulate matter, weather, seasonality, and long-term trends). The study conducts the statistical analysis to estimate the national average relative risk of mortality by going through 2 distinct stages. In the first stage, the study used distributed-lag models to estimate community-specific mortality rate ratio (i.e. adjusted for time-varying confounders listed earlier). In the second stage, the study combined the community-specific estimates to generate national average relative risk (i.e. adjusted for spatial and community heterogeneity). An important advantage of the Bell et al. (2004) study is that it uses distributed-lag models (i.e. the exposure period) rather than determining the estimates based on the effect of a single day or several days at a particular lag.

The Levy et al. (2005) study is a meta-regression that includes the relationship between ozone concentrations and other air pollutants and the statistical methods used in the studies as covariates. Meta-regression is simply an extension of meta-analysis that is used to investigate heterogeneity of effects of certain factors across studies (Morton et al., 2004). Levy et al. (2005) used the meta-regression approach to deal with the uncertainty due to analytical method used and characteristics that could account for between-study variability. One limitation of the study that the Levy et al. (2005) recognize about their own study is the fact multiple studies that were found in the screening process (as part of the Levy et al. 2005 study) conclude that effect of ozone is "statistically insignificant" without actually reporting quantitative estimates. This limitation could potentially bias the pooled estimates determined in the study. The study found using the

Cochran's Q-statistics that there is a significant heterogeneity among the effect estimates that were pooled.

1.3 Effect Estimate and Concentration Units

The different studies used in this thesis report the effect estimates (i.e. concentration response function) differently. For example, some use rate ratios, some use relative risk, others use risk ratios, and some report odds ratios. These different measures are mathematically different. However, the general characteristic of ratio is the division of two numbers that are unrelated; whereas rate is the division of the two numbers where time is always in the denominator. Relative risk is sub-type of risk ratio. Furthermore, relative risk is defined as the probability of an event occurring (i.e. dying or developing a disease) in the exposed group relative to the unexposed group (e.g. exposure to air pollution). In the studies used in this thesis, relative risk refers specifically to a ratio of the probability of the event occurring in the exposed group (i.e. specific group of the population) versus a non-exposed group (i.e. the general population) for a particular time period. To understand an Odds ratio, it helps to first consider the meaning of an estimate of Odds. The Odds of an event occurring is defined as the ratio of its probability of occurrence to the probability of complement event occurring (i.e., of it not occurring). So that the Odds of death in a certain age interval would expressed as P[death]/(1-P[death]) where P[death] denotes the probability of death in that age interval. An Odds ratio is defined as a ratio of two Odds estimates. In the case of mortality studies the Odds in the numerator represents the prognosis of the exposed, while that in the denominator represents the prognosis among the unexposed. Relative risk and odds ratio are two different measures. The discrepancy between the two measures is influenced by two factors, incidence of the outcome and the strength of the association. However, when the initial incidence of the outcome is relatively small (i.e. 10%

prevalence rate or lower) OR provides an acceptable approximation of the RR. The use of the approximation of OR for RR is acceptable in the context of this thesis, since the prevalence of the outcome is low. The different ways used to report the concentration response function are translated to the change in the effect estimate due to one unit change in the ambient air pollution.

Some studies report the concentration response function using parts per million (ppm) and parts per billion (ppb), while others use microgram per meter cubed (ug/m^3). The units used in this report were ppb for ozone and ug/m^3 for $PM_{2.5}$. The effect estimates which were reported in different units were converted using the relevant conversion factor to be consistent with the other units used. For example, to change the units from ug/m^3 to ppb we used the conversion ratio of (24.45 / MW). MW is the molecular weight of the pollutant in grams per mole. To change the units from parts per million to parts per billion we multiplied by a factor of 1000.

1.4 Contribution of Thesis

Air pollution is an important public health concern. This project attempts to quantify the effects of air pollution on mortality (life expectancy) and quality adjusted life years (morbidity) in Canada. The findings from this thesis could be used to inform air pollution policy. In addition, the findings of this thesis may be added to the Air Quality Benefits Assessment Tool (AQBAT). The AQBAT is a simulation tool designed to be used to estimate the health impact associated with changes in Canada's ambient air quality. Additionally, quantifying the impacts of air pollution using the indices of life expectancy or QALYs provide an alternative to the monetary valuation employed in AQBAT.

1.5 Aims and objectives of the Thesis

The objective of the study was to estimate the impact of the two air pollutants, ozone and fine particulate matter ($PM_{2.5}$), on life expectancy and quality adjusted life years of Canadians. The mortality risks associated with the prevailing levels of each of the pollutants were used to determine life expectancy impacts for eight Canadian cities. The census divisions whose air pollution levels were investigated as part of this study were: Communaute-Urbaine-De-Quebec, Communaute-Urbaine-De-Montreal, Ottawa Division/Ottawa Carleton Regional Municipality, Toronto Division/Toronto Metropolitan Municipality, Hamilton Division/Hamilton-Wentworth Regional Municipality, Essex County (Windsor), Division No. 6 (Calgary), Greater Vancouver Regional District. The impact of air pollution on the incidence of CB and AMI were incorporated to assess morbidity associated quality adjusted life years.

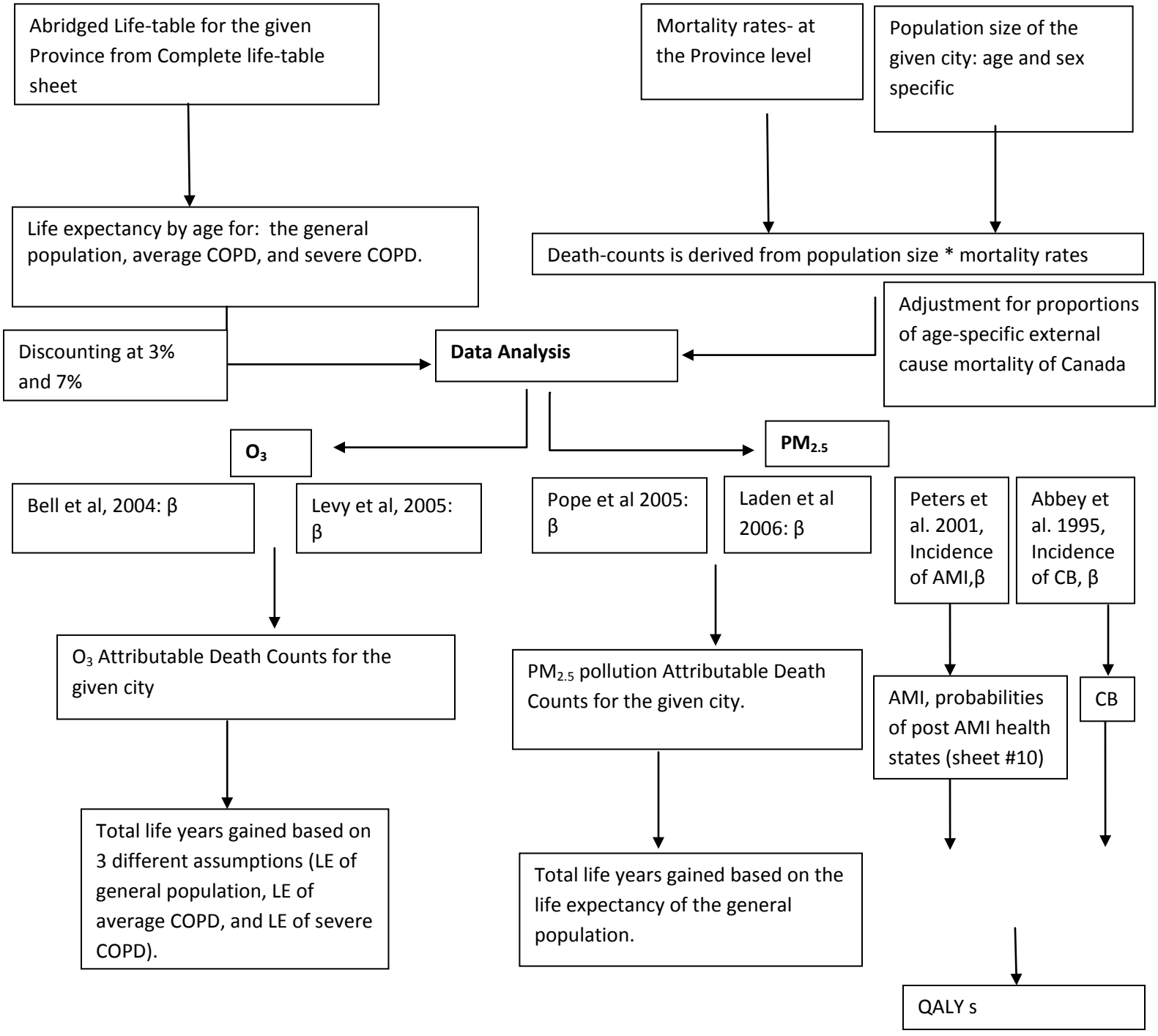
Chapter 2 Materials and Methods

2.1 Study Outline

The purpose of this thesis is to provide estimates of the impact of the two air pollutants, ozone and fine particulate matter ($PM_{2.5}$), on life expectancy and quality adjusted life years of Canadians. The mortality risk associated with each pollutant is used to determine life expectancy impacts. The impact of air pollution on the incidence of selected diseases is multiplied by the residual life expectancy (i.e. the outcome obtained from standard life tables), and quality of life weight to assess quality adjusted life years. The analysis done in the project is based on the analysis done in the EPA (2008) report, adapting it to Canada, and conducting additional sensitivity analyses, and uncertainty analyses. A Flow chart of the general outline of the analysis is presented on the next page. The project determines the potential health gains in terms of life expectancy and quality adjusted life years associated with the elimination of $PM_{2.5}$ and O_3 anthropogenic air pollution.

The analysis performed in this project employs life table methods, together with utility based health status measures and concentration response functions linking air pollution with selected health outcomes. The impacts of uncertainty are assessed using sensitivity analysis and Monte Carlo simulation. The impact of timing is addressed using discounting.

Figure 2.1: Flow chart of a given city illustrating the general outline of the major steps followed in the project.



The life table is an analytical tool used by epidemiologists and researchers in other fields to determine lifetime impacts that result from modification to baseline mortality (Brand, 2005). There are two forms of the life table, the cohort life table and the current life table. This project uses the current life table form. A current life table summarizes the mortality and the survival experience of a hypothetical birth cohort population during the current year (Chiang, 1984). In other words, the current life table is entirely dependent on the age-specific death rates prevailing in the current year. As a result, a current life table is the reflection of the mortality experience of a synthetic birth cohort during a given year (Chiang, 1984; Brand, 2005). The current life table for the Canadian population that is used in the thesis is based on the time period 2000-2002 (i.e. the most recent life-table available). The current life table has approximately ten columns; the first column has the age interval and the last column has the residual life expectancy. The most important column in a life table is arguably the column "qx", which has the estimates of the probability that an individual will die in that year at that specific age interval; once the entries in the qx column are specified, the entries in the other columns follow directly from this it (using standard expressions) (Chiang, 1984; Statistics Canada, 2002). A different life-table is warranted for different populations or subpopulations provided that those populations are subject to different patterns of mortality. For this reason, separate life-tables by sex, province, and city (where available) will be used in this analysis. Other distinctions such as socioeconomic status could warrant separate life-tables but are not explored in this thesis.

The project is based on an analysis of the impact of ozone and $PM_{2.5}$ exposure on life expectancy and quality adjusted-life expectancy for eight Canadian cities. The cities selected for the project are based on the official classification system of geographic areas (SGC) used by Statistics Canada. The SGC system has unique codes for three types of geographic areas:

provinces and territories, census division, and census subdivisions. In this thesis, we used the codes for census division to identify the cities selected. Census division are basically intermediate geographic areas that fall between the province/territories level and the municipality (i.e. they cover counties, regional municipalities and census subdivisions). The census divisions of the eight cities studied are: Communaute-Urbaine-De-Quebec, Communaute-Urbaine-De-Montreal, Ottawa Division/Ottawa Carleton Regional Municipality, Toronto Division/Toronto Metropolitan Municipality, Hamilton Division/Hamilton-Wentworth Regional Municipality, Essex County (Windsor), Division No. 6 (Calgary), Greater Vancouver Regional District. Detailed explanations of the areas that are covered by each census division are provided in Table 2.1.

Table 2.1: A List of the areas covered by each Census Division used in the thesis according to the Standard Geographical classification (SGC) of 1996 (Statistics Canada).

Census Division (CD)	CD code	Areas Covered By The CD
Communaute-Urbaine-De-Quebec	2423	Beauport, Vanier, Notre-Dame-des-Anges, Sillery, Québec, Charlesbourg, Saint-Émile, Lac-Saint-Charles, Loretteville, Val-Bélair, L'Ancienne-Lorette, Sainte-Foy, Cap-Rouge, Saint-Augustin-de-Desmaures, Wendake
Communaute-Urbaine-De-Montreal	2466	Montréal-Est, Anjou, Saint-Léonard, Montréal-Nord, Montréal, Westmount, Verdun, LaSalle, Montréal-Ouest, Saint-Pierre, Côte-Saint-Luc, Hampstead, Outremont, Mont-Royal, Saint-Laurent, Lachine, Dorval, L'Île-Dorval, Pointe-Claire, Kirkland, Beaconsfield, Baie-d'Urfé, Sainte-Anne-de-Bellevue, Senneville, Pierrefonds, Sainte-Geneviève, Dollard-des-Ormeaux, Roxboro, L'Île-Bizard
Ottawa Division/Ottawa Carleton Regional Municipality	3506	Osgoode, Cumberland, Gloucester, Vanier, Rockcliffe Park, Nepean, Ottawa, Rideau, Goulbourn, Kanata, West Carleton
Toronto Division/Toronto Metropolitan Municipality	3520	Scarborough, Toronto, East York, North York, York, Etobicoke
Hamilton Division/Hamilton-Wentworth Regional Municipality	3525	Stoney Creek, Glanbrook, Ancaster, Hamilton, Dundas, Flamborough
Essex County (Windsor)	3537	Pelee, Mersea, Leamington, Gosfield South, Kingsville, Gosfield North, Colchester North, Colchester South, Harrow, Malden, Amherstburg, Anderdon, LaSalle, Windsor, Tecumseh, Sandwich South, Maidstone, St. Clair Beach, Essex, Rochester, Belle River, Tilbury West, Tilbury North
Division No. 6 (Calgary)	4806	Foothills No. 31, Cayley, Blackie, High River, Longview, Turner Valley, Black Diamond, Okotoks, Rocky View No. 44, Calgary, Chestermere, Cochrane, Airdrie, Irricana, Beiseker, Crossfield, Mountain View County No. 17, Carstairs, Cremona, Didsbury, Olds, Sundre, Eden Valley 216, Sarcee 145
Greater Vancouver Regional District	5915	Langley, Langley, Surrey, White Rock, Delta, Richmond, University Endowment Area, Vancouver, Burnaby, New Westminster, Coquitlam, Belcarra, Anmore, Port Coquitlam, Port Moody, North Vancouver, North Vancouver, West Vancouver, Greater Vancouver, Subd. A, Lions Bay, Pitt Meadows, Maple Ridge, Semiahmoo, Tsawwassen, Musqueam 2, Coquitlam 2, Coquitlam 1, Burrard Inlet 3, Mission 1, Capilano 5, Barnston Island 3, Musqueam 4, Seymour Creek 2, Katzie 2, McMillan Island 6, Matsqui 4, Katzie 1, Langley 5, Whonnock 1

The reason for choosing those eight Canadian cities is to extend a previous analysis conducted by Health Canada. The pollutant concentration exposure change for each of the cities was determined by Judek et al. (2004) study by taking the difference between the actual pollutant concentrations and the background pollutant concentration. The actual pollutant concentrations are determined for each city using an annual average of the four quarters of a given year. Whereas, the background pollutant concentration is determined using a complex combination of qualitative and quantitative methods based on the concentration measured at the monitoring sites. A detailed explanation of methods used by Judek et al. to determine the background pollutant concentration is provided in the Judek et al. (2004) study. The initial step in the project is to gather the necessary data to perform the analysis from the relevant sources.

2.2 Statistics Canada: Life tables, mortality rates, and population size

The first step performed is to obtain life-tables for the following Canadian provinces from Statistics Canada: Alberta, Ontario, Quebec, and British Colombia. The life-tables obtained are complete life-tables and gender specific (see Appendix **A)**. In general, the life tables obtained from Statistics Canada represent accepted demographics that are used to synthesize the mortality experience of the Canadian populations to allow investigators to compare measures of expected longevity (i.e. life expectancy). To construct the life tables, Statistics Canada assumes a hypothetical cohort size of 100,000 individuals born at the same moment in time and then it subjects the cohort to the age-sex-specific mortality rates experienced by the actual specific Canadian (i.e. provinces in the 2000-2002 period) population during a specific time period. A detailed explanation of the methodology and the formulas used to derive the estimates used to construct the life tables are published by Statistics Canada (Statistic Canada, 2006).

The second step is to obtain age-specific mortality rates for those same provinces from Statistics Canada (see Appendix B). Statistics Canada determines mortality rates for the provinces and territories by extracting death counts from the death registrations submitted to the vital statistics registrar in the relevant province and territories. The vital statistics registrar collects demographic and medical cause of death from the vital statistics registries on all deaths in Canada. The World Health Organization "International Statistical Classification of Diseases and Related Health Problems" (ICD-10) is the system used to classify the cause of death in the death database (Statistics Canada, 2006). The mortality rates used in this project are all-cause mortality rate (i.e. it covers all the cause-specific deaths) that are age and gender specific.

The third step is to obtain the population size for age groups in each of the eight cities according to their census division (see Appendix B). The population size for each of the census divisions was obtained from Statistics Canada specific to age and gender. The population sizes are obtained from the “2006 Community Profiles” of the Census of Population conducted by Statistics Canada.

2.3 Life tables

The first step after the data collection is conducted is to construct abridged life-tables for each of the four provinces. The methodology for constructing abridged life-table is described in CDC (2002). Two abridged life-tables are constructed, a 5-year interval and a 10-year interval. The 5-year interval abridged life-table is used for the analysis of ozone, whereas the 10-year interval abridged life-able is used for the analysis of $PM_{2.5}$. The reason for using two different intervals is to stay consistent with the analysis done in EPA 2008 report to allow for comparison between the results. According to EPA 2008 report, they use two different intervals because

incidence rates of the morbidity for $PM_{2.5}$ exposure studies are done for 10-year age interval; whereas, for ozone the studies are based on 5-year age interval.

An abridged life table is basically a collapsed version of the complete life table in which life table functions are shown for 5-year or 10-year rather than 1-year age intervals. The abridging of the complete life table is determined based on three important properties of life table functions. The l_x, T_x, and e_x functions describe the exact age x (i.e., the beginning of the age interval x to $x + n$ (n denotes the span of the age interval for 5-year age intervals $n = 5$)). Life expectancy at age 30 (e_{30}), has the same value regardless of whether the age interval is 30–31 years or 30–35 years. To construct the abridged life table, the values of l_x, T_x, and e_x are extracted at 5-year intervals from the complete life table and placed into the abridged life table. However, the q_x, d_x, and L_x functions describe the age interval x to $x + n$. As a result, the notation for these functions is ${}_nq_x$, ${}_nd_x$, and ${}_nL_x$ in the abridged life table. This general notation implies $1q_x$ for the case of single year intervals and the "1" is usually dropped when reporting it for a single year interval. Therefore to account for this, ${}_nq_x$, ${}_nd_x$, and ${}_nL_x$ in the abridged life table are determined as follows.

$$
\begin{aligned}
{}_nd_x &= l_x - l_{x+n} \\
{}_nq_x &= {}_nd_x / l_x \qquad [1] \\
{}_nL_x &= T_x - T_{x+n}
\end{aligned}
$$

2.4 Death counts

The second step is to determine the number of deaths age-and-gender-specific for each of the eight cities. Ideally, the number of deaths for each city is determined using direct death counts. In the absence of available death counts (age-gender stratified) by city, city-specific mortality rates (age-gender stratified) could be used to estimate the death counts. Since neither death nor mortality rates were available at the city level another approach was required. As a work around solution, the number of deaths for each city is estimated by combining the mortality rate for the given province and the population size of that city (where the mortality rate and population counts are both available in gender-age stratified form). For example, to determine the number of deaths in 0-4 age group in the city of Ottawa, the mortality rate for the province of Ontario for 0-4 age group is multiplied by the population size of 0-4 age group in the city of Ottawa. It is necessary to provide the number of deaths for each age group because not the same number of deaths occurs at each age. The deaths caused by air pollution are modeled as multipliers of the baseline mortality (i.e. deaths counts from all-cause mortality rates). As a result, we anticipate a greater absolute number of deaths in older age groups where the baseline mortality is higher. In addition, deaths that occur in older age groups are associated with lesser losses in life years (i.e. because of the shorter residual life expectancy in those age groups). In short, to comprehensively account for the number of deaths we determine it for each age group at which it occurs.

Epidemiological studies argue that there is no logical connection between air pollution mortality and external causes of death. These studies argue that the increase in mortality associated with exposure to air-pollutants can only be mediated through an increase in non-external cause related mortality (since a link with external causes seems implausible). Given this argument, this thesis adjusts the baseline all-cause mortality rates obtained at the province level

in an effort to obtain rates that are restricted to non-external causes. This is done using the proportion of accidental death to all-cause mortality at the country level (i.e. there was not sufficient data to allow the determination of the proportion ratio at the province level). Therefore, to exclude the accidental death from the mortality rates used, Canada wide proportion ratio (i.e. accidental death: all-cause death) is used.

2.5 Discounting

Discounting is a method used to weight future gains and losses less heavily than those that occur in the present time (Smith and Gravelle, 2001; West et al., 2003). Discounting methodology is applied in costs and health outcomes analysis to reflect the societal rate of time preference. The reason that discounting is applied in some analysis is to reflect the fact that society believes that future costs and benefits are less valuable than present benefits and costs. According to the literature, the most frequently recommended discount rates are 3% and 5% (Smith and Gravelle, 2001; West et al., 2003; Gold et al., 1996). However, it is usually recommended that lower discount rates be used for health effects and benefits. In this project, we use discount rates of 3% and 7% as recommended by the guidelines for the economic evaluation of health technologies for Canada (HTA, 2006) and the EPA (2008) report. To determine the time-dependent nature of the values of gains in life years, we discounted the life expectancies using a 3% and a 7% rates according to the formula shown below.

$$\text{Discounted LY} = \int_0^{LE} e^{-rt}\,dt, \qquad [2]$$

Where r is the discount rate, t indicates times, and LE is the residual life expectancy at the time the premature death would have occurred, dt is the first derivative of time.

2.6 Uncertainty analyses

Given that the estimates of the health effects of air pollution used in the analysis involve uncertainty, we perform uncertainty analysis. While this thesis does explore the implications of the obvious sources of uncertainty (either by way of sensitivity or uncertainty analysis) these efforts to explore uncertainty should not be considered complete. The objective of performing the uncertainty analysis is to ensure that uncertainty in the inputs is appropriately reflected in the uncertainty in the output (i.e. life expectancy) (Morgan and Henrion, 1990). There are several methods that are used to examine uncertainty. For example, the simplest method is to perform sensitivity analysis (Morgan and Henrion, 1990). In this thesis, the effects of the parameters and the model uncertainties on the result of the life tables are determined using sensitivity and uncertainty analysis techniques (Morgan and Henrion, 1990). We propagate the uncertainty throughout the analysis to obtain the uncertainty associated with the output. Since we have more than three uncertain variables (i.e. effect estimate, quality of life weights, duration of life with CB and AMI), we use Monte Carlo simulation to allow parameters used in the life-table to vary simultaneously according to their uncertainty distributions; thus propagating them through the calculation of the outputs. The advantage of using Monte Carlo simulation is that its computational complexity is linear and it does not require us to discretize continuous distributions (Morgan and Henrion, 1990).

Monte Carlo simulation is a computational approach that uses repeated random sampling to compute results. In this thesis we use the program @ Risk 5.1 software, which implements the Monte Carlo method. Monte Carlo methods are useful for modeling outcomes that are associated with significant uncertainty in the inputs (i.e. uncertainty in concentration-response function). In

the @ Risk analyses, the uncertain inputs are modeled using a range of possible values from the probability distribution. The use of probability distributions is a way of representing uncertainty in the variables of a risk analysis. The most common probability distribution that are used in our analysis are: lognormal, uniform and triangular. The reason for using log normal (e.g. used for the concentration-response function) is that lognormal is well suited for values that do not go below zero. The uniform distribution (e.g. used for some of the weights in the QALY calculations) is often used when the input-value in question can be bounded (specifying a minimum and maximum value), and when the knowledge about the input indicates that values are equally likely between the specified bounds. Thus, in uniform distribution we just define the minimum and the maximum values of the input. The triangular distribution (e.g. used for certain weight for some of the chronic conditions) is used to represent values around which the input is most likely to occur. The parameters we define for triangular distributions are minimum, most likely and maximum values of the input. The simulation size is 10,000.

2.7 Life Years Saved as a result of Eliminations in Air pollution

The third step is to determine the health impact of the air pollutants, ozone and $PM_{2.5}$, on the population of each of the cities. The health impact function refers to the association between air pollution and the health outcome (i.e. the association of exposure function or effect estimate with a relative increase in the given health outcome for a given increment of change in air pollution). In summary, the standard health impact function that is used in the project has four components: an effect estimate from a particular epidemiological study, a baseline incidence rate for the health effect, the size of the affected population, and the estimated change in the relevant

pollutant summary measure. The standard health impact function (will be referred to as health impact function in this project) used is as follows:

$$\Delta y = M_i * P_i * (e^{\beta \Delta x} - 1) \qquad [3]$$

Where M_i is the baseline mortality rate for ith age group; P_i is the population size of ith age group; β is the effect estimate (i.e. log relative risk obtained from the relevant studies); Δx is the estimated change in the pollutant (i.e. O_3 or $PM_{2.5}$) and Δy is the estimated change in the incidence of the health effect (i.e. the number of avoided deaths) associated with the change in the pollutant, Δx. The effect estimates for the pollutant ozone are obtained from the two studies: Bell et al. (2004) and Levy et al. (2005). The effect estimates for the pollutant $PM_{2.5}$ are obtained from Laden et al. (2006) and Pope et al. (2002) with some adjustments.

2.8 Life Years Saved as a result of Eliminations in Ozone-related Mortality Risk

To estimate the impact of the change in number of deaths on life years we must first link them. Therefore, for each age group, we multiply Δy by the residual life expectancy at that age to obtain the total life years gained associated with the change in the pollutant. The effect estimate from Bell et al. (2004) is 0.00052 per 1 ppb change in ozone exposure (i.e. an increase of a 0.52% in daily mortality for 10 ppb increase in the previous week's ozone). Similarly, the effect estimate obtained from Levy et al. (2005) is 0.00041 per 1 ppb change in ozone exposure (i.e. a mean of 0.41% increase in mortality per 10 ppb increase of 1-hour maximum). The total life years gained are determined using the following formula:

$$\text{Total life years gained} = \sum^{N}_{i=0} LE_i \times \Delta Y_{i,} \qquad [4]$$

Where LE_i is the residual life expectancy for the age *i*, ΔY_i is the number of deaths avoided among the individuals age *i*, and *N* is the oldest age considered.

The total life years gained is determined for both pollutants for each of the eight cities. There is evidence in the literature that indicates that there is statistically significant association between short-term exposure to ozone and respiratory hospital admissions, indicating that ozone exposure aggravates respiratory conditions that are pre-existing. Thus, individuals that have acute and chronic illnesses (e.g. pneumonia and chronic obstructive pulmonary disease (COPD)) are at a higher risk of mortality when exposed to higher ambient concentrations of air pollutant. Thus, to account for individuals whose life expectancy is on average shorter than those of the general population due to pre-existing chronic condition, we look for epidemiological evidence of life expectancies of those with chronic illness (Mannino et al. (2006)). This step is actually a sensitivity analysis to see how the estimated life years gained differs if life expectancies less than the population average are used. The reason for doing this is that people who die in relation to short-term air pollution exposure may be more fragile and thus have a shorter residual life expectancy than the general population.

The Mannino et al. (2006) study is used to determine the impact of COPD on the mortality risks of the general population. COPD is one of the most common lung diseases known to affect the mortality risks of a population. There are two main forms of COPD, Chronic bronchitis (CB) and Emphysema. People who have COPD generally have a combination of both forms. This disease is a progressive disease meaning that the disease gets worse over time. There is evidence in the literature to indicate that tobacco smoking is the most important risk factor for the development and progression of COPD. Thus, it is important to determine the impact of

COPD on mortality risks of the general population. The Atherosclerosis Risk Communities (ARIC) study initiated in 1986 as longitudinal population-based study provides the subjects used to perform the analysis in the Mannino study. The Mannino study uses the Cox proportional hazard models with 11 years of follow-up period to determine the impact of impaired lung function on subsequent mortality rate of the general population adjusting for the covariates: age, race, sex, smoking status, and education level. The study uses a modified version of the criteria developed by the Global Initiative on Obstructive Lung Disease (GOLD) to classify COPD into four stages, with the category 3 or 4 being the most severe stage. The numbers 0 to 4 of the modified GOLD criteria are indicative of the number of chronic respiratory symptoms that the subjects report. The Mannino et al. (2006) study found that subjects that have lung function impairments had higher mortality risks during the 11 years follow-up period than normal subjects.

The life expectancies for the subpopulations with severe COPD and with "average" COPD are determined by amplifying the age-specific all-cause mortality probabilities (q) and then calculating the life expectancies based on the adjusted probabilities. To determine the age-specific mortality for the subpopulation with severe COPD, each age-specific mortality probability of the general population is multiplied by a hazard ratio (HR) of 5.7. The Cox proportional hazard regression models are developed using the SUDAAN procedure SURVIVAL in SAS version 8.2 to account for the difference in the follow-up period for the subjects in the Mannino et al. (2006) study. Given that COPD is a progressive disease it is expected that the proportion of older individuals increase as the stages (i.e. severity of COPD) increase, the hazard ratio takes age into account to avoid this problem. Therefore, we apply a

standard hazard ratio to all the age groups to derive the age-specific mortality probabilities for the general population under the assumption for the given severity of COPD.

Similarly, to derive the age-specific mortality for the subpopulation with "average" COPD, each age-specific mortality probability of the general population is multiplied by a HR of 1.906. The average COPD is determined for the general population by taking a weighted average of the four GOLD categories. Thus, the age-specific life expectancies are then determined for the severe COPD and "average" COPD subpopulations using these adjusted mortality probabilities.

After determining the 3 sets of the life expectancies (e.g., life expectancies for the general population, life expectancies for a subpopulation with severe and "average" COPD), these are then used to determine the total life years gained as specified above. Given that the ozone related premature mortality is associated with short-term exposures, all of the ozone related premature deaths are assumed to happen in the year of exposure.

2.9 Life Years Saved as a result of Eliminations in $PM_{2.5}$-related Mortality Risk

To determine $PM_{2.5}$-related health outcomes, we use the same framework as the one used for the ozone-related estimates. The abridged life-table used to determine the health outcomes is a 10-year interval life table. The reason for using a 10-year interval is that most of the data available for the morbidity endpoint estimates for older age groups that have 10-year intervals. The effect estimates used to determine the health impact of $PM_{2.5}$ are obtained from two studies: Pope et al. (2002) and Laden et al. (2006). The concentration-response function (C-R) obtained from Pope et al. (2002) quantified the association between the annual mean $PM_{2.5}$ levels and the

all cause mortality in adults 30 and older. The effect estimate from the Pope et al. (2002) study is 0.0058 per 1 ug/m^3 change in $PM_{2.5}$ exposure (e.g. relative risk of 1.06 for a 10 ug/m^3 change in $PM_{2.5}$). Similarly, the effect estimate obtained from Laden et al. (2006) is 0.0148 per 1 ug/m^3change in $PM_{2.5}$ exposure (e.g. relative risk of 1.16 for a 10ug/m^3 change in $PM_{2.5}$). The effect estimate is derived from the division of the ln relative risk by the change in the concentration of the pollutant concentration.

Life years saved associated with a given change in the $PM_{2.5}$ pollutant are estimated by multiplying the remaining life expectancies for each age-specific interval with the age-specific estimates of reductions in premature mortality.

2.10.1 Calculating Changes in the Quality of Life Years

In addition to determining the quantity of life years gained, we estimate the gains in the quality adjusted-life years (QALY) that are associated with morbidity alone. This is because $PM_{2.5}$ exposure is associated with reduction in serious illness that affects quality of life. The quality-of-life adjustments for $PM_{2.5}$ are based on two conditions, chronic bronchitis and acute myocardial infarction. Given that the Science Advisory Board-Health Effects Subcommittee (SAB-HES) has advised against including any additional gains in life expectancy due to reduction in the incidence of CB and AMI, the direct impacts of the concentration-response exposure function on life expectancy are determined only through the estimated change in mortality risk based on the Pope et al. (2002) (EPA 2008). They explain that although reductions in those endpoints result in increased life expectancy, the cohort design and relatively long follow-up period of the Pope et al. (2002) study captures any life-prolonging impacts related to those endpoints (EPA, 2008). As

a result, the impacts of CB and AMI on quality of life are determined as part of separate QALY calculation that focuses on morbidity effects alone.

There are several epidemiologic studies that show that $PM_{2.5}$ negatively affects chronic conditions such as, lung cancer, cardiovascular disease, CB, and AMI. The two conditions, CB and AMI, are singled out because there is sufficient literature evidence to enable us to quantify the changes. Also, these two conditions have detrimental health impact on long-term health. The changes in the incidences of CB and AMI are converted into life-year equivalent which are then combined directly with gains in life expectancy that are described in sections 2.9.2 and 2.9.3. The calculation of QALY requires four different elements: the estimated change in incidence of the health condition, the duration of the health condition, the quality of life weight with the health condition, and the quality of life weight without the health condition (e.g. weight of the baseline health state). The estimated change in the incidence of the health condition, CB and AMI, are determined using the health impact function approach (i.e. equation [3]) described above in relation to mortality impacts. The other three elements are derived based on the most reliable available literature.

2.10.2 Calculating QALYs Associated with Reductions in the Incidence of CB

CB is a disease characterized by mucus in the lungs with a wet cough that persists for at least 3 months of a year for several years in a row. The discounted morbidity associated quality of life gained from the reduction in the incidence of PM-induced CB is determined using the following formula:

$$\text{Discounted QALY Gained} = \sum \Delta CB_i \times D^*_i \times (w_i - w_i^{CB}) \qquad [5]$$

Where ΔCB_i is the number of incident cases of CB avoided in age interval i, w_i is the average QALY weight for the ith age interval, w_i^{CB} is the QALY weight associated with CB in the ith age interval, and D^*_i is the discounted duration of life with CB for individuals with onset of disease in the ith age interval (i.e. $_0 \int^{Di} e^{-rt} dt$, where D_i is the duration of life with CB for individuals with onset of disease in the ith age interval).

There are a limited number of studies that have estimated the impact of air pollution on incidence of CB. The study that provides evidence for the association between long-term $PM_{2.5}$ exposure and incidence of CB in the United States is Abbey et al. (1995). Since there is no similar Canadian study, we rely on the Abbey et al. (1995) study to specify the C-F between long-term $PM_{2.5}$ exposure and incidence of CB. The incidence rate, 0.00378 per person, is used to determine the number of the new cases of CB (Abbey et al. 1995). The number of new cases of CB in each age interval is determined using the effect estimate from Abbey et al. (1995) applied to the appropriate baseline incidence rate in each age-interval (i.e. the baseline incidence rate for new cases of CB is 0.00378 per person taken from Abbey et al. (1995)). According to Abbey et al. (1995), the effect estimate (β) is 0.0137 per 1 ug/m^3 change in $PM_{2.5}$ exposure (i.e. equivalent to a relative risk of 1.15 for a $10ug/m^3$ change in $PM_{2.5}$).

According to the literature, we assume that CB persists for the remainder of an affected individual`s lifespan. As a result, the duration of CB is equal to life expectancy conditional on having CB. Following the EPA (2008) report, we subtract 4.26 years from the residual life expectancy of each age interval up to 75 years. For age intervals over 75, we use a modified ratio to determine the residual life expectancy. The modified ratio is determined by taking the ratio of 4.26 to the life expectancy for the 65 to 74 year interval. We then take the residual life

expectancy of 75-84 and 85+ and multiply each of them by the modified ratio to estimate the potential life years lost and finally we subtract that value from the base residual life expectancy respective of its age interval. The method used by EPA (2008) study is based on estimates determined by CDC (2003), which indicate that COPD (of which CB is one element) results in the average loss of life years equal to 4.26 per COPD death, relative to a reference life expectancy of 75 years.

There are several studies that examined the quality of life with CB disease and assigned weight to years lived with CB, such as de Hollander et al. (1999) and the Victoria Burden of Disease (BoD). According to the recommendations of Gold et al. (1996), the best estimates for weights of quality of life are those based on community preferences for interventions affecting a broad population. To stay consistent with EPA (2008) report, we use a triangular distribution centered at 0.7 with upper bound at 0.9 and a lower bound at 0.5, which is based on the Victoria BoD Study (EPA 2008). In Accordance with EPA (2008) report, the weight for the quality of life of the general population without CB used is 0.95 (triangular distribution bounded by 0.9 and 1.0). The QALYs are discounted using 3 percent and 7 percent discount rates. Furthermore, based on the assumptions and distribution defined earlier, we use Monte Carlo simulation to propagate the uncertainty in the QALYs gained per incidence of CB for each age interval.

2.10.3 Calculating QALYs Associated with Reductions in the Incidence of AMI

Acute myocardial infarctions (AMI), is the actual heart attack in which an area of the heart muscle dies or is permanently damaged due to oxygen deprivation. This leads to emergency care that lasts for a short duration (i.e. days), but it can result in a significant loss in quality of life and

life expectancy. Therefore, the determination of the estimates of QALY impacts for AMI requires a more complex calculation. The total gain in QALYs is determined as follows:

Discounted AMI QALY GAINED =

$$\sum_i \Delta_i AMI \times {}_i^{*AMI}D \times ({}_iw - {}_i^{AMI}w) + \sum_i \sum_{j=1}^{4} \Delta_i AMI \times {}_jp_{ij}^{*postAMI}D \times ({}_iw - {}_{ij}^{postAMI}w) \quad [6]$$

Where $\Delta_i AMI$ is the number of nonfatal acute myocardial infarctions avoided in the age interval i, ${}_i^{AMI}w$ is the QALY weight of the acute phase of the AMI, ${}_jp$ is the probability of being in the jth post-AMI status, ${}_{ij}^{postAMI}w$ is the QALY weight of the post-AMI health state j, ${}_iw$ is the average QALY weight for the age interval i, ${}_i^{*AMI}D = \int_{i=1} {}_i^{D\,AMI} e^{-rt}\, dt$, the discounted value of ${}_i^{AMI}D$, which is the duration of the acute phase of the AMI, and ${}_i^{*postAMI}D = \int_{i=1} {}_i^{postDAMI} e^{-rt}\, dt$, is the discounted value of ${}_{ij}^{postAMI}D$, which is the duration of the post-AMI health state j (Adapted from EPA 2008).

In this part of the analysis, we follow the method used in EPA (2008), which does not independently estimate the gains in life expectancy associated with reductions in nonfatal heart attacks. This is done in accordance with the recommendations from the Science Advisory Board-Health Effects Subcommittee (SAB-HES), which assumes that all gains in life expectancies are captured in the estimates of reduced mortality risk that are determined based on the study Pope et al. (2002). Thus, this approach for determining QALY may understate the QALY impacts of AMI; however, it tries to ensure that the overall QALY impact estimates across endpoints are not double-counted in potential life-year gains.

There are few studies that have linked AMI with short-term exposures to $PM_{2.5}$ (Peters et al. (2001) and Poloniecki et al. (1997)). We use Peters et al. (2001) study for determining the concentration-response function to estimate the relationship between $PM_{2.5}$ exposure and nonfatal

AMI. Peters et al. (2001) is the only available study that provides a specific estimate for heart attacks. Thus, the number of cases of avoided AMI in each age interval is determined using the health impact function (i.e. equation [3]) from Peters et al. (2001) to the population in each age interval with the appropriate baseline incidence rate (obtained from Jack et al. (2009)). The effect estimate (β) in the study is 0.0241 per 1 ug/m^3 change in $PM_{2.5}$ exposure (i.e. equivalent to a relative risk of 1.27 for a 10 ug /m^3change in $PM_{2.5}$).

Acute myocardial infarction results in significant loss of quality of life for a relatively short duration. In accordance with the WHO Global Burden of Disease study (as reported in Vos (1999b), we assume that the acute phase of an AMI lasts for 0.06 years (EPA 2008). During this acute phase of AMI we assign a quality of life weight equal to 0.605 (Vos, 1999b). However, during the post-AMI period, there are different health states that are used to determine the loss in quality of life. To be consistent with the EPA (2008) report, we classify the post-AMI health status into four states defined by the presence or absence of angina and congestive heart failure (CHF). The probabilities for the four post-AMI health states must sum to one, the probabilities for each of the four health states are tabulated in Table 2.3 reported by EPA (2008).

The duration of the post-AMI health states varies based on the assumptions regarding the life expectancy associated with post-AMI health conditions. Following the Vos (1999b) and EPA (2008) reports, we assume that individuals with CHF have a shorter life expectancy and therefore, a shorter period with reduced quality of life (i.e. the duration of CHF are obtained from Vos 1999b report).

On the other hand, the duration of health states without CHF is assumed to be equal to the life expectancy of individuals conditioned on having survived an AMI. However, Ganz et al. (2000) study, as explained in the EPA (2008) report, states that "Because patients with a history

of myocardial infarction have a higher chance of dying of CHD that is unrelated to recurrent myocardial infarction (for example, arrhythmia), this cohort has a higher risk for death from causes other than myocardial infarction or stroke than does an unselected population." The study specifies a mortality risk ratio of 1.52 for mortality from other causes for the cohort of those individuals that had previous (nonfatal) AMI. We adopt this risk ratio and apply it to each age-specific all-cause mortality rate to determine the life expectancies for each age group after an AMI. The obtained life expectancies from this modification are used to represent the duration of non-CHF post-AMI health states (III and IV).

The QALY weights for four post-AMI health states used are based on preferences for the combined conditions characterizing each health state (i.e. the four states explained in Table 2.3). The first two health states are based on the presence of CHF with or without angina. In accordance with the Victoria Burden of Disease study and the EPA (2008) report, we assume that most cases of angina are treated and therefore kept at a mild to moderate state. As a result, the weights that are selected for QALY are for mild to moderate angina. To be consistent with the EPA (2008) report, we summarized the weights and the associated distribution types for the four different states in Table 2.4. As was assumed when discounting CB (section 2.10.2), the weight of quality of life for the general population without AMI used is 0.95 (triangular bounded by 0.9 and 1.0).

Sensitivity analyses are conducted using alternative values for CB and AMI incidence rates and quality of life weights to determine the QALYs. The base case incidence rate used in the analysis for CB is 0.00378 per person. The alternative senstivity values for incidence of CB came from the Marco et al. (2006), and they are age-specific incidences (3 age groups). The estimates for incidence of AMI used in the project came from Jack et al. (2009), these incidences

rates are age-and-gender specific. The base case incidence rate used in the analysis for AMI are tabulated below in Table 2.2. The alternative sensitivity values used for AMI incidence is determined using the average baseline incidence rates per person reported in EPA (2008) (i.e. incidence rate of 0.004608 per person). The incidence rates used in the EPA (2008) report are not age-specific. The reason for using alternative values for the baseline incidence rates is that, when using the same incidence rate across all age groups the number of cases will be overestimated for younger age groups and underestimated for older age groups, ultimately the net result would be overestimating the QALYs. Therefore, the use of alternative values for incidence rates allows us to determine if age distribution affects the estimates of QALYs. The QALYs are discounted using 3 percent and 7 percent discount rates. Furthermore, based on the assumptions and distribution defined earlier, we use Monte Carlo simulation to propagate the uncertainty in the QALYs gained per incidence of CB and AMI for each age interval.

Table 2.2: Baseline age-specific Incidence rates of AMI for both genders obtained from Jack et al. (2009).

Age group	**Incidence Rate**	
	Male	**Female**
30-34	0.00066	0.00157
35-44	0.00066	0.00157
45-54	0.004222	0.001254
55-64	0.004222	0.001254
65-74	0.007643	0.003748
75-84	0.015094	0.010096
85+	0.015094	0.010096

The alternative values used in the sensitivity analysis for the weights of quality of life years associated with having CB and AMI are obtained from Health Utility Index (HUI) from the Canadian Community Health Survey (CCHS) Cycle 3.1. The CCHS Cycle 3.1 is a survey conducted by Statistics Canada, the Canadian Institute for Health Information (CIHI), and Health Canada that provides health information (i.e. estimates of health determinants, health status and health system utilization) for 126 health regions in Canada. The sample size of the CCHS Cycle 3.1 was approximately 130,000 persons of Canadian household resident age 12 and older. The health utility index is the measurement system used by CCHS to measure the population health. The two components that make-up the HUI system are Health status classification system, and the preference-based scoring system. The HUI system was developed by researchers at McMaster University. The preference-based scoring system is based on the general population preferences; therefore, those scores represent community preferences. Given that the community preferences are the most appropriate source for weights of quality of life when determining QALYs, we use the weights from HUI as sensitivity values for our analysis. The sensitivity value used for CB QALYs obtained from the HUI scores for individuals with CB was 0.73. The same proportional range as used in the EPA report was used with the central estimate of the triangular distribution being 0.73 (i.e. the upper and lower bound of the distribution are summarized in Table 2.4). Similarly, assuming the same relative quality of life among post MI health states as used by the EPA (2008) report, the estimates of weights for the 4 health states we get are tabulated in Table 2.3. The flow of the major step and how the analysis is performed are illustrated in Figure 2.1. Also, a summary of the key parameters used in QALY calculations for CB and AMI are summarized in Table 2.4.

Table 2.3: A summary of the probability, weight, and distribution type of four post-AMI health status defined by the presence or absence of angina and congestive heart failure (CHF).

Post AMI with:		**Probability**	**Weight**	**Distribution type**
CHF	**Angina**			
Yes	Yes	0.102	0.81	Uniform distribution with a lower bound at 0.76 and an upper bound at 0.85 (EPA, 2008) **Sensitivity:** (0.64, 0.68, 0.71)
Yes	No	0.098	0.85	Uniform distribution with a lower bound at 0.8 and an upper bound at 0.89 (EPA, 2008) **Sensitivity:** (0.71, 0.71, 0.79)
No	Yes	0.408	0.8	Uniform distribution with a lower bound at 0.7 and an upper bound at 0.89(EPA, 2008) Sensitivity: (0.54, 0.67, 0.74)
No	No	0.392	0.93	No distribution is used due to lack of evidence (EPA, 2008) **Sensitivity:** 0.78

Table 2.4: A summary of the key parameters, their values and their reference sources, used in the project.

Parameter	**Reference Source**	**Values**
Discount rate	EPA (2008), HTA (2006)	3% and 7%
Concentration-response function: ozone	Lognormal distribution with μ= 0.00033 and σ=0.000063, Bell et al. (2004)	0.00033
Concentration-response function: ozone	Lognormal distribution with μ= 0.00041 and σ=0.00005, Levy et al. (2005)	0.00041
Concentration-response function: $PM_{2.5}$	Lognormal distribution with μ= 0.0058 and σ=0.0022, Pope et al. (2002)	0.0058
Concentration-response function: $PM_{2.5}$	Lognormal distribution with μ= 0.015 and σ=0.0042, Laden et al. (2006)	0.015
Concentration-response function: CB	Lognormal distribution with μ= 0.013 and σ=0.0068, Abbey et al. (1995)	0.013
Concentration-response function: AMI	Lognormal distribution with μ= 0.024 and σ=0.0093, Peters et al. (2001)	0.024
Quality of life preference score for CB	Triangular distribution centered at 0.7 with an upper bound of 0.9. (EPA, 2008 and Vos, 1999a). **Sensitivity**: triangular distribution centered at 0.73	0.5---0.9 0.52---0.94
Quality of life preference for the general population	Triangular distribution centered with lower bound of 0.9 and an upper bound of 1.0 (EPA, 2008) Sensitivity: triangular distribution centered at 0.87	0.95 0.82---0.92
Duration of AMI phase	Average of the length of hospital stays (EPA (2008).	0.038 years
Weight of quality of life during acute AMI	EPA(2008) and Vos (1999b)	0.605

* In the @ Risk programs the parameters for lognormal are entered as if they were normally distributed.

Chapter 3 Results

3.1 Population of the Eight Cities

The total population and age- and gender-specific population for each of the eight cities are listed in Appendix B. The pattern of the age distribution of the eight cities is similar and is illustrated on Figure 3-1.

3.2 Mortality Rates and Death Counts

Mortality rates for the four provinces that are age and gender specific are obtained from Statistics Canada (shown in Appendix B). The data indicates that Ontario has the highest mortality rates followed by Quebec and British Columbia; however, the mortality rates across the four provinces are very similar. Figures 3-2a and 3-2b show the mortality rates (age-and-gender specific) for the four provinces. The mortality rates are for year 2006, the most recent year available from Statistics Canada. The implied results of death counts are tabulated in Appendix B. Figure 3-3 and 3-4 show the distribution of death counts across age for the eight cities. In Figure 3-3 illustrates the distribution of death counts for 5-year age interval; whereas, Figure 3-4 shows the distribution of death counts for 10-year age interval. In Figure 3-4 there is a drop in the death counts in the last age interval that is not apparent in Figure 3-3. This drop is the result of the fact that as the population ages the number of deaths increases steadily and that we combined the age groups 75-79 and 80-84 into a single interval producing a higher death counts than in the interval 85+. The pattern of the death counts distribution for the eight cities in both age intervals is similar. The second difference between Figures 3-3 and 3-4 is that in Figure 3-4 the initial age group is 30-34; we started at this age group because the available morbidity concentration-response functions applies to this age group and older.

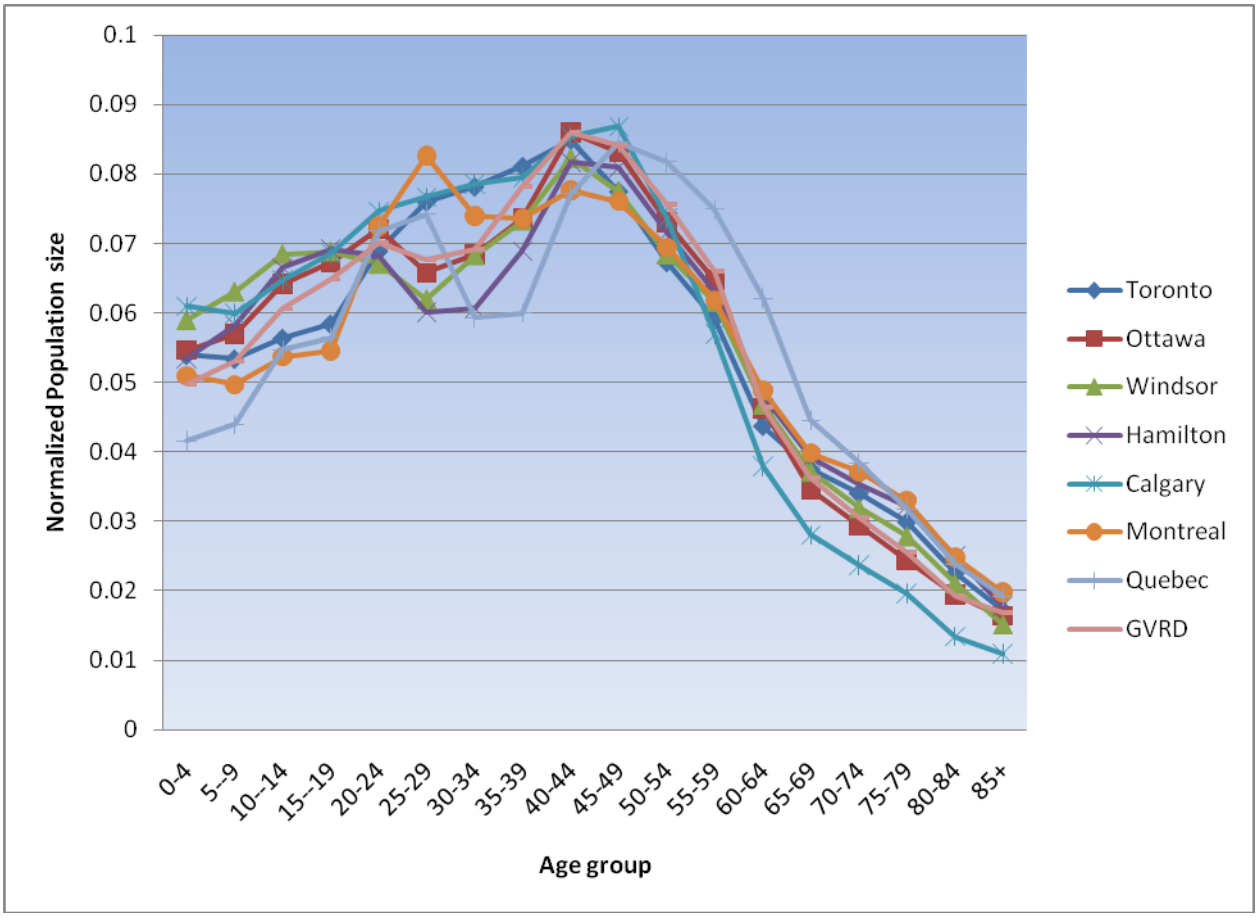


Figure 3-1: A normalized age distribution of the eight cities under study. The normalization of the age groups was determined by dividing each age group of the given city by the total population size of its home city.

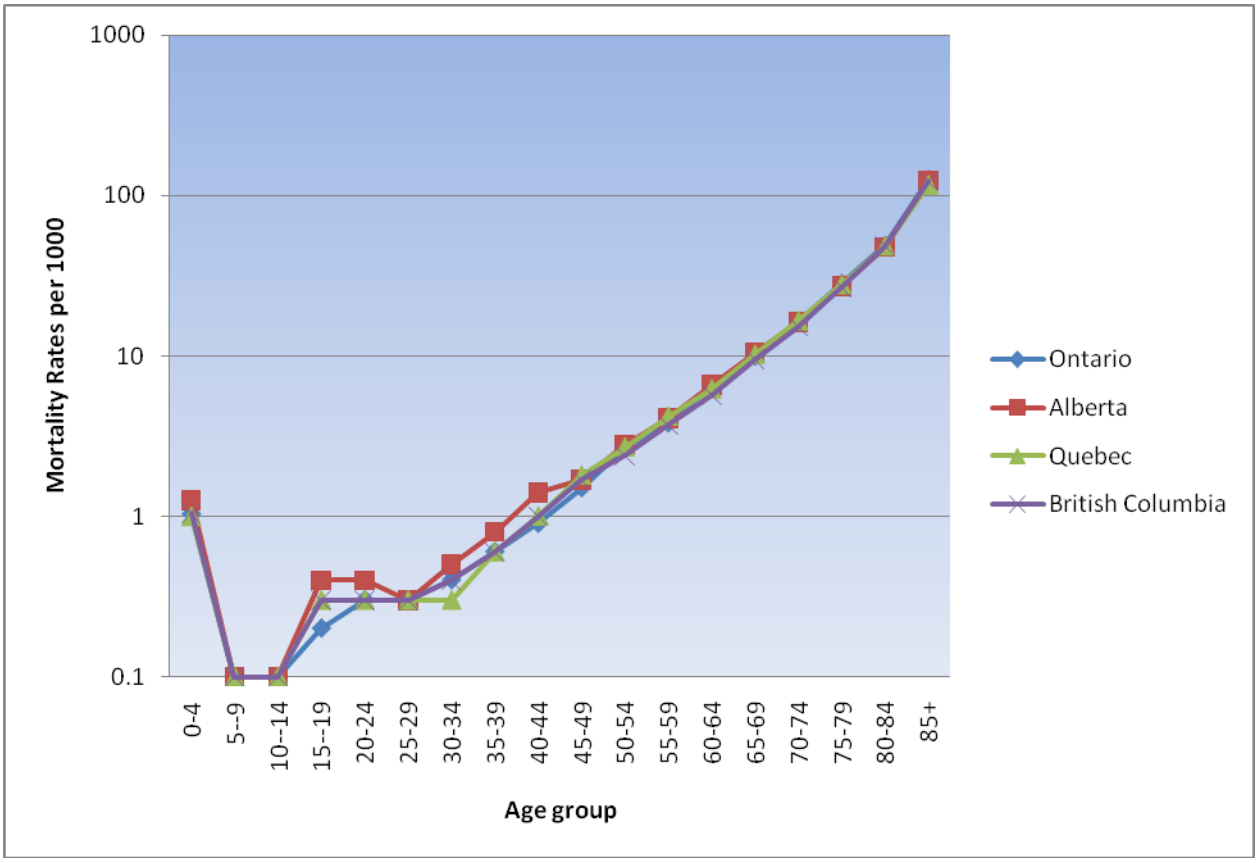


Figure 3-2a: The mortality rates per 1000 for females in the four provinces on a log transformed scale.

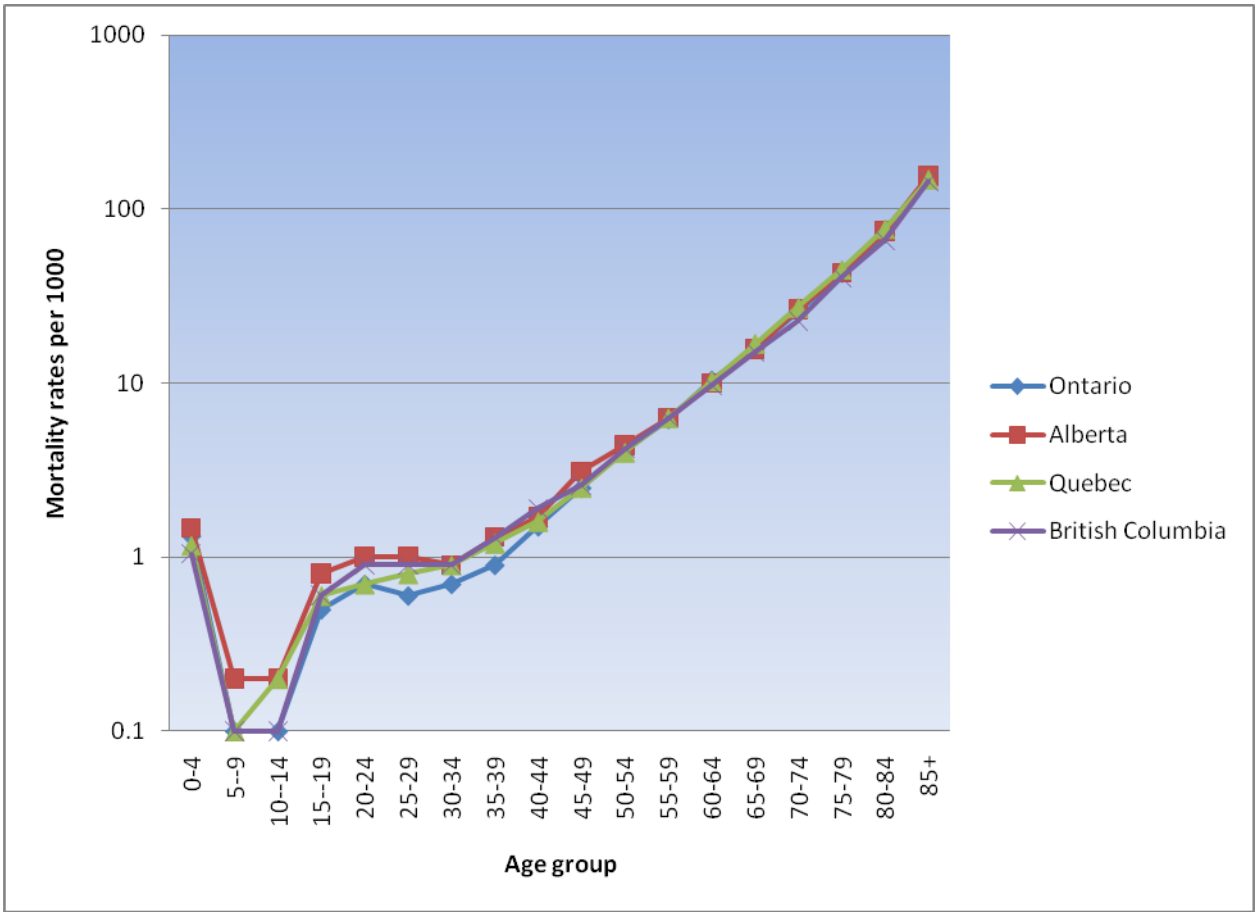


Figure 3-2b: The mortality rates per 1000 for males in the four provinces on a log transformed scale.

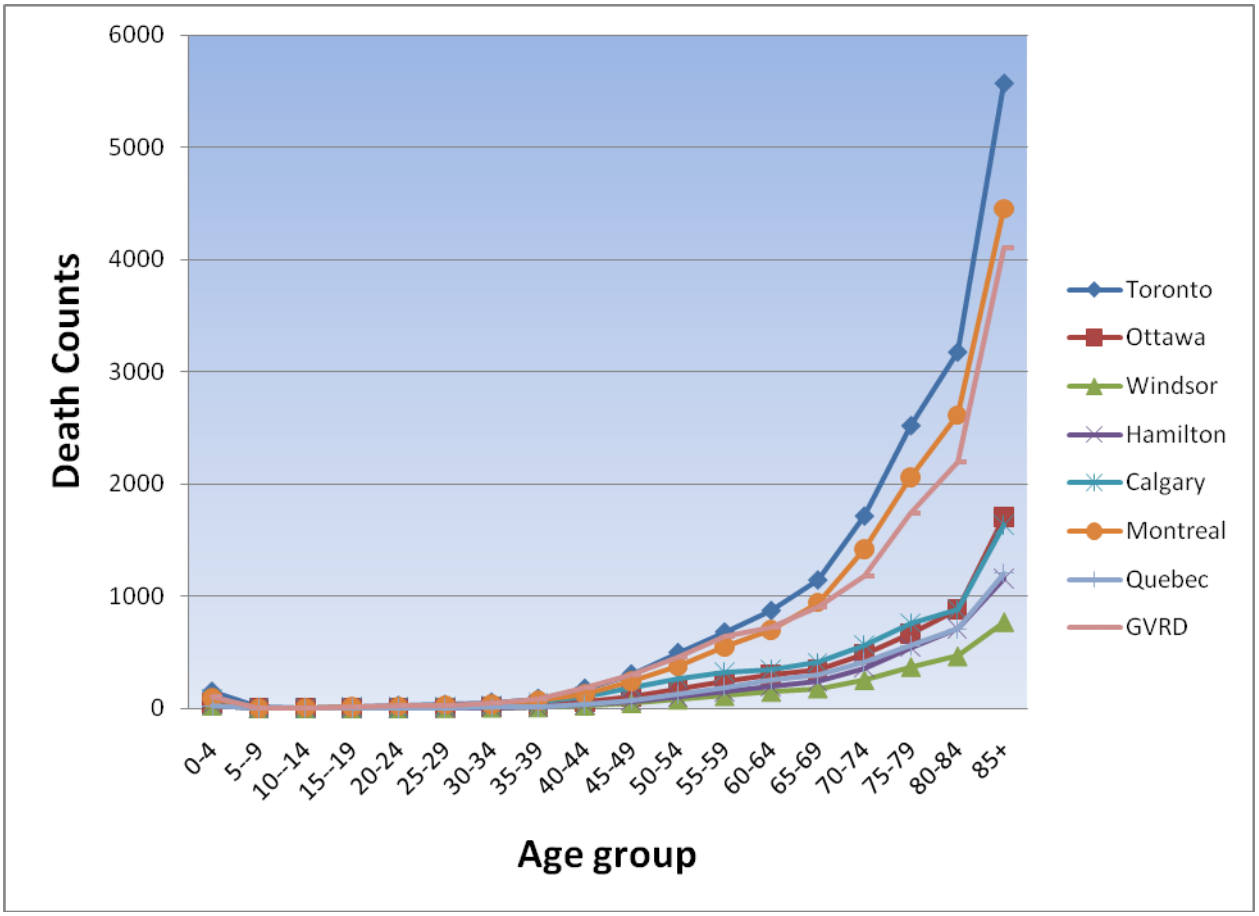


Figure 3-3: The distribution of non-accidental death counts attributable to all cause mortality across the age groups collapsed for both genders, 5-year interval.

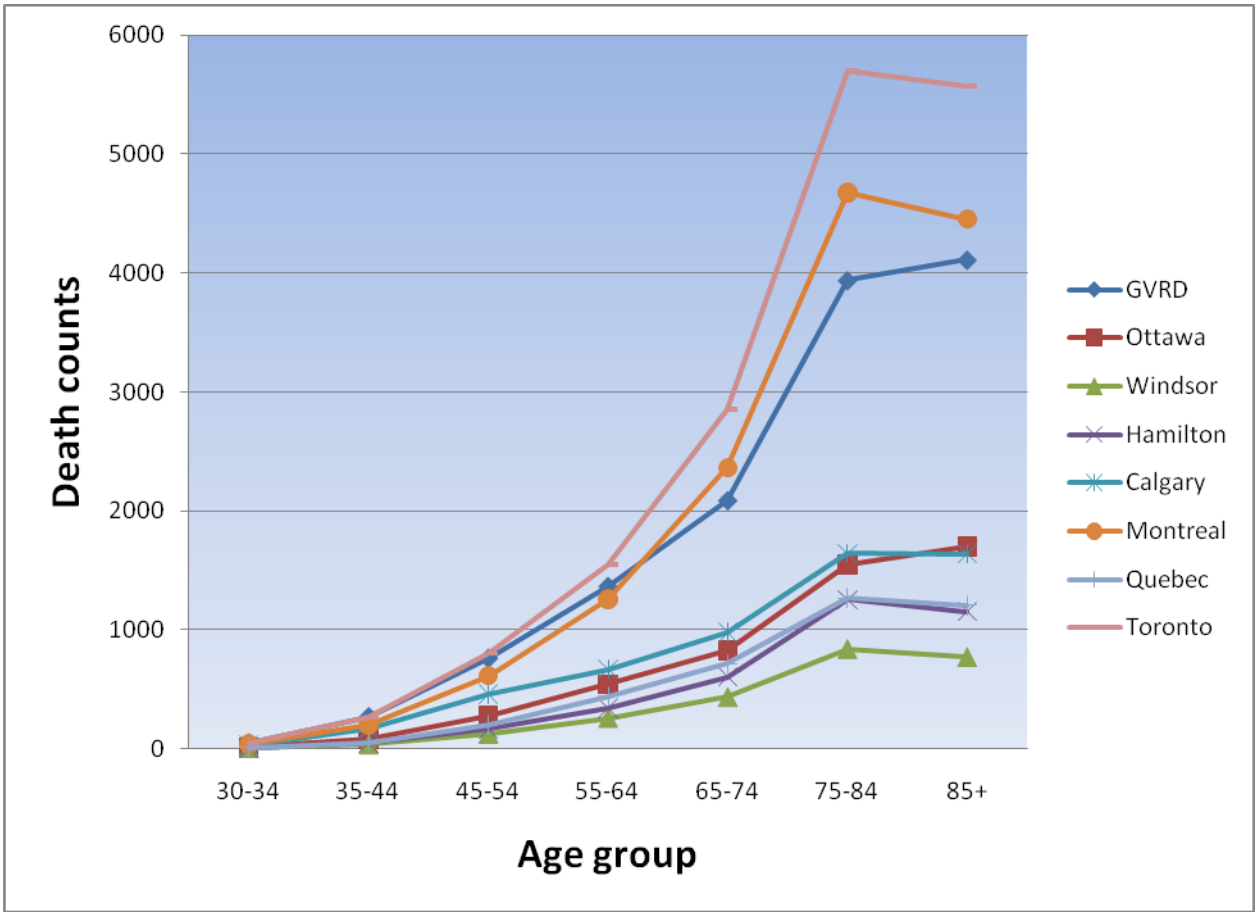


Figure 3-4: The distribution of non-accidental death counts across the age groups collapsed for both genders, 10-year interval.

3.3 Life Expectancy

The life expectancy age-and-gender specific for the eight cities is determined based on the life expectancy for their home province. For example, the life expectancy age-and-gender specific for the cities of Toronto, Ottawa, Windsor and Hamilton are determined based on the life expectancy published by Statistics Canada for the province of Ontario. The life expectancy age-and-gender specific for the eight cities is illustrated in Appendix A. An example of the life

expectancy by age group for the province of Ontario is shown on the next page. The life expectancies appear in the column with headings shaded in blue.

Table 3-1a: Abridged life table, Ontario, 2000 to 2002: males

							Average COPD			Severe COPD		
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
0-4	100000	657	0.007	497008	7736682	77.4	30.8	15.2	70.1	30.0	15.2	56.9	27.9	15.1
5--9	99343	59	0.001	496547	7239674	72.9	30.4	15.3	66.0	29.5	15.1	54.0	27.4	14.9
10--14	99284	82	0.001	496262	6743127	67.9	29.7	15.2	61.1	28.7	15.1	49.2	26.3	14.8
15--19	99202	251	0.003	495439	6246865	63.0	29.0	15.2	56.2	27.8	15.0	44.4	25.1	14.6
20-24	98951	329	0.003	493944	5751426	58.1	28.2	15.0	51.4	26.8	14.9	40.0	23.8	14.3
25-29	98622	334	0.003	492283	5257482	53.3	27.2	14.9	46.8	25.7	14.8	35.8	22.4	14.1
30-34	98288	389	0.004	490502	4765199	48.5	26.1	14.8	42.0	24.4	14.4	31.4	20.8	13.6
35-39	97899	527	0.005	488253	4274697	43.7	24.9	14.6	37.3	22.9	14.2	27.1	18.9	12.9
40-44	97372	807	0.008	485001	3786444	38.9	23.5	14.4	32.7	21.3	13.8	22.8	16.8	12.3
45-49	96565	1314	0.014	479769	3301443	34.2	21.8	13.8	28.2	19.4	13.1	18.8	14.6	11.2
50-54	95251	2003	0.021	471618	2821674	29.6	20.0	13.4	23.9	17.4	12.5	15.1	12.4	9.8
55-59	93248	3257	0.035	458736	2350056	25.2	18.0	12.6	19.7	15.2	11.5	11.8	10.1	8.6
60-64	89991	5174	0.057	437904	1891320	21.0	15.9	11.6	15.9	12.9	10.3	8.8	7.9	7.1
65-69	84817	7681	0.091	406035	1453416	17.1	13.6	10.5	12.5	10.6	8.9	6.5	6.0	5.5
70-74	77136	11014	0.143	359746	1047381	13.6	11.3	9.3	9.5	8.4	7.4	4.5	4.3	4.1
75-79	66122	15114	0.229	294338	687635	10.4	9.1	7.8	6.9	6.4	5.9	2.9	2.9	2.8
80-84	51008	17888	0.351	211070	393297	7.7	7.0	6.3	4.9	4.6	4.4	1.8	1.8	1.8
85+	33120	33120	1.000	182227	182227	5.5	5.1	4.8	3.2	3.1	3.0	1.0	1.0	1.0

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table.

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	98288	389	0.004	490502	4765199	48.5	26.1	14.8
35-44	97899	1334	0.014	973254	4274697	43.7	24.9	14.6
45-54	96565	3317	0.034	951387	3301443	34.2	21.8	13.8
55-64	93248	8431	0.090	896640	2350056	25.2	18.0	12.6
65-74	84817	18695	0.220	765781	1453416	17.1	13.6	10.5
75-84	66122	33002	0.499	505408	687635	10.4	9.1	7.8
85+	33120	33120	1.000	182227	182227	5.5	5.1	4.8

Table 3-1b: Abridged life table, Ontario, 2000 to 2002: females

									Average COPD			Severe COPD		
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
0-4	100000	571	0.006	497403	8204363	82.0	31.3	15.2	75.3	30.6	15.2	62.8	29.0	15.2
5--9	99429	37	0.000	497046	7706960	77.5	30.9	15.3	71.1	30.1	15.2	59.8	28.5	15.2
10--14	99392	55	0.001	496846	7209914	72.5	30.3	15.2	66.2	29.5	15.1	55.0	27.6	15.1
15--19	99337	119	0.001	496404	6713068	67.6	29.7	15.2	61.2	28.7	15.1	50.1	26.5	14.8
20-24	99218	134	0.001	495758	6216664	62.7	28.9	15.2	56.4	27.8	15.0	45.5	25.4	14.7
25-29	99084	154	0.002	495048	5720906	57.7	28.1	15.1	51.5	26.8	14.9	40.8	24.1	14.5
30-34	98930	208	0.002	494162	5225858	52.8	27.1	15.0	46.7	25.7	14.8	36.1	22.5	14.0
35-39	98722	322	0.003	492869	4731696	47.9	26.0	14.9	41.8	24.4	14.6	31.5	20.8	13.6
40-44	98400	523	0.005	490786	4238827	43.1	24.7	14.5	37.1	22.9	14.1	27.1	18.9	12.9
45-49	97877	800	0.008	487534	3748041	38.3	23.3	14.2	32.4	21.2	13.7	22.8	16.9	12.3
50-54	97077	1305	0.013	482383	3260507	33.6	21.6	13.9	27.9	19.3	13.2	18.8	14.6	11.2
55-59	95772	2102	0.022	473969	2778124	29.0	19.8	13.1	23.6	17.2	12.3	15.1	12.4	9.8
60-64	93670	3212	0.034	460901	2304155	24.6	17.7	12.6	19.5	15.0	11.3	11.8	10.1	8.6
65-69	90458	5060	0.056	440521	1843254	20.4	15.5	11.5	15.6	12.7	10.1	8.9	7.9	7.1
70-74	85398	7676	0.090	409074	1402733	16.4	13.2	10.4	12.1	10.4	8.6	6.4	5.9	5.4
75-79	77722	11478	0.14768	361716	993659	12.8	10.8	9.0	9.0	8.0	7.0	4.3	4.1	3.9
80-84	66244	16375	0.247192	292436	631943	9.5	8.4	7.4	6.4	5.9	5.4	2.7	2.7	2.6
85+	49869	49869	1	339507	339507	6.8	6.3	5.8	4.2	4.0	3.8	1.5	1.5	1.5

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table.

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	98930	208	0.002	494162	5225858	52.8	27.1	15.0
35-44	98722	845	0.009	983655	4731696	47.9	26.0	14.9
45-54	97877	2105	0.022	969917	3748041	38.3	23.3	14.2
55-64	95772	5314	0.055	934870	2778124	29.0	19.8	13.1
65-74	90458	12736	0.141	849595	1843254	20.4	15.5	11.5
75-84	77722	27853	0.358	654152	993659	12.8	10.8	9.0
85+	49869	49869	1.000	339507	339507	6.8	6.3	5.8

The life expectancy is determined under three assumptions, general population, population with average COPD and population with severe COPD, tabulated in Appendix A. The life expectancy under the three assumptions and discounted using a 3% and a 7% discount rates are presented (in the previous page) together to allow for an easy comparison. The parameter (i.e. comparing discounting rates and the assumption of life expectancy of the population) that

has the greatest impact on life expectancy is the discounting rate. The 7% discounting rate produces the highest reduction in the residual life expectancy. The effect of the discounting rates on the residual life expectancy of the population is demonstrated graphically on Figure 3-5a for the city of Toronto (Ontario), age-specific. A similar pattern to that in Figure 3-5a applies to the remaining 7 cities. The effect of the different assumptions regarding the residual life expectancy of the general population of the province of Ontario is illustrated on Figure 3-5b. As expected the lowest estimates of life expectancies are obtained when we use the assumption of population with severe COPD. We also illustrate the effect of the two parameters combined together in Figure 3-5c.At the advance ages, the influence of the assumption of residual life expectancy is greater than that of the discount rate. Therefore, the greatest reduction in the estimates of the residual life expectancy occurs when we use the assumption of life expectancy of a population with severe COPD and 7% discounting rate. Comparing the residual life expectancy for the eight cities, Figure 3-6, shows that the eight cities have roughly the same life expectancies.

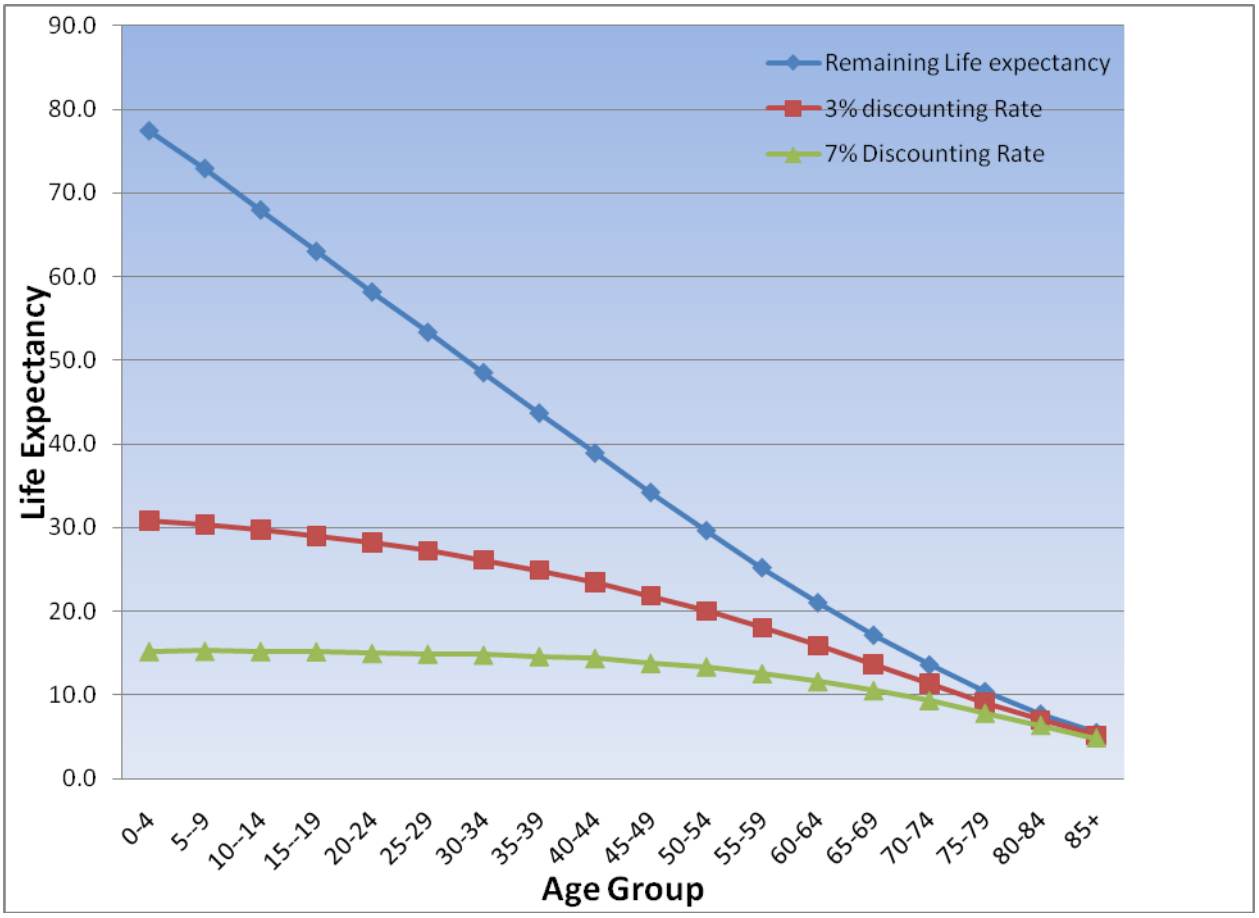


Figure 3-5a: An illustration of the effect of discounting rates on the residual life expectancy of age-specific population collapsed for both genders for the province of Ontario.

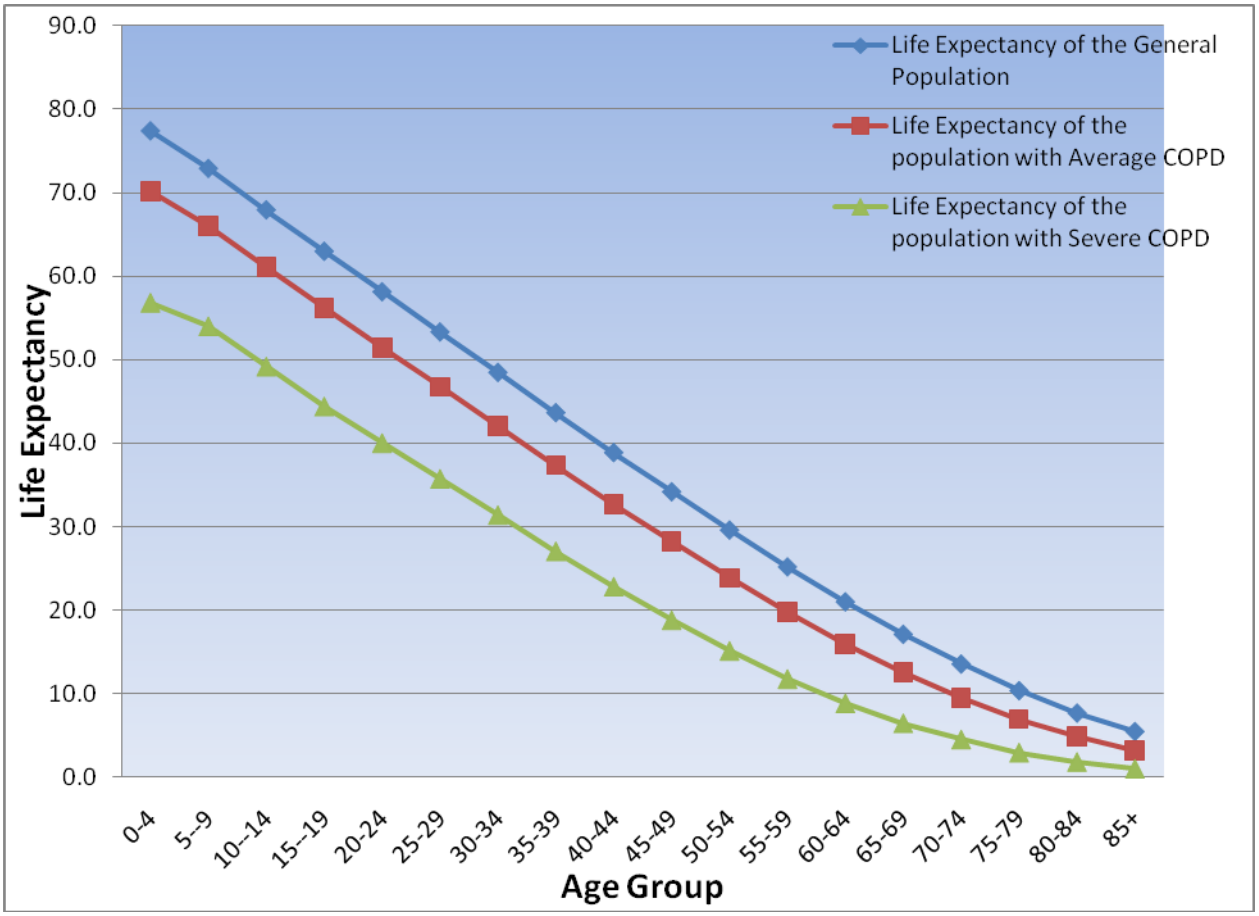


Figure 3-5b: An illustration of the effect of the assumptions used about the residual life expectancy of the population age-specific collapsed for both genders for the province of Ontario.

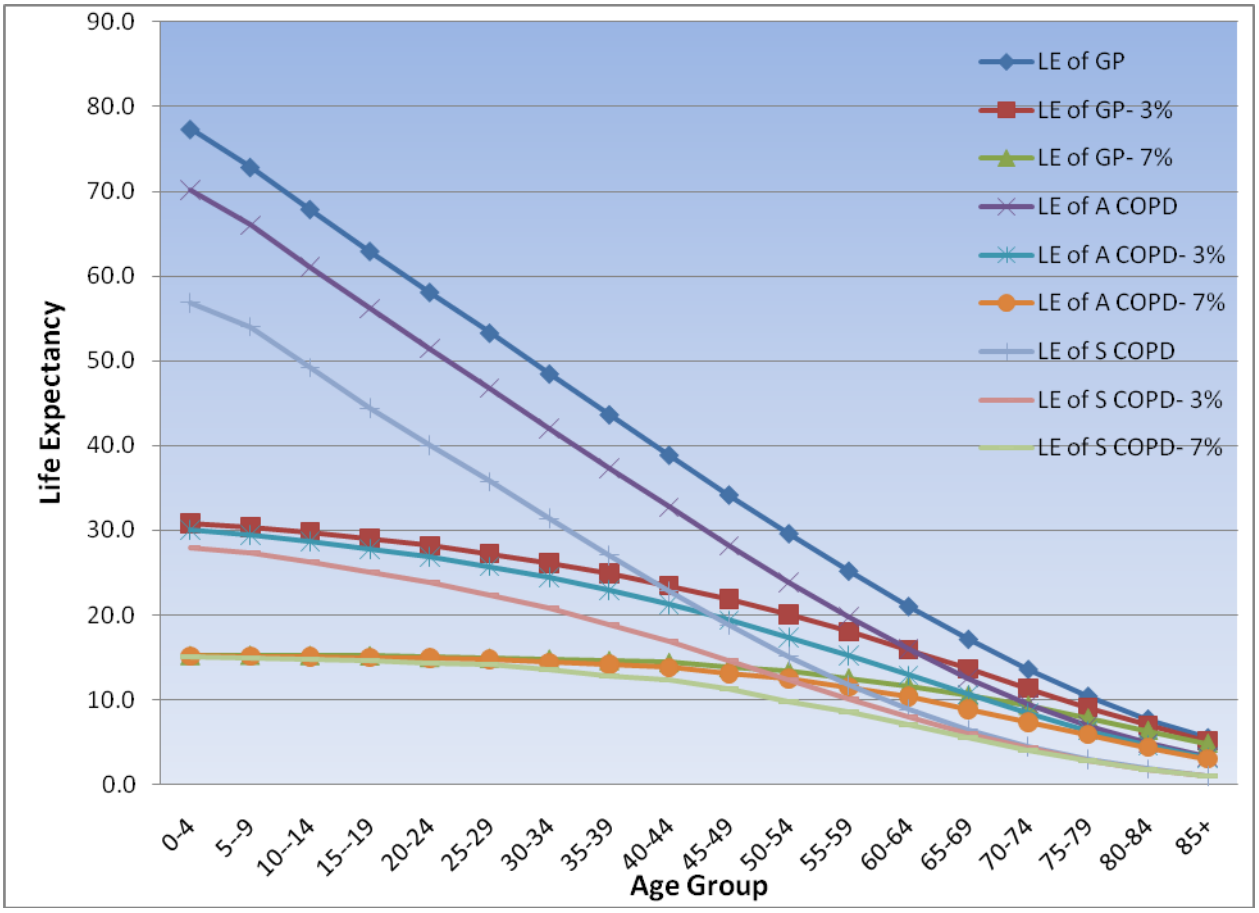


Figure 3-5c: An illustration of the effect of the two parameters, discounting rate and the underlying assumption of the population life expectancy collapsed for both genders. LE= life expectancy, GP= general population, A= average COPD, S= severe COPD.

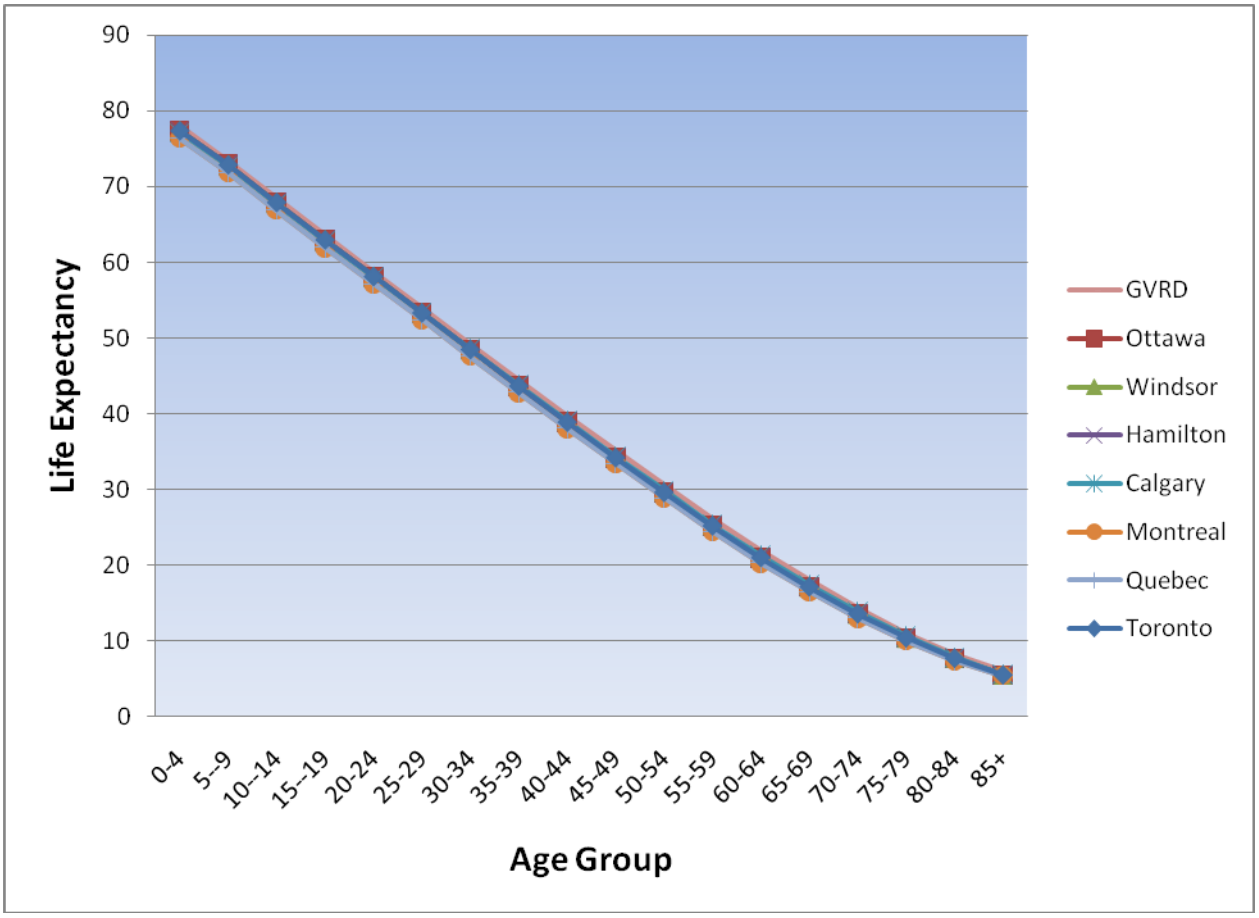


Figure 3-6: An illustration of the residual life expectancy age-specific for males for the eight cities.

3.4 Air pollution Concentrations

The anthropogenic concentrations (i.e. the measured urban concentrations minus the background concentrations) of the two pollutants obtained from the Health Canada study are tabulated in Table 3-A. The city that has the highest concentration for ozone is Windsor; whereas, the city that has the highest concentration for $PM_{2.5}$ is Hamilton.

Table 3-A: Anthropogenic concentration (AC) levels (i.e. the change in the pollutant concentration) and background concentration (BC) for ozone and $PM_{2.5}$ in the eight cities.

City Name	**Ozone (ppb) daily 1-hour**		**$PM_{2.5}$ (ug/m^3) every six-day 24-hour**	
	AC	**BC**	**AC**	**BC**
Toronto	12.8	37.6	10.6	12.4
Ottawa	7.8	32.6	6.7	8.5
Windsor	13.7	37.7	9.4	11.2
Hamilton	12	36.5	11.5	13.3
Calgary	8.9	33.3	8.4	10.1
Montreal	7.4	31.8	10.0	11.8
Quebec	6.3	30.7	10.3	12.1
Greater Vancouver region district	5.1	28.8	5.4	5.4

3.5 Total life Years Gained

3.5.1 Ozone

The total life years gained across each age group is determined initially specific to gender and under the three assumptions for a change in the ozone concentrations. The detailed results are listed in Appendix C for each of the eight cities. The total life years gained across all age groups undiscounted and discounted at 3% and 7% are presented in tables 3-1 to 3-9 found on the next pages. Table 3-1 shows a summary of all the results for all cities.

The distribution of total life years gained across the age groups for the eight cities based on the effect estimate obtained from Bell et al. (2004) for ozone is shown on Figure 3-7. Not surprisingly the health impacts (life years) are generally larger in Toronto; there results for each city are expected to scale in rough proportion to their respective population sizes. Similary, the distribution of total life years gained across the age groups for the cities using the Levy et al. (2005) effect estimate for ozone is illustrated on Figure 3-8. The pattern of distribution of total life years gained is similar to that observed using the effect estimate from the Bell et al. (2004) study. There is an obivous blip in both Figures 3-7 and 3-8 in the 80-84 age group. This drop in the total life years gained is the result of the fact that 80-84 age group has a lower death counts than 85+ age group across the eight cities. The estimates of total life years gained across the eight are higher by approximately 24% when using the Levy et al. (2005) study than when using the Bell et al. (2004) study.

The use of discounting rates reduces the estimates of the total life years gained. For example, using a discounting rate of 3% yields an approximately 20% higher estimates of total life years gained than using a 7% discount rate. Also, the assumption of the residual life

expectancy of the population affects the estimates of the total life years gained. The assumption of the residual life expectancy of the population that yeilds the highest gain in total life years gained is when residual life expectancy of the general population is used followed by the assumption of average COPD and then severe COPD. When combining the two parameters (i.e. assumption of residual life expectancy of the population and discounting rate), the highest estimates obtained is higher than the lowest estimate (i.e. highest estimate is when using the assumption of the general population and no discounting versus the estimate when using the assumption severe COPD and discounting rate of 7%) by a factor of 2.70. In conclusion, the parameter that has the biggest impact on the estimates of the total life year gained is the assumption of the residual life expectancy of the population. For example, the estimates of the total life years gained under the assumption of the general population (undiscounted) is higher by a factor of 2.08 than the estimate obtained under the assumption of population with severe COPD (undiscounted).

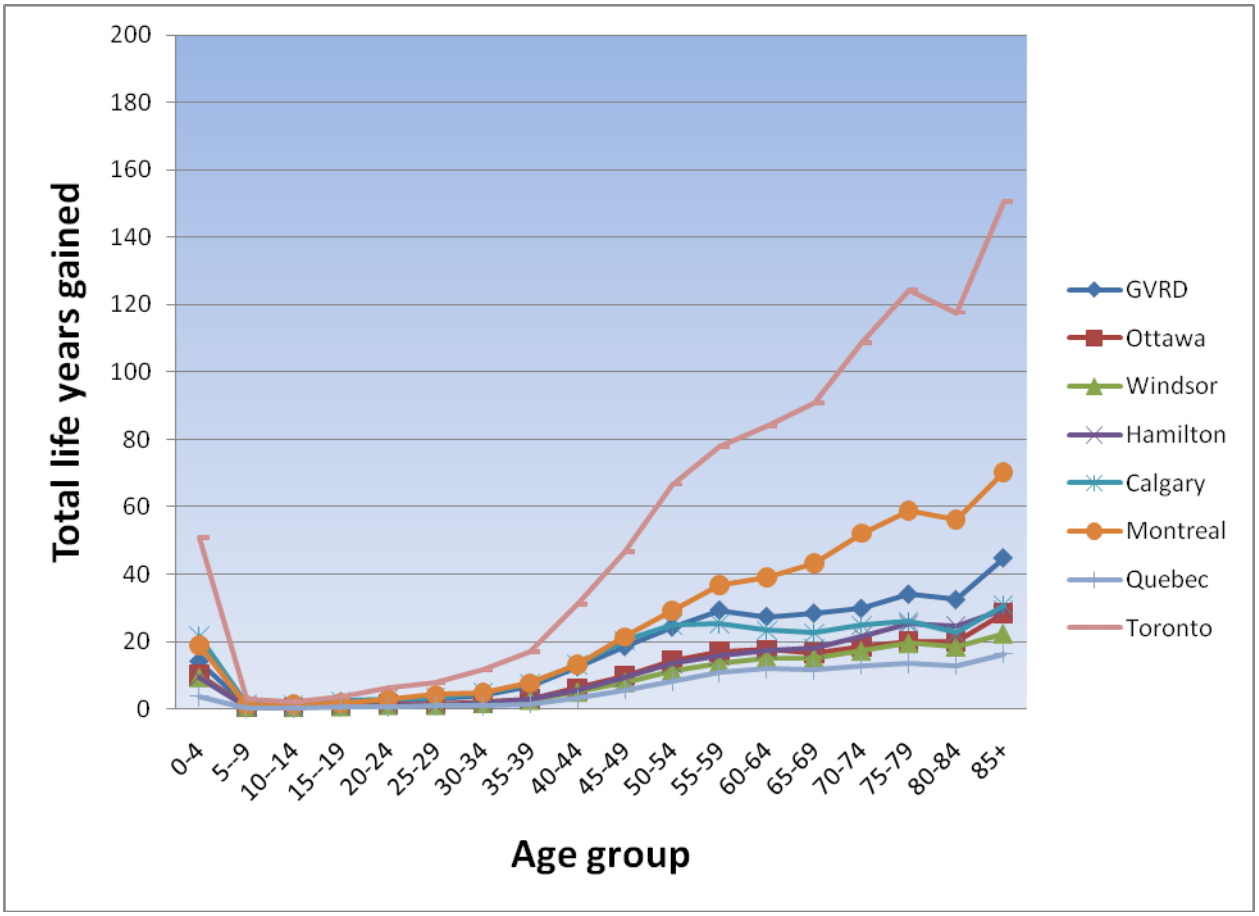


Figure 3-7: The distribution of total life years gained per year associated with elimination of ozone exposure across the age groups collapsed for both genders using the effect estimate obtained from Bell et al. (2004).

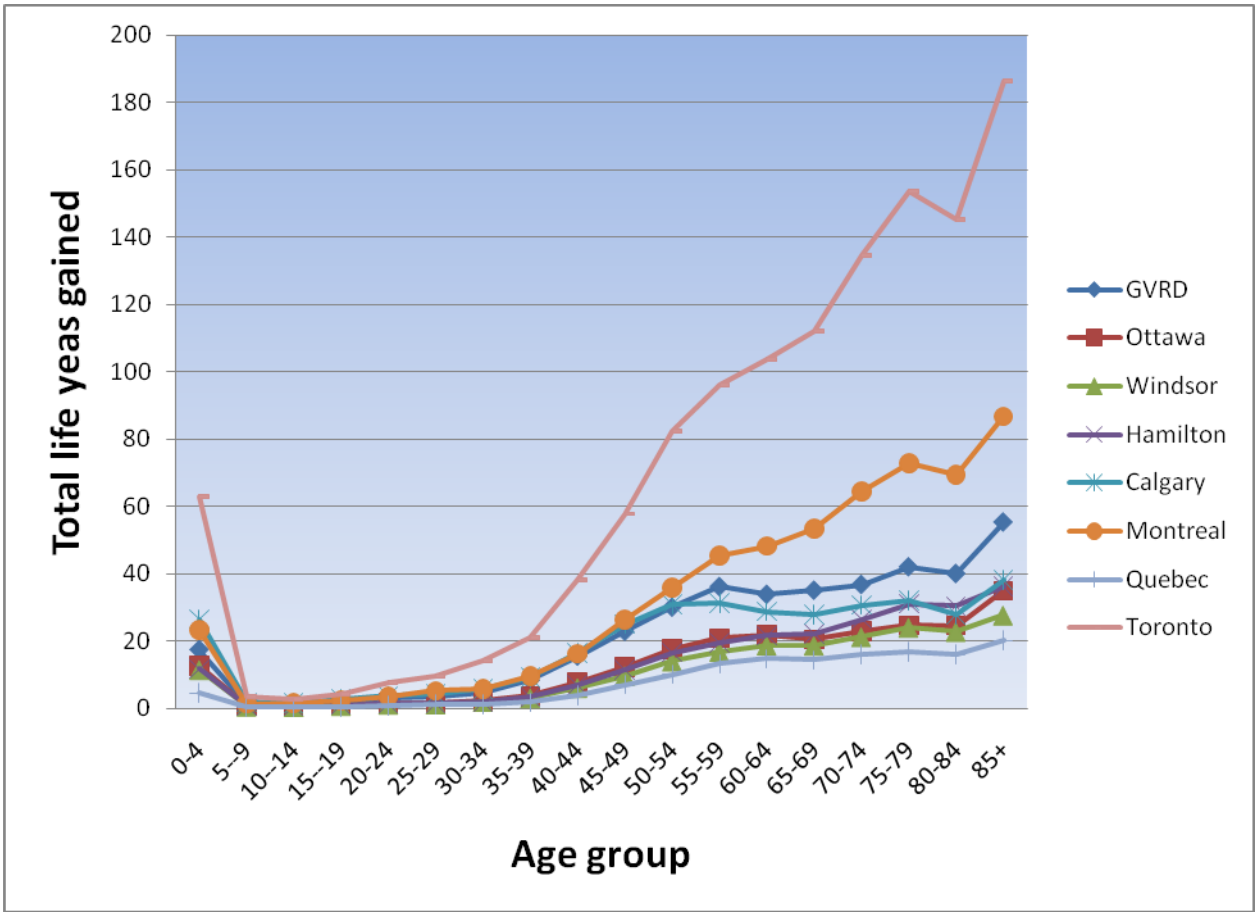


Figure 3-8: The distribution of total life years gained per year associated with elimination of ozone exposure across the age groups collapsed for both genders using the effect estimate obtained from Levy et al. (2005).

3.5.2 $PM_{2.5}$

The total life years gained for a change in $PM_{2.5}$ concentrations is also determined for each city specific to gender and age group. A detailed summary of the results specific to gender and age groups for each of the eight cities is presented in Appendix C. However, a summary of the overall total life years gained, undiscounted and discounted at 3% and 7% rates , for each of the eight cities and total of all cities using the effect estimate from Pope et al. (2002) and Laden et al.

(2006) are shown on tables 3.1-3.9. The impacts estimated due to eliminations in $PM_{2.5}$ concentrations are much larger than those due to reductions in ozone concentrations (i.e. 10-30 fold more). The distribution of the total life years gained across the age groups and gender specific for the eight cities from $PM_{2.5}$ concentrations are illustrated on Figure 3-9 and 3-10. Figure 3-9 shows the results when using the effect estimate from Pope et al. (2002); whereas, Figure 3-10 presents the results based on the effect estimate from Laden et al. (2006). From both figures we see that the pattern of the distribution of total life years gained across the eight is similar to that of ozone. The obvious drop in the last age group in both figures is the result of the fact that age group 75-84 has a higher death counts than the age group 85+, combined with the smaller residual life-expectancy ascribed to the latter age interval (though the former difference, namely in death counts, seems the primary explanation). The city that has the highest distribution of total life years gained is Toronto followed by Montreal and Greater Vancouver region disctrict. The biggest gain in the estimates of the total life years gained is obtained using the Laden et al. (2006) study undiscounted. In fact, the estimates of total life years gained based on Laden et al. (2006) are higher by approximately factor of 2.66 than those based on Pope et al. (2002). Also, the use of 3% discounting rate, in both studies, results in estimates that are approximately higher by a factor of 1.28 than using the 7% discounting rate. Thus, the use of discount rates reduces the estimates of the gains in total life years as expected.

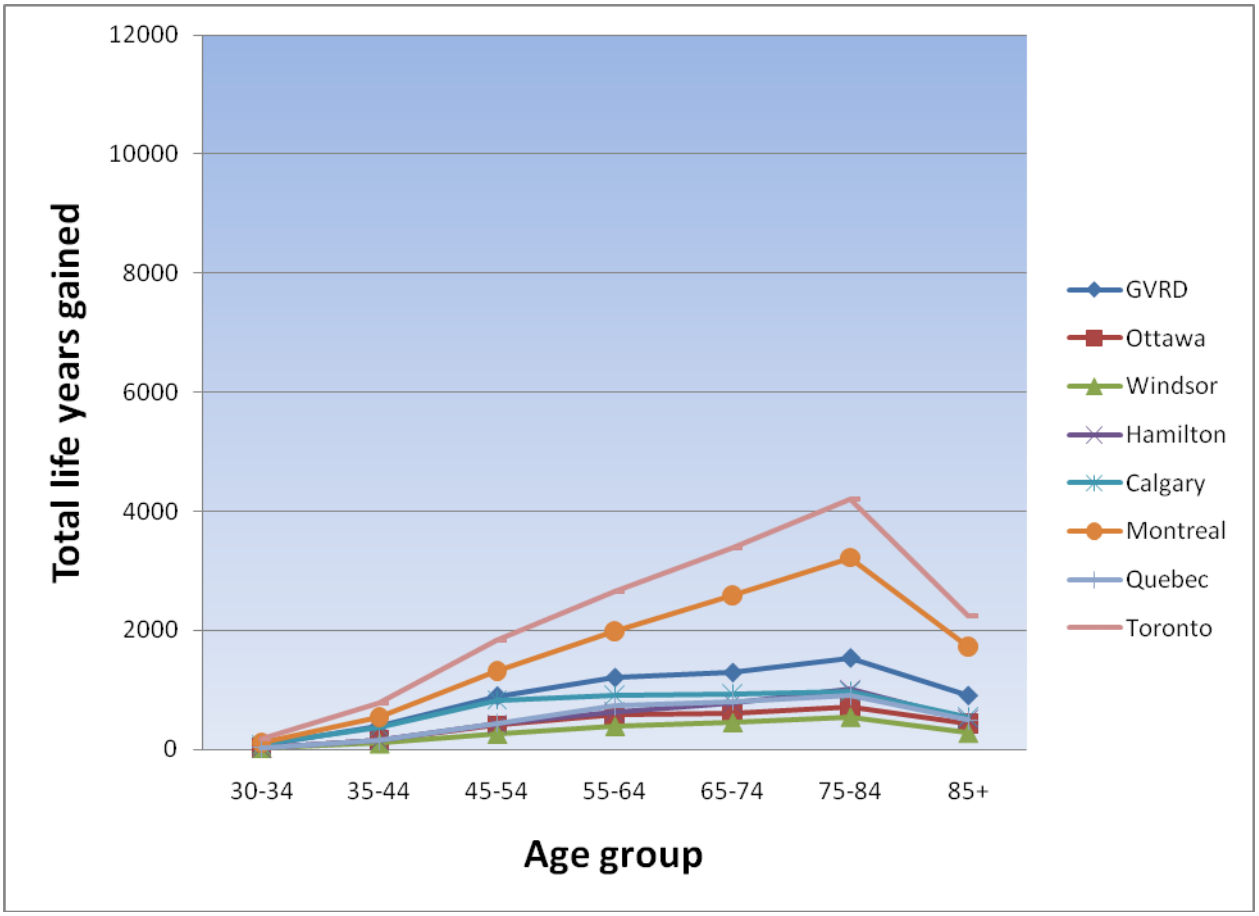


Figure 3-9: The distribution of total life years gained per year associated with elimination of $PM_{2.5}$ exposure across the age groups collapsed for both genders using the effect estimate obtained from Pope et al. (2002).

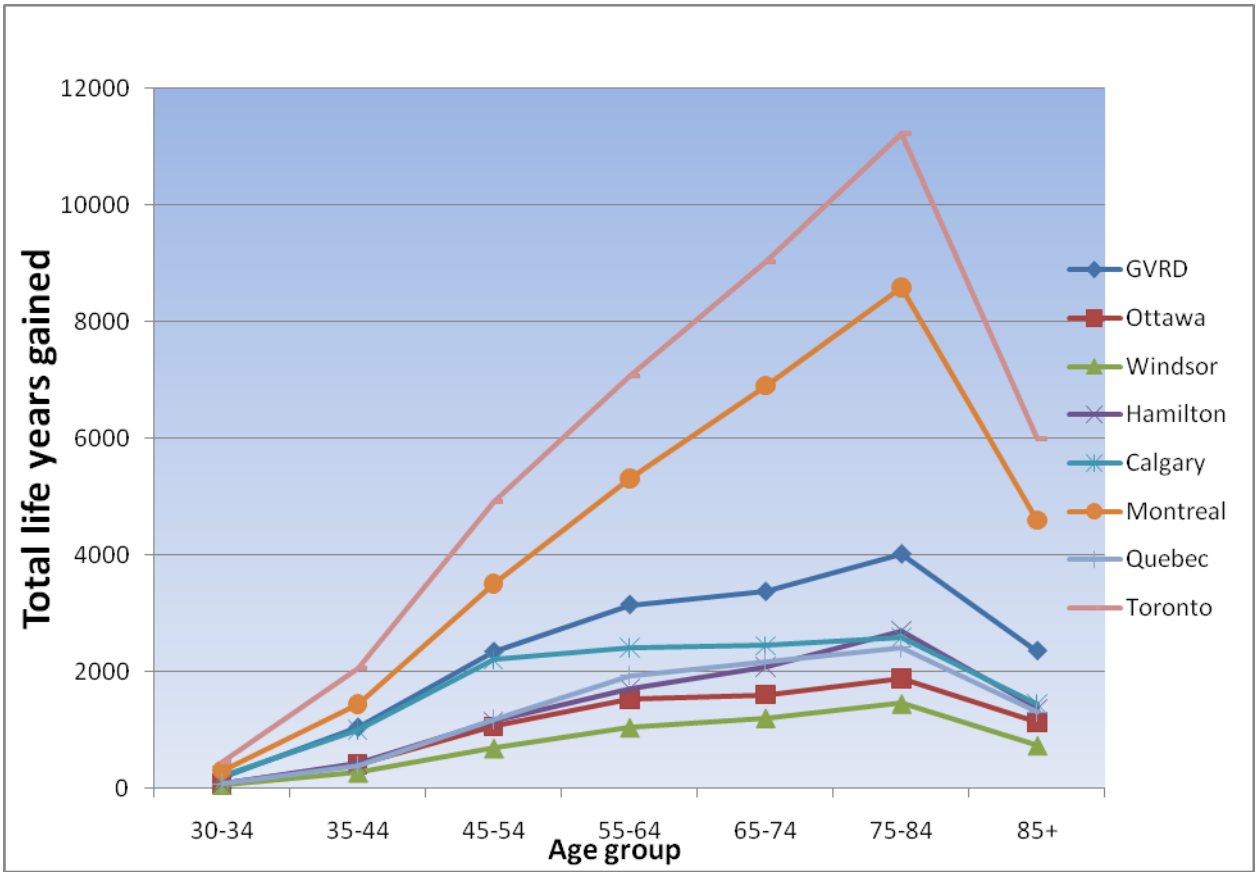


Figure 3-10: The distribution of total life years gained per year associated with elimination of $PM_{2.5}$ exposure across the age groups collapsed for both genders using the effect estimate obtained from Laden et al. (2006) for $PM_{2.5}$.

3.6 Quality Adjusted Life Years (QALYs)

The reader is reminded that the QALY estimates obtained herein focus exclusively on QALYs attributable to changes in morbidity alone; the impacts associated with changes in mortality are assumed to have already been captured in the analysis of changes in life-years. The QALYs, undiscounted and discounted, gained per incidence avoided of CB and AMI for $PM_{2.5}$ are determined. The detailed results for each of the eight cities are presented in Appendix C. A summary of the QALYs gained across all of the age groups for the cities are presented in Tables

3.1-3.9. The sum of the impact function of CB and AMI are also presented in the same tables. The results indicate that there are more cases of AMI than there are of CB (i.e. by approximately a factor of 1.6). However, the QALYs gained as a results of CB are higher than those gained as a result of the AMI (i.e. by approximately a factor of 2.58). In general, the relative trend and pattern of the various outcomes is consistent from city to city and also the order of the cities for each impact is consistent and porportional to the population sizes of each city.

Table 3.1: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the eight cities for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 193 (172-218)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		1122 (885-1404)	886 (705-1103)	724 (581-895)	General population
		859(684-1068)	705 (566-871)	598 (484-734)	With average COPD
		528 (430-644)	457 (375-553)	408 (338-491)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 239 (224-256)	3469 (3268-3696)	2756 (2602-2929)	2267 (2145-2403)	General population
		2697 (2548-2864)	2228 (2110-2360)	1903 (1807-2011)	With average COPD
		1719 (1637-1801)	1500 (1432-1575)	1350 (1292-1415)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 3396 (2951-4050)	49691 (43350-58930)	38328 (33410-45520)	29810 (25960-35410)	General population
	Laden et al.(2006) **Avoided deaths**= 9032 (8031-10607)	132124 (117900-154500)	101919 (90850-119310)	79276 (70610-92870)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 3235 (2748-4254)	16215 (12960-23310)	9078 (7110-12990)	4938 (3870-7040)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 5204 (4525-6431)	6279 (5436-7816)	4924 (4278-6096)	3779 (3284-4681)	General population

Table 3.2: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Toronto for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 73 (55-94)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		1001 (763-1293)	766 (584-989)	603 (460-779)	General population
		738 (562-954)	584 (445-755)	477 (364-617)	With average COPD
		407 (310-526)	336 (256-434)	287 (219-371)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 90 (76-106)	1237 (1043-1462)	946 (798-1118)	745 (629-881)	General population
		912 (770-1078)	722 (609-854)	590 (510-678)	With average COPD
		503 (424-595)	415 (350-491)	355 (300-420)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths** = 1070(617-1763)	15238 (8790-25090)	11825 (6820-19480)	9253 (5430-15230)	General population
	Laden et al.(2006) **Avoided deaths** = 2862(1860-4330)	40750 (26400-60600)	31624 (20500-47030)	24745 (16040-36790)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 899(415-1879)	4600 (1000-11340)	2556 (560-6280)	1380 (310-3410)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 1455(775-2651)	1793 (979-3366)	1374 (748-2568)	1053 (575-1967)	General population

Table 3.3: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Ottawa for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 13 (10-17)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		188 (143-242)	142 (109-183)	111 (85-143)	General population
		140 (107-180)	110 (84-141)	89 (68-114)	With average COPD
		78 (60-101)	64 (49-82)	54 (41-70)	With severe COPD
	Levy et al.(2005) **Avoided deaths** =16 (14-19)	233 196-274)	176 (148-207)	137 (116-162)	General population
		173 (145-204)	135 (114-160)	110 (92-129)	With average COPD
		97 (84-111)	79 (69-91)	67 (58-77)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 199 (114-324)	2919 (1670-4740)	2245 (1280-3640)	1742 (995-2824)	General population
	Laden et al.(2006) **Avoided deaths**= 523 (343-779)	7666 (5030-11420)	5895 (3870-8780)	4575 (3010-6820)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 227 (104-468)	1155 (270-2830)	646 (153-1581)	350 (82-856)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 380 (217-644)	499 (256-976)	380 (195-740)	288 (147-559)	General population

Table 3.4: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Windsor for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** =12 (9-15)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		164 (125-211)	124 (95-160)	97 (74-125)	General population
		122 (93-157)	96 (73-123)	78 (59-100)	With average COPD
		68 (52-87)	56 (42-72)	47 (36-61)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 14 (12-17)	202 (170-238)	154 (129-181)	120 (101-141)	General population
		150 (126-177)	118 (99-139)	96 (80-113)	With average COPD
		84 (70-99)	69 (58-81)	58 (49-69)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 139 (80-229)	2045 (1180-3370)	1579 (909-2599)	1228 (2140-4890)	General population
	Laden et al.(2006) **Avoided deaths**= 371 (243-555)	5439 (3560-8140)	4199 (2750-6280)	3266 (2140-4890)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 245 (198-342)	1214 (279-2274)	685 (155-1282)	372 (84-696)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 195 (105-356)	245 (130-453)	187 (100-346)	143 (76-264)	General population

Table 3.5: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Hamilton for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths**= 14 (11-19)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		198 (151-256)	152 (116-197)	120 (92-156)	General population
		146 (111-188)	116 (88-150)	95 (72-123)	With average COPD
		80 (61-103)	66 (51-86)	57 (43-74)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 18 (15-21)	245 (207-288)	188(159-222)	149 (126-175)	General population
		180 (152-212)	144 (121-169)	118 (99-139)	With average COPD
		99 (83-116)	82 (69-97)	71 (59-83)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths$_5$**= 248 (145-408)	3531 (2060-5810)	2748 (1610-4520)	2153 (1257-3542)	General population
	Laden et al.(2006) **Avoided deaths**= 667 (427-1014)	9482 (6080-14410)	7378 (4730-11220)	5781 (3700-8800)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 195 (101-353)	962 (210-2430)	541 (120-1370)	295 (65-746)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 341 (200-568)	415 (219-776)	320 (169-598)	246 (130-460)	General population

Table 3.6: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Calgary for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 17 (13-22)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		279 (212-360)	202 (153-260)	152 (116-196)	General population
		213 (162-275)	159 (121-206)	124 (95-161)	With average COPD
		126 (96-163)	99 (75-128)	81 (62-104)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 21 (18-25)	345 (291-407)	249 (210-294)	188 (159-221)	General population
		264 (223-311)	197 (166-232)	154 (130-181)	With average COPD
		156 (132-184)	122 (103-144)	100 (84-118)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 280 (162-459)	4643 (2690-7610)	3457 (2000-5660)	2609 (1510-4280)	General population
	Laden et al.(2006) **Avoided deaths**= 741 (484-1112)	12290 (8020-18440)	9150 (5970-13730)	6906 (4510-10370)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 522 (240-1040)	2617 (610-6310)	1464 (340-3520)	798 (190-1920)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 883 (481-1589)	1078 (583-1955)	830 (448-1503)	641 (348-1156)	General population

Table 3.7: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Montreal for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 34 (26-44)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		463 (354-597)	357 (272-460)	282 (215-364)	General population
		341 (260- 439)	272 (208-351)	223 (170-288)	With average COPD
		186 (142-240)	155 (119-200)	134 (102-172)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 42 (35-50)	572 (482-676)	441 (371-520)	348 (293-412)	General population
		421 (354-497)	336 (283-396)	275 (232-325)	With average COPD
		230 (194-272)	192 (166-220)	165 (143-189)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 816 (475-1362)	11487 (6680-19180)	8966 (5210-14970)	7056 (4100-11780)	General population
	Laden et al.(2006) **Avoided deaths**= 2177 (1422-3281)	30632 (20000-46200)	23908 (15620-36060)	18815 (12290-28410)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 628 (285-1270)	3083 (730-7590)	1736 (410-4260)	951 (230-2330)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 1073 (579-197)	1294 (690-2390)	997 (534-1843)	768 (412-1418)	General population

Table 3.8: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Quebec for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 8 (6-11)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		116 (89-150)	90 (68-116)	70 (54-91)	General population
		86 (66-111)	69 (52-89)	56 (43-72)	With average COPD
		47 (36-61)	40 (30-52)	34 (26-44)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 10 (9-12)	144 (121-169)	110 (93-130)	87 (73-102)	General population
		106 (89-125)	85 (72-100)	69 (58-82)	With average COPD
		58 (49-68)	49 (41-58)	42 (36-48)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 241 (140-400)	3535 (2050-5880)	2737 (1590-4550)	2135 (1237-3550)	General population
	Laden et al.(2006) **Avoided deaths**= 643 (418-971)	9440 (6140-14240)	7310 (4760-11020)	5702 (3710-8600)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 190 (210-2240)	906 (210-2240)	517 (122-1281)	286 (68-707)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 330 (176-603)	409 (216-753)	314 (166-578)	241 (128-443)	General population

Table 3.9: A summary of the estimated avoided deaths, total life years gained for O_3 and $PM_{2.5,}$ and QALYs related to $PM_{2.5}$ with 95% confidence intervals associated with the elimination of anthropogenic pollutant concentrations for the city of Greater Vancouver region area for one year.

Pollutant	**Study Name**	**Summary measure**			
		Total life years gained (95%CI)			
Ozone	Bell et al.(2004) **Avoided deaths** = 22 (16-28)	**Undiscounted**	**Discounted at 3%**	**Discounted at 7%**	**Assumption of health state of the population**
		315 (240-408)	238 (181-308)	185 (141-239)	General population
		235 (179-304)	184 (140-238)	148 (113-192)	With average COPD
		132 (101-171)	108 (83-140)	92 (70-118)	With severe COPD
	Levy et al.(2005) **Avoided deaths** = 27 (23-32)	390 (328-460)	294 (247-347)	228 (192-269)	General population
		290 (244-343)	227 (191-268)	183 (154-216)	With average COPD
		164 (138-193)	134 (113-158)	113 (95-134)	With severe COPD
$PM_{2.5}$	Pope et al.(2002) **Avoided deaths**= 402 (232-652)	6292 (3640-10170)	4772 (2760-7720)	3634 (2100-5880)	General population
	Laden et al.(2006) **Avoided deaths**= 1049 (696-1558)	16425 (10890-24380)	12456 (8260-18480)	9486 (6290-14070)	General population
		QALYs (95%CI)			
	Abbey et al.(1995) **Avoided Incidence CB**= 329 (154-638)	1678 (400-4020)	933 (220-2240)	504 (121-1209)	General population
	Peters et al.(2001) **Avoided Incidence AMI**= 547 (306-952)	546 (282-1025)	522 (290-912)	400 (222-698)	General population

3.7 Senstivity analyses

A senstivity analysis was conducted on the baseline incidence and weights of quality of life years for both CB and AMI. For CB we found that total incidence estimates summed over age groups based on Abbey et al. (1995) study are higher by approximately a factor of 2 relative to Marco et al. (2006). The findings using the Abbey et al. (1995) study are consistenly higher across all age groups than using Marco et al. (2006), but the difference is greater for younger age groups (see tables 3.10a-b). Applying alternative values for quality of life weights has only a small impact on QALYs compared to that of incidence rates. For AMI, the sum of incidences across all age groups when using the EPA (2008) report rates are almost the same as those obtained using Jack et al. (2009). However, in younger age groups the estimates obtained using the Jack et al. (2009) rates are lower than their counterparts when using the EPA (2008) report, while the opposite is true in older age groups. Using age specific incidence rates reduces the total estimated QALYs by almost half, while alternative quality of life weights have only a small impact. In general, these findings of the senstivity analysis for both CB and AMI are consistent across the eight cities.

Table 3.10a: Sensitivity analysis for city of Toronto for CB on two parameters, baseline incidence rates and the weights of quality of life.

Age	Baseline Measures		Sensitivity Measures		
Male	**# of new cases**	**QALYs**	**# of new cases**	**QALYs using sensitivity # of new cases**	**QALYs using sensitivity values for baseline #cases and sensitivity values for quality of life weights**
30-34	355	401	118	134	330
35-44	776	779	351	353	642
45-54	660	504	376	287	415
55-64	460	245	261	140	202
65-74	305	100	174	57	83
75-84	205	33	117	19	27
85+	55	5	31	3	4
Total	2816	2068	1428	991	1703
Female					
30-34	384	476	128	159	392
35-44	795	886	360	401	729
45-54	710	616	404	350	507
55-64	514	324	292	185	267
65-74	371	152	211	87	126
75-84	291	65	166	37	53
85+	108	13	62	7	10
Total	3174	2532	1622	1225	2085

Table 3.10b: Sensitivity analysis for city of Toronto for AMI on two parameters, baseline incidence rates and the weights of quality of life.

Age	Baseline Measures		Sensitivity Measures		
Male	**# of new cases**	**QALYs**	**# of new cases**	**QALYs using sensitivity # of new cases**	**QALYs using sensitivity values for baseline #cases and sensitivity values for quality of life weights**
30-34	62	56	433	394	58
35-44	135	110	946	768	113
45-54	738	458	805	500	474
55-64	513	222	560	242	227
65-74	618	173	372	104	178
75-84	819	132	250	40	138
85+	218	25	67	7	26
Total	3104	1175	3433	2055	1214
Female					
30-34	16	16	468	477	16
35-44	33	30	970	888	30
45-54	235	168	865	618	168
55-64	171	87	627	319	87
65-74	368	126	452	155	126
75-84	778	158	355	72	158
85+	289	32	132	15	32
Total	1890	618	3869	2543	618

Chapter 4 Discussion

4.1 Summary of Findings

Air pollution is a major environmental risk that has a negative impact on human health and is an important public health concern. This project estimated the effects of air pollution on mortality (life expectancy) and quality of life (i.e. quality adjusted life expectancy) in eight Canadian cities. The estimates provided in this thesis are based on the impact of the two air pollutants, ozone and fine particulate matter ($PM_{2.5}$). The mortality risk associated with each pollutant is used to determine life expectancy impacts for eight Canadian cities: Communaute-Urbaine-De-Quebec, Communaute-Urbaine-De-Montreal, Ottawa Division/Ottawa Carleton Regional Municipality, Toronto Division/Toronto Metropolitan Municipality, Hamilton Division/Hamilton-Wentworth Regional Municipality, Essex County (Windsor), Division No. 6 (Calgary), Greater Vancouver Regional District.

We determined that the total life years gained from the elimination of ozone exposure for the eight cities, assuming the residual life expectancy of the general population, baseline death counts, and using the effect estimate from the Bell et al. (2004) study, with a 95% confidence interval is 1122 (885-1404) years. Furthermore, under the same conditions but using discounting rates of 3% and 7% yields 886 (95% CI: 705-1103) years and 724 (95% CI: 581-895) years respectively. We used a 95% confidence interval to reflect the uncertainty in the parameters used (i.e. the uncertainty in the concentration-response function for the mortality and morbidity endpoints). Using the effect estimate from the Levy et al. (2005) study and assuming the life expectancy of the general population, we determine a total life years gained across the eight

cities to be 3469 (95% CI: 3268-3696) years. Similarly, under the same conditions and using discounting rates of 3% and 7% yields 2756 (95% CI: 2602-2929) years and 2267 (95% CI: 2145-2403) years respectively.

The estimates of total life years gained $PM_{2.5}$-related based on Pope et al. (2002), assuming the life expectancy of the general population, across the eight cities is 49691 (95% CI: 43350-58930). Furthermore, under the same conditions but applying discounting rates of 3% and 7%, the total life years gained are 38328 (95% CI: 33410-45520) and 39810 (95% CI: 25960-35410) respectively. When using the effect estimate based on Laden et al. (2006), the total life years gained undiscounted, discounted at 3% and 7% rates are: 132124 (95% CI: 117900-154500), 101919 (95% CI: 90850-119310) and 79276 (70610-92870) respectively. Similar to the ozone analysis, the estimates in this report are higher than their counterparts in the EPA (2008) report. The intervention of reducing $PM_{2.5}$concentration levels extends the number of life years lived each year considerably for each of the eight cities studied. In fact, the average life years lost per death due to $PM_{2.5}$ exposure is 14.2 years. The difference in the estimates between our report and that of the EPA (2008) are due to the same reasons explained for ozone. The estimated change in the $PM_{2.5}$ pollutant used in this thesis ranged from 5.4 ug/m^3 to 11.5 ug/m^3; whereas, the EPA (2008) report was 0.014 ug/m^3 (i.e. 400- 800 fold difference).

To provide another perspective on the results obtained from the analysis in this thesis, we look at the concept of potential years of life lost. Potential years of life lost (PYLL) is defined as the number of years lost by an individual due to premature death that occurred before age 75. We estimated the potential years of life lost due to ozone and $PM_{2.5}$ exposure. For example, according to the eight cities the PYLL due to ozone exposure using the effect estimate from Bell

et al. (2004) and the assumption of residual life expectancy of the general population is 12.17 per 100,000. The PYLL from external-cause, all-cause, maternal conditions, and skin diseases mortality for the province of Ontario are 834.3, 4864, 4.6, 3.9 per 100,000 respectively. The PYLL due $PM_{2.5}$ exposure using the effect estimate from Pope et al. (2002) and the assumption of residual life expectancy of the general population is 538.96 per 100,000. The estimates of PYLL according the different studies, effect estimates, and assumptions of residual life expectancy are summarized below in a chart. External cause mortality does not include deaths due to air pollution. From the estimates detailed below, we observe that the PYLL due to $PM_{2.5}$ exposure are comparable to the external cases mortality of the province of Ontario.

Study	**Potential Years of life lost per 100,000**	**Assumption of health state of the population**
Bell et al. (2004) Ozone	12.17	General population
	9.32	With average COPD
	5.73	With severe COPD
Levy et al.(2005) Ozone	37.62	General population
	29.25	With average COPD
	18.64	With severe COPD
Pope et al.(2002) $PM_{2.5}$	538.96	General population
Laden et al.(2006) $PM_{2.5}$	1433.05	General population

The reductions in levels of $PM_{2.5}$ also lead to reductions in serious illnesses, such as CB and AMI that affect the quality of life. The total number of cases related to CB and AMI associated with elimination in $PM_{2.5}$ exposure across the eight cities that could be avoided are

3235 (95%CI: 2748-4254) and 5204 (95%CI: 4525-6431) respectively. Furthermore, the average QALYs gained per new case averted for CB and AMI are 4.9 and 1.3 QALYs respectively. The QALY approach is used because it attempts to quantify morbidity impacts which can then be added to the measures of life years gained. The QALYs gained undiscounted and discounted at 3% and 7% rates as a result of the elimination in CB are: 16215 (95% CI: 12690-23310) years, 9078 (95% CI: 7110-12990) years, and 4930 (95% CI: 3870-7040) years respectively. Similarly, the QALYs gained undiscounted and discounted at 3% and 7% rates as a result of the elimination in AMI are: 6279 (95% CI: 5436-7816) years, 4924 (95% CI: 4278-6096) years, and 3779 (95% CI: 3284-4681) years respectively. In summary, the advantage of QALYs is that it measures the quality of life years lived and the quantity of life lived and sums them into a single number estimate. In this thesis, the estimated number of QALYs represents the number of life years adjusted (i.e. morbidity only) for quality of life that would be achieved by reducing the $PM_{2.5}$ concentration levels. The results obtained in this thesis indicate that the two air pollutants have significant impact on the health of the population.

4.2 Analysis and Interpretation of the Results

The trend in the results from the analysis for both pollutants, ozone and $PM_{2.5}$, is consistent with the trend of the results in the EPA (2008) report. However, direct comparison between the results obtained in this project and their counterparts in the EPA (2008) report is not provided here due to some difference in the methodology followed. The analysis conducted in the EPA (2008) report is for the entire population of the United States, while the analysis done in this thesis is for eight major cities in Canada. Yet, the similarity between our results and those of the EPA (2008) report is in the age pattern and the trends of the results of certain outcomes.

When comparing the results obtained for the total life years gained to their counterparts in the EPA (2008) report, we see the results obtained in this thesis are higher. The majority of the difference between the two estimates is largely due to the difference in the value used for the estimated change in the pollutant concentration. The estimated change in the pollutant concentration across the eight Canadian cities ranged from 5.1ppb to 13.7ppb; whereas, the estimated change used in the EPA (2008) report ranged from 0.005ppb to 0.019ppb. The other factors that explain the differences between the values obtained in this thesis and the EPA (2008) report are the difference in baseline incidences (i.e. the death counts), the life expectancy of the general populations, and the difference in the population demographics.

The large difference in the values used for the estimated change in the pollutant concentrations between our analysis and that of the EPA (2008) report lies in the method we used to determine the change in the pollutant concentrations. The EPA (2008) report estimates the change in the pollutant concentrations by hypothetically reducing the current pollutant concentrations standards to specified new standards. On the other hand, this thesis determines the anthropogenic concentration of the pollutant by subtracting the background concentration from the measured urban concentrations. Furthermore, the background concentration is defined as the concentration that would occur if all North America anthropogenic sources of pollutants and their precursors are terminated. The background concentration of the pollutant is caused only by the natural emissions of the pollutant and its precursors (i.e. pollution produced by nature). Therefore, the estimates obtained in the thesis reflect the number of total life years gained if we were to eliminate all of the unnatural sources of air pollutions.

The difference in the second factor, death counts, between this thesis and the EPA (2008) report is due to the difference in the population size primarily; though differences in the mortality rates between the United States and Canada also play a minor role. The baseline death counts while largely driven by differences in population size, may also be affected by differences in the age-composition between the US and Canadian populations (though these are expected to be small differences). Furthermore, since air pollution mortality risks are part of the non-accidental deaths, the mortality counts in this thesis are adjusted for accidental deaths. However, it is not clear whether the EPA (2008) report adjusts for accidental deaths when determining their baseline incidences. The adjustment factor used in this thesis to convert all-cause mortality into non-external mortality was typically so close to unity that this adjustment is unlikely to have a material influence upon our final results. The difference in the third factor, the residual life expectancy of the general population, between our analysis and the EPA (2008) report is simply due to different factors that affect the life-expectancies of the two populations.

In general, the number of the total life years gained depends on the life expectancy of the population. An upper bound assumption for the total life years gained for ozone-related premature death of an individual of a given age is obtained if we assumed the life expectancy in the general population of that age. However, there are some concerns that air pollution affects preferentially impacts upon those individuals with pre-existing chronic conditions whose life expectancy is shorter than that of the general population. Therefore, we determined the total life years gained under two additional scenarios (i.e. as a sensitivity analysis): assuming life expectancy of the population with average COPD and assuming severe COPD. The estimates of the total life years gained across the eight cities under the assumption of life expectancy of the

population with average COPD and assuming severe COPD were 859 (95%CI: 684-1068) and 528 (95%CI: 430-644) respectively using the Bell et al. (2004) concentration-response function. Similarly, using the Levy et al. (200%) concentration-response function, the estimated total life years gained under the assumption of life expectancy of the population with average COPD and assuming severe COPD were 2697 (95%CI: 2548-2864) and 1719 (95%CI: 1637-1801) respectively. The estimates under the two intermediate assumptions in this thesis are proportionally similar to their counterparts in the EPA (2008) report.

The estimates of the total life years gained under the assumption of the life expectancy of the population with severe COPD are smaller than that of average COPD. This is consistent with the fact that the life expectancy of a population with severe COPD is shorter than a population that has average COPD. The findings of total life years gained under the two assumptions regarding the residual life expectancy indicates the total life years gained is sensitive to the residual life expectancy of the general population. Another way of looking at the significance of the findings is to determine the average life years lost per death. We estimated that the average life years lost per death (regardless of the source study for the concentration-response function) is 13.8 years assuming the residual life expectancy of the general population. However, if we assume the residual life expectancy of the general population with average COPD and severe COPD, we estimate that the average life years lost per death is 10.0 and 5.4 years respectively. These findings indicate that estimated impacts are strongly influenced by what we assume regarding the underlying health status of the population affected by ozone. In general, the life expectancy of the general population includes individuals with chronic conditions. As a result, mortality rates of the general population reflect the prevalence of chronic diseases. Since the

effect estimates used to determine the total life years gained for $PM_{2.5}$ is based on long-term exposure, we only use the life expectancy of the general population because it reflects the prevalence of those chronic conditions (EPA, 2008).

The estimates of QALYs gained as an elimination of $PM_{2.5}$ for the two chronic conditions are higher than their counterparts in the EPA (2008) report (i.e. without adjusting for the population size) for the same reasons explained for ozone and $PM_{2.5}$ and mortality. However, the results for the QALYs gained per avoided incidence of CB and AMI (shown in Appendix C) obtained are very similar to those of the EPA (2008) report. For example, the QALYs gained per avoided incidence of CB undiscounted just for the city of Toronto, for the age group 35-44, is 7.07 years compared to 9.91 years for the same age category in the EPA (2008) report. Similarly, the QALYs gained per avoided incidence of AMI undiscounted for Toronto city for the age group 35-44 is 2.86 years versus 2.81 years in the EPA (2008) report.

There were five outcome measures reported in this thesis (i.e. # of avoided deaths, total life years gained, average life years lost per death, QALY, and potential years of life lost). All of these outcome measures are based on the use of relative risk (RR), which is determined by taking the ratio of the probability of developing the disease in the exposed group versus the non-exposed group. The outcome avoided death counts (or attributable deaths) are a specific estimate that only identifies the number of deaths that could be avoided by the given intervention (i.e. elimination of air pollution) and the resulting changes in exposure. The advantage of using attributable deaths is that it quantifies the impact of the given intervention on the entire population. However, the attributable deaths as an outcome measure is limited in that it does not account for the age distribution of the given population (i.e. it does not account for the timing of

the death counts). For example, an intervention that has attributable deaths of 150 is equivalent to another intervention that has the same number of attributable deaths, even though the first intervention targets younger age groups. Therefore, we used another outcome measure, total life years gained, to account for the age-distribution in our estimates of the impact of air pollution. The total life years gained is basically the product of attributable deaths and residual life expectancy. Further, life expectancy (LE), which is the expected remaining number of life years at a given age, is a product of life-table methodology. The use of residual LE in the thesis analysis allowed us to determine the impact of eliminating air pollutants on the number of life years for the given population. Thus, the use of total life years gained is more advantageous than the use of death counts and RR alone. The use of total life years gained gives policy makers information on the magnitude of the impact of elimination air pollution for the given population per exposure change (accounting for the age-distribution of the population). We have also estimated the average life years gained/lost per death. Further, the average life years lost/gained per death gives policy makers information on the magnitude of impact on individuals, which is not provided by RR, total life years gained or death counts.

We used QALY as another outcome measure because it quantify morbidity (i.e. CB an AMI) impacts on quality of life lived. We have used potential years of life lost (PYLL) as another outcome measure to provide another perspective and compare our results to a commonly reported outcome measure. PYLL is basically the number of years lost by an individual due to premature death that occurred before age 75.

There are two other studies similar to this thesis that were conducted to determine the impact of air pollution on the Canadian population. The Judek et al. (2004) study provided

estimates of the number of deaths that could be prevented annually if the air pollution from human sources within North America were eliminated. They found that the total number of deaths across Canada that could be prevented each year due to long- and short-exposure to air pollution is 5,900± 2,100. The concentration-response functions used in Judek et al. (2004) study to estimate the numbers of excess deaths associated with short-term and long-term exposure were obtained from Burnett et al. (2004) study and Krewski et al. (2000) study respectively. The Burnett et al. (2004) study was a 12 Canadian city 1981-1999 time-series study; whereas, the Krewski et al. (2000) study is based on 50 U.S. metropolitan areas over a 7 year period from the American Cancer Society cohort study. Applying the concentration-response function and death counts used by Judek et al. (2004), we estimate the deaths avoided due to elimination in ozone exposure in Toronto city to be 189 deaths. In contrast, applying the concentration-response functions from Bell et al. (2004) and Levy et al. (2005) on the death counts in Toronto city from the Judek et al. (2004) study, we estimate that the numbers of deaths avoided are 75 and 92 deaths respectively. The estimates of the number of deaths avoided in the thesis are lower than their counterpart in the Judek et al. (2004) study because our concentration-response functions values are smaller.

Performing a similar analysis to estimate the number of deaths avoided due to $PM_{2.5}$ exposure, we find that the number of deaths avoided in Toronto city according to Judek et al. (2004), and this thesis, are 1302 deaths, 1112 deaths (this thesis based on Pope et al. 2002), and 2979 deaths (this thesis based on Laden et al., 2006) respectively. The difference between the numbers obtained in this thesis and that of Judek et al. (2004) study is the result of the difference in the concentration-response functions used. In addition to the number of deaths avoided (i.e.

the change in incidence of death), our analysis attempts to quantify the number of deaths avoided in terms of total life years gained and quality-adjusted life years. Therefore, the advantage of our analysis over that of the Judek et al. (2004) study is that ours quantifies the number of potential life years gained from the number of deaths that could be avoided if we eliminate air pollution. When considering polices regarding air pollution, policy makers need to know the health impact of reducing air pollution on the population. The Judek et al. (2004) study only tells us the number of deaths prevented; those deaths avoided could mostly be in the older age groups, which would mean a lower gain in total life years gained. Yet, with the analysis performed in this thesis, we get a more practical and enhanced view of the gains (i.e. total # of life years gained, life years gained per death and total quality-adjusted life years) obtained from the elimination of two air pollutants.

Another study that conducts a similar analysis to the analysis in this project is Coyle et al. (2003). The Coyle et al. (2003) study estimates the total life years and quality-adjusted life years gained from changing sulfate pollution in Canada. It is not feasible to compare the estimates from Coyle et al. (2003) study to our estimates since they use a different methodology. However, we can compare the methodology used. The Coyle et al. (2003) study estimates of QALYs is obtained from a one unit reduction in sulfate pollution. The modeled scenario is simulated for a period of 105 years. The Coyle et al. (2003) study based its concentration response function (linking sulphate exposure to mortality) upon the American Cancer Society (ACS) cohort. They examined the association of sulphate pollution with life expectancy in 144 metropolitan statistical areas (MSAs) for the years 1980 and 1981. The Coyle et al. (2003) study found that one unit reduction in sulphate air pollution leads to an increase of 20,960 in QALYs. The Coyle et al. (2003) analysis propagated the air pollution risk through the life table in order to estimate

change in life expectancy. Furthermore, the increases in the population size were simulated by adding new members to the cohort at the birth rate of the year 2001. Whereas in this thesis, we used existing life expectancy and the number of deaths to determine total life years gained and QALYs. This is because according to the EPA report (2008) "Life expectancy is an ex ante concept, indicating the impact on an entire population's expectation of the number of life years they have remaining, before knowing which individuals will be affected. Life expectancy thus incorporates both the probability of an effect and the impact of the effect if realized. Life years is an ex post concept, indicating the impact on individuals who actually die from exposure to air pollution. Changes in population life expectancy will always be substantially smaller than changes in life years per premature mortality avoided, although the total life years gained in the population will be the same. This is because life expectancy gains average expected life years gained over the entire population, while life years gained measures life years gained only for those experiencing the life extension." The Coyle et al. (2003) study forecasts average life expectancy gains, using CRF from Brunekreef (1997) and Nevalainen and Pekkanen (1998), of 0.80 and 0.85 years respectively. The average life expectancy gains are estimated for age group 25 and up. Whereas, in this thesis we estimate that the average life years lost per death due to $PM_{2.5}$ exposure for age group 30 and up to be 14.3 years. Since the estimates of life years lost per death due to ozone exposure in this thesis are done for all age groups, it is not meaningful to compare that estimate to that of Coyle et al. (2003) results.

4.3 Review and Critique of Methods

The first part of the analyses is to obtain life tables for the target population. The analyses are done for eight Canadian cities. Ideally, life tables should be obtained for each city. However,

because city-level life table are not available, we obtain province-level life tables. Those life tables may not be specific for the city (i.e. their mortality estimates may not be reflective of the city target population); but, given that the population of the target cities are among the largest in size in their home province, using the province-level life table should provide a fairly accurate reflection for the population. If however, the life table of the target city is different from its home province, then estimates of the outcomes of that city would be biased. This type of bias would be the result of a systematic error that could be corrected. Therefore, since the target cities are among the large cities in terms of population size in their home province the use of province-level life tables provides a good estimate. Also, the age-specific mortality did not vary much between provinces; as a result, we do not expect much error in applying provincial life tables to individual cities.

The next step is to determine the number of death counts age- and gender-specific in the target population, which is not available directly. To perform this step, we need two elements, population size and mortality rates (age- and gender-specific) for each city. The population sizes (age- and gender-specific) for each city are available but not death counts nor the mortality rates. To overcome this problem, we obtain the mortality rates age- and gender-specific at the province level. Another challenge faced is that the total mortality risks need to be adjusted for external cause (i.e. accidental) risk since air pollution does not affect external cause mortality risk. The external cause mortality risks age- and gender specific are only available at the national level. We apply the modification ratio based on the national-level numbers to each city death counts to maintain estimates of death counts that are reflective of the actual city. Although, we do not use the ideal methods of determining the death counts for each city, the coupling of the actual

population size of the city with mortality rates from its home province should reduce any difference between the two populations (the two populations refer to the city and the province).

The death counts are then linked to the concentration-response function to determine the change in incidence of the health effect. For each of the pollutant, ozone and $PM_{2.5}$, two concentration response functions are used in the analyses. The accuracy of the outcome measures is limited by the accuracy of the concentration-response function. Any bias in the concentration-response function may bias the results upward or downward.

For ozone, the two effect estimates from Bell et al. (2004) and Levy et al. (2005) studies are used in the analyses. The Bell et al. (2004) study assesses the effect of short-term exposure to ambient ozone concentration with mortality in the United States. The Levy et al. (2005) study claims that there is a significant heterogeneity among the effect estimates based on Cochran's Q-statistics. The effect estimate from Levy et al. (2005) study is bigger than that of Bell et al. (2004) study by a factor of 1.24 (i.e. an absolute difference of 0.00008). In summary, the Bell et al. (2004) study provides an estimate for the concentration-response function of ozone that is based on a multisite time-series study of 95 large US urban communities throughout a 14-year period. Similarly, the Levy et al. (2005) study provides an estimate for the concentration-response function of ozone based on a meta-regression analysis that includes 28 studies (the studies population include population from the US, Canada and Europe etc).

Similar to ozone, the concentration-response function for $PM_{2.5}$ used in the analyses are obtained from two studies, Pope et al. (2002) and Laden et al. (2006). The two studies use Cox proportional hazards regression to estimate the effect of $PM_{2.5}$ long-term exposure on all-cause mortality. Furthermore, the two studies do not indicate anywhere in their respective paper's

whether the estimates of all-cause mortality they use are adjusted for external cause mortality risk or not. One of the advantages of using the Pope et al. (2002) study is that it has a long follow-up period of more than 16 years. The Pope et al. (2002) study also controlled for the following covariates: education, marital status, BMI, smoking, diet, and alcohol consumption. The finding of the Pope et al. (2002) study provides strong evidence for the association between $PM_{2.5}$ long-term exposure and all-cause mortality risks in the United States. A unique feature of the Laden et al. (2006) study is it assesses the effect of recent versus past exposure for Harvard Six Cities cohort. They found that in the extended follow-up period the average concentrations of $PM_{2.5}$ are lower; and as a result, the mortality risks associated with this period are lower. These findings led the authors to conclude that the $PM_{2.5}$ associated mortality are at least in part reversible suggesting that ambient $PM_{2.5}$ concentrations are associated with exacerbation of existing disease. The effect estimate from Laden et al. (2006) study is bigger than that of Pope et al. (2002) study by a factor of 2.55 (i.e. an absolute difference of 0.009). In summary, both studies provide strong evidence for a significant association of $PM_{2.5}$ exposure with all-cause mortality.

In addition, two other studies that establish the association of $PM_{2.5}$ exposure with CB and AMI are used in this thesis. The Abbey et al. (1995) study determines the association of long-term $PM_{2.5}$ exposure with CB incidence in the United States. A critical limitation of the Abbey et al. (1995) study is that it cannot truly separate the effects of TSP, PM_{10} and $PM_{2.5}$ because the ambient concentrations of PM_{10} and $PM_{2.5}$ are indirectly estimated. The study uses multiple logistic regressions to study the association between the change in $PM_{2.5}$ long-term exposure and CB. Furthermore, the study adjusts the estimate of the association for the following possible confounders: age, education, sex, childhood colds, possible symptoms in

1977, years smoked prior to 1977, and years lived with a smoker. With the exception of a possible bias due to method used to estimate $PM_{2.5}$ exposure, the Abbey et al. (1995) study provides strong evidence for a significant association of $PM_{2.5}$ exposure with CB. The Peters et al. (2001) study determines the association of $PM_{2.5}$ exposure and AMI incidence in the United States. The study uses a case-crossover design to assess the change in AMI risk after exposure to $PM_{2.5}$. A key advantage of the case-crossover design is that each patient acts as his or her own control based on their past exposure experience. Although the design of case-crossover control for inherent risk factor associated with myocardial infarction, such as sex, age and hypertension, this design does not control for time-varying risk factors, such as time of day, season, or weather. However, the authors in the study adjust for those possible confounders using multivariate analyses. In summary, the Peters et al. (2001) study presents strong evidence of the association of $PM_{2.5}$ exposure and AMI risk.

The sensitivity analysis performed for CB indicates that the use of alternative values for the incidence rates of CB reduces the number of cases by approximately 50%. In the original analysis, we use a single incidence rate across all age groups and both genders, which leads to an overestimated number of cases in the younger age groups. In the sensitivity analysis, we use incidence rates that are age-specific. The use of age-specific incidence rates would typically be expected to produces more accurate estimates of the number of cases (provided the age-specific values were correct). Therefore, the reduction in the number of cases of CB in the sensitivity analysis is consistent with the fact that the use of age-specific incidence rates leads to a more accurate estimate of the number of cases. Furthermore, the sensitivity analysis done on the QALYs using the sensitivity values for the number of cases leads to a reduction of roughly 50% in the total QALYs. The factor of reduction in the total QALYs is consistent with the factor of

reduction in the number of cases. The sensitivity analysis performed on the weights of quality of life indicate that when we use the weights from the CCHS Cycle 3.1, the total QALYs is reduced by approximately 18%. The small reduction in the total QALYs is consistent with the fact that the Canadian values for weight of quality of life with CB are only slightly smaller than their counterparts used in the EPA (2008) report. According to the sensitivity analysis, we conclude that the total QALYs is more sensitive to the parameter of incidence rate (i.e. the baseline number of new cases) used in the analysis than the weights of quality of life used.

Similarly, the sensitivity analysis performed for AMI indicates that the use of alternative values for the incidence rates of AMI increases the number of cases by approximately 11%. The incidence rates of AMI used in the original analysis is age-and-gender-specific. The increase in the number of cases in the sensitivity analysis is due to the use of a single incidence rate across all age groups and both genders. The application of a single incidence rate of AMI to all age groups results in the number of cases being overestimated in the younger age groups. Furthermore, the sensitivity analysis done on the QALYs using the sensitivity values for the number of cases leads to an increase of roughly 175% in the total QALYs. The factor of increase in the total QALYs is not consistent with the factor of increase in the number of cases because of the age distribution of cases from using age-specific versus global incidence rates. The sensitivity analysis performed on the weights of quality of life indicate that when we use the weights from the CCHS Cycle 3.1, the total QALYs is increased by approximately 3%. The small increase in the total QALYs is consistent with the fact that the Canadian values for weight of quality of life with AMI are only slightly higher than their counterparts used in the EPA (2008) report. In conclusion, the total QALYs is more sensitive to the parameter of incidence

rate (i.e. the baseline number of new cases) used in the analysis than the weights of quality of life used.

In conclusion, the biggest and common limitation that applies to all the effects estimates used in these analyses is that we assume that those relative risks from non-Canadian population (they were mostly based on the population of the United States) are applicable to the general population of Canada. There may be factors with population of those studies that are not comparable to the general population of Canada. As a result of those differences, the air pollution impact function may be biased upward or downward.

After determining the impact function for each age group, we then link it to the residual life expectancy in each age group to determine the outcome measures: total life years gained and total quality-adjusted life years. The error in the outcome measures is dependent on the error in the input variables. We use Monte Carlo simulation as part of the @ Risk software to propagate the uncertainty in the input to determine the uncertainty in the outcome measures. Finally, those outcome measures allow us to forecast the effect of reductions in ozone and $PM_{2.5}$ concentrations on the population. In summary, the outcome measures determined in this thesis are based on the best and most relevant data available, but there are several remaining sources of potential error and bias.

4.4 Conclusions

The estimates of the effects of the two pollutants, ozone and $PM_{2.5}$, on the population's health of eight Canadian cities are determined in this project. The determination of changes in life years and life expectancy are accomplished by combining the standard health impact function and life

expectancy of the population (i.e. life expectancy obtained from standard life tables). However, certain assumptions about the baseline mortality risk for the population by air pollution are made. The first assumption is that air pollutant mortality risks affect the general mortality risk of the population equally. Yet, there are some concerns that air pollution affects significantly individuals with pre-existing cardiovascular and respiratory diseases, whose life expectancy is lower than the general population. This concern is addressed in this thesis by using the life expectancy of the population with average and severe COPD. The impact of key parameters used in the analysis is examined by changing them along with key assumptions: the discount rate, the concentration-response function for ozone and $PM_{2.5}$-related mortality, and the life expectancy of individuals who dies as a result of exposure to ozone. The total life years gained due to reduction in ozone exposure is significantly affected by the underlying assumption regarding residual life expectancy. The total life years gained as a result of reduction in both ozone and $PM_{2.5}$ are affected by the discounting rate used in the analysis. The QALYs gained from the association of $PM_{2.5}$ exposure with CB and AMI are significantly affected by the incidence rates used to determine the number of new cases. The QALYs for both CB and AMI are also affected, but to a lesser extent than incidence rates used, by the weights of quality of life used.

In summary, the estimates obtained in this thesis are basically estimates of potential total life years that could be gained each year if air pollution (i.e. specifically ozone and $PM_{2.5}$) from human sources within Canada were eliminated. The results of this project (i.e. the substantial impact of air pollution on life expectancy and quality-adjusted life expectancy) indicate that we need effective health policies that promote reduction of the current air pollution levels. The findings of this thesis can improve the basis of air pollution policies decisions, because it

provides additional information on the impact of air pollution on both life expectancy and quality-adjusted life expectancy. Furthermore, the findings of this thesis may be added to the Air Quality Benefits Assessment Tool (AQBAT). In conclusion, the impacts of air pollution as total life years gained or QALYs provides an alternative estimate to the monetary valuation employed in AQBAT. Given the observed sensitivity of the findings to key parameters, further application of this methodology should employ similar sensitivity analyses.

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Appendix A: Abridged and Complete Life Tables

							Average COPD			Severe COPD		
Age x	**lx**	**dx**	**qx**	**Lx**	**Tx**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	100000	657	0.007	497008	7736682	77.4	30.8	15.2	70.1	30.0	15.2	56.9	27.9	15.1
5--9	99343	59	0.001	496547	7239674	72.9	30.4	15.3	66.0	29.5	15.1	54.0	27.4	14.9
10--14	99284	82	0.001	496262	6743127	67.9	29.7	15.2	61.1	28.7	15.1	49.2	26.3	14.8
15--19	99202	251	0.003	495439	6246865	63.0	29.0	15.2	56.2	27.8	15.0	44.4	25.1	14.6
20-24	98951	329	0.003	493944	5751426	58.1	28.2	15.0	51.4	26.8	14.9	40.0	23.8	14.3
25-29	98622	334	0.003	492283	5257482	53.3	27.2	14.9	46.8	25.7	14.8	35.8	22.4	14.1
30-34	98288	389	0.004	490502	4765199	48.5	26.1	14.8	42.0	24.4	14.4	31.4	20.8	13.6
35-39	97899	527	0.005	488253	4274697	43.7	24.9	14.6	37.3	22.9	14.2	27.1	18.9	12.9
40-44	97372	807	0.008	485001	3786444	38.9	23.5	14.4	32.7	21.3	13.8	22.8	16.8	12.3
45-49	96565	1314	0.014	479769	3301443	34.2	21.8	13.8	28.2	19.4	13.1	18.8	14.6	11.2
50-54	95251	2003	0.021	471618	2821674	29.6	20.0	13.4	23.9	17.4	12.5	15.1	12.4	9.8
55-59	93248	3257	0.035	458736	2350056	25.2	18.0	12.6	19.7	15.2	11.5	11.8	10.1	8.6
60-64	89991	5174	0.057	437904	1891320	21.0	15.9	11.6	15.9	12.9	10.3	8.8	7.9	7.1
65-69	84817	7681	0.091	406035	1453416	17.1	13.6	10.5	12.5	10.6	8.9	6.5	6.0	5.5
70-74	77136	11014	0.143	359746	1047381	13.6	11.3	9.3	9.5	8.4	7.4	4.5	4.3	4.1
75-79	66122	15114	0.229	294338	687635	10.4	9.1	7.8	6.9	6.4	5.9	2.9	2.9	2.8
80-84	51008	17888	0.351	211070	393297	7.7	7.0	6.3	4.9	4.6	4.4	1.8	1.8	1.8
85+	33120	33120	1.000	182227	182227	5.5	5.1	4.8	3.2	3.1	3.0	1.0	1.0	1.0

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 12 for the upper year in the age group (i.e. In the age group 0-4, the estimates for lx

Age x	**lx**	**dx**	**qx**	**Lx**	**Tx**	**ex**	**3% Disc**	**7% Disc**
30-34	98288	389	0.004	490502	4765199	48.5	26.1	14.8
35-44	97899	1334	0.014	973254	4274697	43.7	24.9	14.6
45-54	96565	3317	0.034	951387	3301443	34.2	21.8	13.8
55-64	93248	8431	0.090	896640	2350056	25.2	18.0	12.6
65-74	84817	18695	0.220	765781	1453416	17.1	13.6	10.5
75-84	66122	33002	0.499	505408	687635	10.4	9.1	7.8
85+	33120	33120	1.000	182227	182227	5.5	5.1	4.8

Table 1b: Abridged life table, Ontario, 2000 to 2002: females									Average COPD			Severe COPD		
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
0-4	100000	571	0.00571	497403	8204363	82.04	31.29555	15.22972	75.30895	30.62654	15.22376	62.76701	28.96307	15.17802
5--9	99429	37	0.000372	497046	7706960	77.51	30.85997	15.25458	71.12914	30.13926	15.17622	59.84698	28.47908	15.15153
10--14	99392	55	0.000553	496846	7209914	72.54	30.31033	15.23287	66.17768	29.47815	15.1352	54.96843	27.57126	15.08611
15--19	99337	119	0.001198	496404	6713068	67.58	29.67509	15.20148	61.24529	28.71598	15.0796	50.13504	26.53246	14.7976
20-24	99218	134	0.001351	495758	6216664	62.66	28.94595	15.1609	56.37955	27.84694	15.01245	45.46136	25.37628	14.67991
25-29	99084	154	0.001554	495048	5720906	57.74	28.10271	15.09981	51.51728	26.84432	14.9153	40.79075	24.05062	14.50734
30-34	98930	208	0.002102	494162	5225858	52.82	27.12754	15.00878	46.66306	25.68894	14.77575	36.1324	22.5329	13.99335
35-39	98722	322	0.003262	492869	4731696	47.93	26.00726	14.88183	41.84049	24.36493	14.58186	31.53805	20.81566	13.62426
40-44	98400	523	0.005315	490786	4238827	43.08	24.7238	14.47489	37.08387	22.86035	14.0633	27.07842	18.91215	12.86108
45-49	97877	800	0.008174	487534	3748041	38.29	23.26155	14.21133	32.43562	21.1696	13.70098	22.83394	16.85025	12.27075
50-54	97077	1305	0.013443	482383	3260507	33.59	21.61121	13.869	27.90502	19.28427	13.23321	18.80338	14.63802	11.23513
55-59	95772	2102	0.021948	473969	2778124	29.01	19.76835	13.14135	23.56484	17.22311	12.34744	15.10602	12.36412	9.813515
60-64	93670	3212	0.034291	460901	2304155	24.6	17.73877	12.56735	19.4696	15.02132	11.3269	11.80703	10.11322	8.606594
65-69	90458	5060	0.055938	440521	1843254	20.38	15.5342	11.54599	15.62886	12.69972	10.14911	8.867524	7.915114	7.07412
70-74	85398	7676	0.089885	409074	1402733	16.43	13.2059	10.37588	12.14199	10.35222	8.598265	6.396592	5.911847	5.432337
75-79	77722	11478	0.14768	361716	993659	12.78	10.7997	9.045751	9.029709	8.042462	6.994068	4.34834	4.138107	3.933812
80-84	66244	16375	0.247192	292436	631943	9.54	8.433557	7.385164	6.35917	5.880506	5.400997	2.728634	2.657681	2.621387
85+	49869	49869	1	339507	339507	6.81	6.258069	5.77856	4.208974	4.014282	3.809987	1.519627	1.504493	1.504493

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 13 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	98930	208	0.002102	494162	5225858	52.82	27.12754	15.00878
35-44	98722	845	0.008559	983655	4731696	47.93	26.00726	14.88183
45-54	97877	2105	0.021507	969917	3748041	38.29	23.26155	14.21133
55-64	95772	5314	0.055486	934870	2778124	29.01	19.76835	13.14135
65-74	90458	12736	0.140795	849595	1843254	20.38	15.5342	11.54599
75-84	77722	27853	0.358367	654152	993659	12.78	10.7997	9.045751
85+	49869	49869	1	339507	339507	6.81	6.258069	5.77856

Table 2a: Abrigded life table, Alberta, 2000 to 2002: males															
									Average COPD			Severe COPD			
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	
0-4	100000	840	0.0084	496228	7704335	77.04	30.81171	15.20631	69.42106	29.92181	15.197	54.98177	27.57397	15.08881	
5--9	99160	67	0.000676	495569	7208107	72.69	30.32818	15.25073	65.53609	29.38497	15.17613	52.69093	27.09979	14.98103	
10--14	99093	89	0.000898	495323	6712538	67.74	29.69717	15.22357	60.61205	28.60972	15.12581	47.87297	25.99304	14.86761	
15--19	99004	385	0.003889	494147	6217215	62.8	28.96834	15.1833	55.71143	27.71765	15.05572	43.10454	24.73069	14.48178	
20-24	98619	457	0.004634	491944	5723068	58.03	28.15634	14.9891	51.10604	26.75325	14.82423	39.01206	23.49627	14.19728	
25-29	98162	424	0.004319	489765	5231124	53.29	27.22678	14.92266	46.53934	25.65718	14.74399	34.9962	22.13045	14.11845	
30-34	97738	540	0.005525	487394	4741359	48.51	26.14813	14.81503	41.90434	24.38393	14.60087	30.80964	20.52202	13.61124	
35-39	97198	671	0.006903	484382	4253965	43.77	24.91738	14.66847	37.32282	22.94039	14.14335	26.71969	18.74686	12.9873	
40-44	96527	921	0.009541	480466	3769583	39.05	23.50825	14.20926	32.78447	21.30507	13.83645	22.69448	16.77747	12.19797	
45-49	95606	1350	0.01412	474858	3289117	34.4	21.91221	13.90021	28.34094	19.47605	13.13573	18.82713	14.65197	11.24907	
50-54	94256	1997	0.021187	466641	2814259	29.86	20.12905	13.50205	24.04786	17.46715	12.29573	15.20489	12.42758	9.876979	
55-59	92259	3192	0.034598	453929	2347618	25.45	18.15046	12.68426	19.94039	15.2898	11.59538	11.85458	10.14757	8.640948	
60-64	89067	5064	0.056856	433555	1893689	21.26	16.01724	11.73378	16.14271	13.02687	10.19685	8.944621	7.975976	7.134982	
65-69	84003	7537	0.089723	402270	1460134	17.38	13.79101	10.67655	12.74413	10.77454	9.02059	6.558338	6.047306	5.567796	
70-74	76466	10579	0.138349	357288	1057864	13.83	11.51919	9.507876	9.751265	8.595474	7.547081	4.639606	4.396893	4.192598	
75-79	65887	14349	0.217782	295169	700576	10.63	9.254888	7.984011	7.143007	6.533469	5.882818	3.082212	2.988706	2.883254	
80-84	51538	17574	0.340991	214580	405407	7.87	7.124581	6.473929	4.98359	4.702518	4.498223	1.888165	1.862296	1.862296	
85+	33964	33964	1	190827	190827	5.62	5.251916	4.922029	3.322119	3.208254	3.102802	1.057125	1.055461	1.055461	

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 12 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	97738	540	0.005525	487394	4741359	48.51	26.14813	14.81503
35-44	97198	1592	0.016379	964848	4253965	43.77	24.91738	14.66847
45-54	95606	3347	0.035008	941499	3289117	34.4	21.91221	13.90021
55-64	92259	8256	0.089487	887484	2347618	25.45	18.15046	12.68426
65-74	84003	18116	0.215659	759558	1460134	17.38	13.79101	10.67655
75-84	65887	31923	0.484511	509749	700576	10.63	9.254888	7.984011
85+	33964	33964	1	190827	190827	5.62	5.251916	4.922029

Table 2b: Abrigded life table, Alberta, 2000 to 2002: females									Average COPD			Severe COPD		
Age x	**lx**	**dx**	**qx**	**Lx**	**Tx**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	100000	693	0.00693	496860	8210333	82.1	31.00999	15.21277	74.97099	30.58963	15.29237	61.47387	28.75365	15.11727
5--9	99307	35	0.000352	496457	7713473	77.67	30.8764	15.27101	70.96344	30.1188	15.2733	58.95803	28.32345	15.15621
10--14	99272	73	0.000735	496213	7217016	72.7	30.32937	15.25192	66.00103	29.45304	15.11009	54.05066	27.38526	14.9001
15--19	99199	176	0.001774	495581	6720803	67.75	29.69855	15.22495	61.08998	28.69039	15.05401	49.26661	26.32935	14.79311
20-24	99023	190	0.001919	494628	6225222	62.87	28.97954	15.1945	56.28863	27.82957	14.99508	44.74245	25.18412	14.70918
25-29	98833	173	0.00175	493750	5730594	57.98	28.14723	15.14432	51.48713	26.83765	14.90863	40.21086	23.87286	14.32957
30-34	98660	285	0.002889	492639	5236844	53.08	27.18294	14.87882	46.65048	25.68571	14.77252	35.58819	22.34087	14.06304
35-39	98375	407	0.004137	490914	4744205	48.23	26.08037	14.74727	41.89435	24.38096	14.59789	31.13773	20.65553	13.46413
40-44	97968	592	0.006043	488457	4253291	43.41	24.81638	14.56747	37.20562	22.90113	14.10409	26.82013	18.79344	13.03387
45-49	97376	896	0.009201	484792	3764834	38.66	23.38188	14.33167	32.60741	21.23631	13.76769	22.67258	16.76604	12.18654
50-54	96480	1374	0.014241	479221	3280042	34	21.76579	14.02358	28.1398	19.38813	13.04781	18.7601	14.6126	11.2097
55-59	95106	2202	0.023153	470441	2800821	29.45	19.95506	13.32807	23.84629	17.36572	12.49005	15.14153	12.38692	9.836312
60-64	92904	3365	0.03622	456573	2330380	25.08	17.97375	12.50754	19.81492	15.21825	11.52383	11.94835	10.21531	8.708691
65-69	89539	4700	0.052491	436698	1873807	20.93	15.83872	11.85051	16.07142	12.98244	10.15242	9.186716	8.162794	7.114401
70-74	84839	7240	0.085338	407328	1437109	16.94	13.52371	10.69369	12.53318	10.62659	8.872636	6.64622	6.120907	5.641397
75-79	77599	10830	0.139564	362626	1029781	13.27	11.13786	9.126543	9.383588	8.31368	7.265287	4.553205	4.320126	4.115831
80-84	66769	15624	0.234001	296979	667155	9.99	8.778445	7.730051	6.669308	6.140242	5.660732	2.882784	2.802982	2.766688
85+	51145	51145	1	370176	370176	7.24	6.612333	5.961682	4.49154	4.265339	4.061043	1.625117	1.60691	1.60691

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 13 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	**lx**	**dx**	**qx**	**Lx**	**Tx**	**ex**	**3% Disc**	**7% Disc**
30-34	98660	285	0.002889	492639	5236844	53.08	27.18294	14.87882
35-44	98375	999	0.010155	979371	4744205	48.23	26.08037	14.74727
45-54	97376	2270	0.023312	964013	3764834	38.66	23.38188	14.33167
55-64	95106	5567	0.058535	927014	2800821	29.45	19.95506	13.32807
65-74	89539	11940	0.13335	844026	1873807	20.93	15.83872	11.85051
75-84	77599	26454	0.340906	659605	1029781	13.27	11.13786	9.126543
85+	51145	51145	1	370176	370176	7.24	6.612333	5.961682

Table 3a: Abrigded life table, Quebec, 2000 to 2002: males														
									Average COPD			Severe COPD		
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
0-4	100000	619	0.00619	497208	7638585	76.39	30.74308	15.23761	69.01616	29.86914	15.14433	55.54696	27.68528	15.02336
5--9	99381	41	0.000413	496789	7141377	71.86	30.22887	15.26584	64.8302	29.28087	15.20967	52.54173	27.06771	14.94895
10--14	99340	88	0.000886	496546	6644588	66.89	29.5794	15.23645	59.87922	28.48472	15.15717	47.6597	25.93988	14.81446
15--19	99252	328	0.003305	495532	6148042	61.94	28.83047	15.19408	54.9754	27.57268	15.08752	42.88576	24.66835	14.65007
20-24	98924	464	0.00469	493471	5652510	57.14	27.99143	14.98853	50.30598	26.57145	14.8366	38.6513	23.37906	14.32884
25-29	98460	427	0.004337	491229	5159039	52.4	27.03723	14.91848	45.73635	25.44899	14.75263	34.63516	21.99829	13.98629
30-34	98033	487	0.004968	488989	4667810	47.61	25.9275	14.80207	41.09672	24.14356	14.3605	30.44443	20.37155	13.46077
35-39	97546	626	0.006417	486238	4178821	42.84	24.65513	14.63685	36.46435	22.64744	14.10789	26.24907	18.52864	12.76907
40-44	96920	871	0.008987	482556	3692583	38.1	23.19976	14.14954	31.8823	20.95335	13.76195	22.13515	16.48556	11.90606
45-49	96049	1339	0.013941	477148	3210027	33.42	21.54712	13.80491	27.39064	19.0527	13.00164	18.17048	14.26626	10.86336
50-54	94710	2169	0.022901	468555	2732879	28.86	19.70292	13.3626	23.06169	16.96817	12.0925	14.47185	11.94691	9.669602
55-59	92541	3523	0.03807	454574	2264324	24.47	17.67482	12.5034	18.98334	14.74373	11.34083	11.15987	9.645698	8.139077
60-64	89018	5571	0.062583	432136	1809750	20.33	15.50651	11.51831	15.24035	12.45035	9.899741	8.320082	7.482959	6.641965
65-69	83447	8386	0.100495	397570	1377614	16.51	13.25575	10.42573	11.9013	10.18132	8.674703	5.988145	5.569481	5.239594
70-74	75061	11922	0.158831	347014	980044	13.06	10.99486	8.983543	9.000585	8.02014	6.971747	4.133696	3.947399	3.743104
75-79	63139	15591	0.246931	278153	633030	10.03	8.808432	7.537555	6.562064	6.050427	5.570917	2.714104	2.643985	2.607691
80-84	47548	17945	0.377408	193139	354877	7.46	6.791214	6.140562	4.587392	4.350502	4.146206	1.647365	1.62851	1.62851
85+	29603	29603	1	161738	161738	5.46	5.113898	4.784011	3.13308	3.035257	2.929805	0.923017	1	1

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 12 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	98033	487	0.004968	488989	4667810	47.61	25.9275	14.80207
35-44	97546	1497	0.015347	968794	4178821	42.84	24.65513	14.63685
45-54	96049	3508	0.036523	945703	3210027	33.42	21.54712	13.80491
55-64	92541	9094	0.09827	886710	2264324	24.47	17.67482	12.5034
65-74	83447	20308	0.243364	744584	1377614	16.51	13.25575	10.42573
75-84	63139	33536	0.531146	471292	633030	10.03	8.808432	7.537555
85+	29603	29603	1	161738	161738	5.46	5.113898	4.784011

Table 3b: Abrigded life table,Quebec, 2000 to 2002: females														
									Average COPD			Severe COPD		
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
0-4	100000	491	0.00491	497776	8200226	82	31.292	15.31325	75.17293	30.61172	15.20894	62.51348	28.9225	15.13746
5--9	99509	42	0.000422	497421	7702450	77.4	30.84867	15.24328	70.8759	30.10775	15.26224	59.28667	28.38112	15.05358
10--14	99467	55	0.000553	497225	7205029	72.44	30.29842	15.22097	65.92971	29.4426	15.23376	54.4206	27.46023	14.97508
15--19	99412	141	0.001418	496735	6707804	67.47	29.6599	15.1863	60.99454	28.67464	15.19073	49.57923	26.4028	14.86657
20-24	99271	169	0.001702	495932	6211069	62.57	28.93155	15.1465	56.1537	27.80379	14.9693	44.96329	25.24427	14.76933
25-29	99102	156	0.001574	495124	5715137	57.67	28.08973	15.08683	51.32793	26.80239	14.87337	40.37731	23.92388	14.3806
30-34	98946	212	0.002143	494249	5220013	52.76	27.11464	14.99588	46.47612	25.64095	14.72776	35.72233	22.38854	14.11071
35-39	98734	378	0.003828	492789	4725764	47.86	25.98981	14.86438	41.65502	24.30972	14.52666	31.12787	20.65159	13.46019
40-44	98356	551	0.005602	490516	4232975	43.04	24.71258	14.46367	36.94168	22.81213	14.27258	26.75936	18.76526	13.00569
45-49	97805	946	0.009672	486824	3742459	38.26	23.25179	14.20158	32.31084	21.12114	13.65252	22.54541	16.69967	12.12017
50-54	96859	1388	0.01433	481054	3255635	33.61	21.61875	13.87654	27.86497	19.26624	13.21518	18.68257	14.56706	11.16416
55-59	95471	2147	0.022489	472347	2774581	29.06	19.78957	13.16257	23.56877	17.22511	12.34943	15.06791	12.33966	9.789054
60-64	93324	3245	0.034771	459065	2302234	24.67	17.7732	12.60178	19.49702	15.03695	11.34253	11.81012	10.11545	8.608827
65-69	90079	5000	0.055507	438742	1843169	20.46	15.57849	11.59029	15.67546	12.72962	10.17902	8.905549	7.945132	7.104138
70-74	85079	7567	0.088941	407749	1404427	16.51	13.25575	10.42573	12.18151	10.37993	8.625985	6.426525	5.936915	5.457405
75-79	77512	11420	0.147332	360875	996678	12.86	10.85581	9.101861	9.053629	8.060795	7.012401	4.353254	4.142473	3.938178
80-84	66092	16427	0.248547	291495	635803	9.62	8.494871	7.446477	6.382303	5.89988	5.42037	2.714455	2.644316	2.608022
85+	49665	49665	1	344308	344308	6.93	6.358568	5.879058	4.276856	4.074594	3.870299	1.530699	1.515242	1.515242

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 13 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	98946	212	0.002143	494249	5220013	52.76	27.11464	14.99588
35-44	98734	929	0.009409	983305	4725764	47.86	25.98981	14.86438
45-54	97805	2334	0.023864	967878	3742459	38.26	23.25179	14.20158
55-64	95471	5392	0.056478	931412	2774581	29.06	19.78957	13.16257
65-74	90079	12567	0.139511	846491	1843169	20.46	15.57849	11.59029
75-84	77512	27847	0.359261	652370	996678	12.86	10.85581	9.101861
85+	49665	49665	1	344308	344308	6.93	6.358568	5.879058

Table 4a: Abrigded life table, British Columbia, 2000 to 2002: males

									Average COPD			Severe COPD		
Age x	**lx**	**dx**	**qx**	**Lx**	**Tx**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	100000	531	0.00531	497591	7806628	78.07	30.91029	15.20767	70.58476	30.07098	15.22547	56.66741	27.90193	15.06744
5--9	99469	37	0.000372	497250	7309037	73.48	30.42057	15.23173	66.29888	29.49538	15.15242	53.40846	27.25151	14.94739
10--14	99432	91	0.000915	496991	6811787	68.51	29.80138	15.20052	61.34389	28.73223	15.09585	48.51597	26.14957	14.81647
15--19	99341	302	0.00304	496037	6314796	63.57	29.08888	15.15892	56.44497	27.85943	15.02494	43.75217	24.91238	14.66347
20-24	99039	457	0.004614	494078	5818759	58.75	28.28599	15.11875	51.75906	26.89787	14.96885	39.47444	23.64227	14.34328
25-29	98582	456	0.004626	491776	5324681	54.01	27.37702	14.89186	47.19467	25.82397	14.69854	35.46253	22.29621	14.01838
30-34	98126	534	0.005442	489346	4832905	49.25	26.32544	14.78921	42.59193	24.58344	14.56516	31.34815	20.7397	13.5483
35-39	97592	699	0.007162	486288	4343559	44.51	25.12081	14.64587	38.00999	23.17049	14.12027	27.25848	18.99321	12.94214
40-44	96893	926	0.009557	482271	3857271	39.81	23.74822	14.44923	33.49988	21.57723	13.83502	23.29609	17.08695	12.21127
45-49	95967	1315	0.013703	476735	3375000	35.17	22.19225	13.91442	29.07045	19.79401	13.16701	19.46484	15.01861	11.32418
50-54	94652	1910	0.020179	468809	2898265	30.62	20.44389	13.53311	24.77633	17.82551	12.65409	15.85409	12.84428	10.29368
55-59	92742	2980	0.032132	456791	2429456	26.2	18.50589	12.74632	20.65445	15.68615	11.69795	12.50082	10.60389	8.849941
60-64	89762	4556	0.050756	438145	1972665	21.98	16.40427	12.12081	16.81363	13.44496	10.61494	9.558752	8.447929	7.399536
65-69	85206	6728	0.078962	410308	1534520	18.01	14.17199	10.7691	13.30031	11.1585	9.147184	7.049189	6.457187	5.806535
70-74	78478	10075	0.12838	368793	1124212	14.33	11.85312	9.57582	10.12578	8.879703	7.608827	4.908208	4.635542	4.431247
75-79	68403	14264	0.208529	308058	755419	11.04	9.5591	8.052478	7.409415	6.750083	6.099432	3.218878	3.113774	3.008322
80-84	54139	17661	0.326216	227451	447361	8.26	7.435529	6.594536	5.223803	4.910153	4.580266	1.98959	1.960767	1.960767
85+	36478	36478	1	219910	219910	6.03	5.604832	5.125322	3.566172	3.431598	3.326146	1.140458	1.136367	1.136367

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 12 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	**lx**	**dx**	**qx**	**Lx**	**Tx**	**ex**	**3% Disc**	**7% Disc**
30-34	98126	534	0.005442	489346	4832905	49.25	26.32544	14.78921
35-44	97592	1625	0.016651	968559	4343559	44.51	25.12081	14.64587
45-54	95967	3225	0.033605	945544	3375000	35.17	22.19225	13.91442
55-64	92742	7536	0.081258	894936	2429456	26.2	18.50589	12.74632
65-74	85206	16803	0.197204	779101	1534520	18.01	14.17199	10.7691
75-84	68403	31925	0.466719	535509	755419	11.04	9.5591	8.052478
85+	36478	36478	1	219910	219910	6.03	5.604832	5.125322

Table 4b: Abrigded life table,British Columbia, 2000 to 2002: females									Average COPD			Severe COPD		
Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
0-4	100000	425	0.00425	498077	8285346	82.85	31.3673	15.30147	76.06704	30.70183	15.19636	63.39209	29.06125	15.13129
5--9	99575	37	0.000372	497771	7787269	78.2	30.93023	15.22761	71.68249	30.20711	15.24407	59.94452	28.49613	15.16858
10--14	99538	64	0.000643	497564	7289498	73.23	30.39167	15.20283	66.73152	29.55688	15.21392	55.06651	27.59075	14.92882
15--19	99474	171	0.001719	496974	6791934	68.28	29.77057	15.1697	61.81051	28.80913	15.17275	50.25978	26.56091	14.82606
20-24	99303	198	0.001994	496018	6294960	63.39	29.06092	15.13096	57.00477	27.96635	14.96344	45.7291	25.44708	14.75071
25-29	99105	189	0.001907	495056	5798942	58.51	28.24277	15.07554	52.21202	26.99681	14.87806	41.22297	24.18113	14.39807
30-34	98916	230	0.002325	494039	5303886	53.62	27.29567	14.99155	47.39335	25.8735	14.74807	36.64725	22.71054	14.17099
35-39	98686	351	0.003557	492606	4809847	48.74	26.20379	14.87069	42.5935	24.5839	14.56562	32.10455	21.04103	13.57242
40-44	98335	512	0.005207	490482	4317241	43.9	24.95385	14.70494	37.86562	23.12222	14.32518	27.70967	19.19633	13.14527
45-49	97823	804	0.008219	487250	3826759	39.12	23.53035	14.23136	33.2186	21.47118	13.72897	23.46999	17.17506	12.29938
50-54	97019	1255	0.012936	482188	3339509	34.42	21.91953	13.90753	28.70285	19.63423	13.29391	19.47543	15.02464	11.33022
55-59	95764	1977	0.020645	474225	2857321	29.84	20.12056	13.49356	24.35739	17.61942	12.448	15.77899	12.79608	10.24547
60-64	93787	3004	0.03203	461907	2383096	25.41	18.13136	12.66515	20.23905	15.45616	11.46795	12.45647	10.57278	8.818835
65-69	90783	4493	0.049492	443444	1921189	21.16	15.96348	11.68002	16.36827	13.16743	10.33741	9.500355	8.403173	7.354779
70-74	86290	6916	0.080148	415371	1477745	17.13	13.63975	10.5253	12.76831	10.7915	9.037555	6.890861	6.32579	5.84628
75-79	79374	10594	0.133469	372169	1062374	13.38	11.21277	9.201448	9.530523	8.426294	7.3779	4.701544	4.451924	4.247629
80-84	68780	15724	0.228613	306999	690205	10.03	8.808432	7.537555	6.734559	6.194888	5.715379	2.951843	2.868077	2.831783
85+	53056	53056	1	383206	383206	7.22	6.596072	5.94542	4.492588	4.266269	4.061974	1.638337	1.619744	1.619744

NOTE: The estimates for lx, Tx, ex are extracted from the complete life table in sheet 13 for the upper year in the age group (i.e. In the age group 0-4, the est

Age x	lx	dx	qx	Lx	Tx	ex	3% Disc	7% Disc
30-34	98916	230	0.002325	494039	5303886	53.62	27.29567	14.99155
35-44	98686	863	0.008745	983088	4809847	48.74	26.20379	14.87069
45-54	97823	2059	0.021048	969438	3826759	39.12	23.53035	14.23136
55-64	95764	4981	0.052013	936132	2857321	29.84	20.12056	13.49356
65-74	90783	11409	0.125673	858815	1921189	21.16	15.96348	11.68002
75-84	79374	26318	0.33157	679168	1062374	13.38	11.21277	9.201448
85+	53056	53056	1	383206	383206	7.22	6.596072	5.94542

Table 1a: Complete life table, Ontario, 2000 to 2002, males																					
			General Population							AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	569	0.99431	0.00569	2.9	99489	7736682	77.37	0.07	0.010845	100000	1084.514	99457.74	7014869	70.14869	0.032433	100000	3243.3	98378.35	5685994	56.85994
1 year	99431	33	0.99967	0.00033	11.8	99414	7637193	76.81	0.07	0.000629	98915.49	62.21586	98884.38	6915411	69.91232	0.001881	96756.7	181.9994	96665.7	5587616	57.74913
2 years	99398	19	0.99981	0.00019	15.1	99386	7537779	75.83	0.07	0.000362	98853.27	35.79872	98835.37	6816527	68.95601	0.001083	96574.7	104.5904	96522.41	5490950	56.85702
3 years	99379	19	0.99981	0.00019	15.5	99369	7438393	74.85	0.07	0.000362	98817.47	35.78576	98799.58	6717692	67.98081	0.001083	96470.11	104.4771	96417.87	5394427	55.91812
4 years	99360	17	0.99982	0.00018	16.7	99350	7339024	73.86	0.07	0.000343	98781.69	33.89002	98764.74	6618892	67.00526	0.001026	96365.63	98.87114	96316.2	5298010	54.97821
5 years	99343	18	0.99982	0.00018	20.6	99334	7239674	72.88	0.07	0.000343	98747.8	33.87839	98730.86	6520127	66.02808	0.001026	96266.76	98.7697	96217.38	5201693	54.03416
6 years	99325	13	0.99987	0.00013	29.4	99319	7140340	71.89	0.07	0.000248	98713.92	24.45933	98701.69	6421396	65.05057	0.000741	96167.99	71.26048	96132.36	5105476	53.08914
7 years	99312	10	0.9999	0.0001	35.4	99307	7041021	70.9	0.07	0.000191	98689.46	18.81021	98680.05	6322695	64.06657	0.00057	96096.73	54.77514	96069.34	5009344	52.12814
8 years	99302	9	0.99991	0.00009	34.7	99298	6941714	69.9	0.07	0.000172	98670.65	16.92596	98662.18	6224015	63.07869	0.000513	96041.96	49.26952	96017.32	4913274	51.15758
9 years	99293	9	0.99991	0.00009	33.2	99289	6842416	68.91	0.07	0.000172	98653.72	16.92306	98645.26	6125353	62.08942	0.000513	95992.69	49.24425	95968.07	4817257	50.18358
10 years	99284	10	0.9999	0.0001	31	99279	6743127	67.92	0.07	0.000191	98636.8	18.80017	98627.4	6026707	61.09999	0.00057	95943.44	54.68776	95916.1	4721289	49.20908
11 years	99274	10	0.9999	0.0001	29.5	99270	6643848	66.92	0.08	0.000191	98618	18.79659	98608.6	5928080	60.11154	0.00057	95888.76	54.65659	95861.43	4625373	48.23686
12 years	99264	14	0.99986	0.00014	29.1	99257	6544578	65.93	0.08	0.000267	98599.2	26.31021	98586.05	5829471	59.12291	0.000798	95834.1	76.47561	95795.86	4529511	47.26409
13 years	99250	20	0.9998	0.0002	20	99240	6445321	64.94	0.08	0.000381	98572.89	37.57599	98554.1	5730885	58.13855	0.00114	95757.62	109.1637	95703.04	4433716	46.30144
14 years	99230	28	0.99972	0.00028	15.8	99216	6346081	63.95	0.08	0.000534	98535.32	52.58633	98509.02	5632331	57.16053	0.001596	95648.46	152.6549	95572.13	4338013	45.35371
15 years	99202	37	0.99963	0.00037	15.7	99183	6246865	62.97	0.08	0.000705	98482.73	69.45199	98448	5533822	56.19079	0.002109	95495.8	201.4007	95395.1	4242440	44.42541
16 years	99165	45	0.99954	0.00046	16	99142	6147682	61.99	0.08	0.000877	98413.28	86.28483	98370.13	5435374	55.23009	0.002622	95294.4	249.8619	95169.47	4147045	43.51825
17 years	99120	52	0.99948	0.00052	15.2	99094	6048540	61.02	0.08	0.000991	98326.99	97.45385	98278.27	5337004	54.27812	0.002964	95044.54	281.712	94903.69	4051876	42.63134
18 years	99068	57	0.99943	0.00057	13	99039	5949446	60.05	0.08	0.001086	98229.54	106.7185	98176.18	5238726	53.33147	0.003249	94762.83	307.8844	94608.89	3956972	41.75658
19 years	99011	60	0.99939	0.00061	11.2	98981	5850407	59.09	0.08	0.001163	98122.82	114.0835	98065.78	5140550	52.38893	0.003477	94454.95	328.4198	94290.74	3862363	40.89106
20 years	98951	63	0.99936	0.00064	11.4	98920	5751426	58.12	0.09	0.00122	98008.74	119.555	97948.96	5042484	51.44933	0.003648	94126.53	343.3736	93954.84	3768073	40.03199
21 years	98888	65	0.99934	0.00066	12.9	98855	5652506	57.16	0.09	0.001258	97889.18	123.1407	97827.61	4944535	50.51155	0.003762	93783.15	352.8122	93606.75	3674118	39.17673
22 years	98823	66	0.99933	0.00067	13.6	98790	5553651	56.2	0.09	0.001277	97766.04	124.8492	97703.62	4846707	49.57455	0.003819	93430.34	356.8105	93251.93	3580511	38.32279
23 years	98757	68	0.99932	0.00068	12.5	98723	5454861	55.24	0.09	0.001296	97641.19	126.5508	97577.92	4749004	48.6373	0.003876	93073.53	360.753	92893.15	3487259	37.46779
24 years	98689	67	0.99932	0.00068	11	98656	5356138	54.27	0.09	0.001296	97514.64	126.3868	97451.45	4651426	47.69977	0.003876	92712.78	359.3547	92533.1	3394366	36.61163
25 years	98622	66	0.99933	0.00067	11.1	98589	5257482	53.31	0.09	0.001277	97388.25	124.3667	97326.07	4553974	46.76102	0.003819	92353.42	352.6977	92177.07	3301833	35.75214
26 years	98556	66	0.99933	0.00067	12.7	98524	5158893	52.34	0.09	0.001277	97263.89	124.2079	97201.78	4456648	45.82017	0.003819	92000.72	351.3508	91825.05	3209656	34.88729
27 years	98490	66	0.99933	0.00067	13.5	98457	5060369	51.38	0.09	0.001277	97139.68	124.0493	97077.65	4359446	44.87812	0.003819	91649.37	350.009	91474.37	3117831	34.01912
28 years	98424	67	0.99931	0.00069	12.4	98390	4961912	50.41	0.1	0.001315	97015.63	127.5891	96951.84	4262369	43.93487	0.003933	91299.36	359.0804	91119.82	3026356	33.14762
29 years	98357	69	0.9993	0.0007	10.7	98323	4863522	49.45	0.1	0.001334	96888.04	129.268	96823.41	4165417	42.99206	0.00399	90940.28	362.8517	90758.86	2935236	32.27653
30 years	98288	71	0.99928	0.00072	10.5	98252	4765199	48.48	0.1	0.001372	96758.77	132.784	96692.38	4068593	42.04883	0.004104	90577.43	371.7298	90391.57	2844478	31.40382
31 years	98217	74	0.99925	0.00075	11.6	98179	4666947	47.52	0.1	0.00143	96625.99	138.1269	96556.93	3971901	41.10593	0.004275	90205.7	385.6294	90012.89	2754086	30.53117
32 years	98143	78	0.99921	0.00079	11.9	98105	4568768	46.55	0.1	0.001506	96487.86	145.2856	96415.22	3875344	40.16406	0.004503	89820.07	404.4598	89617.84	2664073	29.66011
33 years	98065	81	0.99917	0.00083	10.6	98024	4470663	45.59	0.1	0.001582	96342.58	152.412	96266.37	3778929	39.22387	0.004731	89415.61	423.0253	89204.1	2574455	28.79201
34 years	97984	85	0.99913	0.00087	9	97942	4372639	44.63	0.11	0.001658	96190.16	159.5045	96110.41	3682663	38.28523	0.004959	88992.59	441.3142	88771.93	2485251	27.9265
35 years	97899	91	0.99907	0.00093	8.7	97853	4274697	43.66	0.11	0.001773	96030.66	170.222	95945.55	3586552	37.34799	0.005301	88551.27	469.4103	88316.57	2396479	27.06318
36 years	97808	97	0.99901	0.00099	9.4	97759	4176844	42.7	0.11	0.001887	95860.44	180.8829	95770	3490607	36.41342	0.005643	88081.86	497.046	87833.34	2308163	26.20474
37 years	97711	105	0.99893	0.00107	9.4	97659	4079085	41.75	0.11	0.002039	95679.56	195.1308	95581.99	3394837	35.48132	0.006099	87584.82	534.1798	87317.73	2220329	25.35062
38 years	97606	113	0.99884	0.00116	8.2	97549	3981426	40.79	0.12	0.002211	95484.42	211.1122	95378.87	3299255	34.5528	0.006612	87050.64	575.5788	86762.85	2133012	24.50311
39 years	97493	121	0.99875	0.00125	7.1	97433	3883877	39.84	0.12	0.002383	95273.31	226.9887	95159.82	3203876	33.62826	0.007125	86475.06	616.1348	86166.99	2046249	23.66288
40 years	97372	132	0.99864	0.00136	7.3	97306	3786444	38.89	0.12	0.002592	95046.32	246.3753	94923.14	3108716	32.70738	0.007752	85858.92	665.5784	85526.13	1960082	22.8291

41 years	97240	144	0.99852	0.00148	8	97167	3689138	37.94	0.12	0.002821	94799.95	267.4193	94666.24	3013793	31.79108	0.008436	85193.35	718.6911	84834	1874556	22.00355
42 years	97096	159	0.99837	0.00163	7.8	97017	3591971	36.99	0.13	0.003107	94532.53	293.6918	94385.68	2919127	30.8796	0.009291	84474.65	784.854	84082.23	1789722	21.18649
43 years	96937	176	0.99818	0.00182	6.6	96848	3494954	36.05	0.13	0.003469	94238.84	326.907	94075.38	2824741	29.97428	0.010374	83689.8	868.198	83255.7	1705639	20.38049
44 years	96761	196	0.99798	0.00202	5.8	96663	3398106	35.12	0.13	0.00385	93911.93	361.5722	93731.14	2730665	29.07688	0.011514	82821.6	953.6079	82344.8	1622384	19.5889
45 years	96565	217	0.99775	0.00225	6	96457	3301443	34.19	0.14	0.004289	93550.36	401.1907	93349.76	2636934	28.18732	0.012825	81867.99	1049.957	81343.02	1540039	18.81125
46 years	96348	240	0.99751	0.00249	6.6	96228	3204986	33.26	0.14	0.004746	93149.17	442.0804	92928.13	2543585	27.30657	0.014193	80818.04	1147.05	80244.51	1458696	18.04914
47 years	96108	263	0.99726	0.00274	6.5	95977	3108758	32.35	0.14	0.005222	92707.09	484.1572	92465.01	2450656	26.4344	0.015618	79670.99	1244.301	79048.84	1378451	17.3018
48 years	95845	286	0.99702	0.00298	5.6	95702	3012781	31.43	0.15	0.00568	92222.93	523.8152	91961.02	2358191	25.57055	0.016986	78426.69	1332.156	77760.61	1299403	16.56837
49 years	95559	308	0.99678	0.00322	4.9	95405	2917079	30.53	0.15	0.006137	91699.11	562.7868	91417.72	2266230	24.71377	0.018354	77094.53	1414.993	76387.03	1221642	15.84603
50 years	95251	332	0.99651	0.00349	5.1	95084	2821674	29.62	0.15	0.006652	91136.33	606.2334	90833.21	2174813	23.86329	0.019893	75679.54	1505.493	74926.79	1145255	15.13295
51 years	94919	361	0.9962	0.0038	5.6	94739	2726590	28.73	0.16	0.007243	90530.09	655.6914	90202.25	2083979	23.01974	0.02166	74174.04	1606.61	73370.74	1070328	14.42995
52 years	94558	395	0.99582	0.00418	5.5	94361	2631851	27.83	0.16	0.007967	89874.4	716.0366	89516.38	1993777	22.18404	0.023826	72567.43	1728.992	71702.94	996957.4	13.73836
53 years	94163	435	0.99538	0.00462	4.7	93946	2537490	26.95	0.17	0.008806	89158.37	785.1036	88765.81	1904261	21.35818	0.026334	70838.44	1865.46	69905.71	925254.4	13.06147
54 years	93728	480	0.99488	0.00512	4.2	93488	2443544	26.07	0.17	0.009759	88373.26	862.4099	87942.06	1815495	20.54349	0.029184	68972.98	2012.908	67966.53	855348.7	12.40121
55 years	93248	529	0.99432	0.00568	4.6	92983	2350056	25.2	0.18	0.010826	87510.85	947.3995	87037.15	1727553	19.74101	0.032376	66960.08	2167.899	65876.13	787382.2	11.75898
56 years	92719	585	0.9937	0.0063	5	92427	2257073	24.34	0.18	0.012008	86563.45	1039.437	86043.74	1640516	18.9516	0.03591	64792.18	2326.687	63628.83	721506.1	11.1357
57 years	92134	645	0.99299	0.00701	4.9	91811	2164646	23.49	0.19	0.013361	85524.02	1142.692	84952.67	1554472	18.17585	0.039957	62465.49	2495.934	61217.52	657877.2	10.53185
58 years	91489	713	0.99221	0.00779	4.1	91132	2072835	22.66	0.19	0.014848	84381.33	1252.872	83754.89	1469519	17.41522	0.044403	59969.56	2662.828	58638.14	596659.7	9.949377
59 years	90776	785	0.99136	0.00864	3.7	90383	1981703	21.83	0.2	0.016468	83128.45	1368.946	82443.98	1385765	16.67016	0.049248	57306.73	2822.242	55895.61	538021.6	9.388454
60 years	89991	862	0.99043	0.00957	3.9	89560	1891320	21.02	0.2	0.01824	81759.51	1491.328	81013.84	1303321	15.9409	0.054549	54484.49	2972.074	52998.45	482126	8.848867
61 years	89129	943	0.98941	0.01059	4.3	88658	1801760	20.22	0.21	0.020185	80268.18	1620.176	79458.09	1222307	15.22779	0.060363	51512.41	3109.444	49957.69	429127.5	8.330565
62 years	88186	1032	0.9883	0.0117	4.2	87670	1713102	19.43	0.22	0.0223	78648	1753.866	77771.07	1142849	14.53118	0.06669	48402.97	3227.994	46788.97	379169.8	7.833607
63 years	87154	1123	0.98712	0.01288	3.6	86592	1625432	18.65	0.22	0.024549	76894.14	1887.696	75950.29	1065078	13.85122	0.073416	45174.97	3316.566	43516.69	332380.9	7.357632
64 years	86031	1214	0.98588	0.01412	3.2	85424	1538840	17.89	0.23	0.026913	75006.44	2018.627	73997.13	989127.2	13.18723	0.080484	41858.41	3368.932	40173.94	288864.2	6.900983
65 years	84817	1311	0.98454	0.01546	3.3	84161	1453416	17.14	0.24	0.029467	72987.81	2150.714	71912.46	915130.1	12.53812	0.088122	38489.48	3391.77	36793.59	248690.2	6.461253
66 years	83506	1417	0.98304	0.01696	3.6	82797	1369255	16.4	0.25	0.032326	70837.1	2289.863	69692.17	843217.7	11.90362	0.096672	35097.71	3392.965	33401.22	211896.6	6.037336
67 years	82089	1532	0.98134	0.01866	3.5	81324	1286458	15.67	0.26	0.035566	68547.24	2437.948	67328.26	773525.5	11.28456	0.106362	31704.74	3372.18	30018.65	178495.4	5.629928
68 years	80557	1651	0.9795	0.0205	3	79732	1205134	14.96	0.27	0.039073	66109.29	2583.088	64817.74	706197.2	10.68227	0.11685	28332.56	3310.66	26677.23	148476.8	5.240499
69 years	78906	1770	0.97757	0.02243	2.7	78021	1125402	14.26	0.28	0.042752	63526.2	2715.845	62168.28	641379.5	10.0963	0.127851	25021.9	3199.075	23422.36	121799.5	4.867717
70 years	77136	1895	0.97543	0.02457	2.8	76189	1047381	13.58	0.29	0.04683	60810.35	2847.774	59386.47	579211.2	9.524878	0.140049	21822.83	3056.265	20294.69	98377.16	4.507994
71 years	75241	2034	0.97296	0.02704	3	74224	971192	12.91	0.3	0.051538	57962.58	2987.289	56468.94	519824.7	8.968281	0.154128	18766.56	2892.453	17320.33	78082.47	4.160723
72 years	73207	2192	0.97006	0.02994	3	72111	896968	12.25	0.32	0.057066	54975.29	3137.2	53406.69	463355.8	8.428437	0.170658	15874.11	2709.044	14519.59	60762.13	3.827751
73 years	71015	2361	0.96675	0.03325	2.5	69834	824857	11.62	0.33	0.063375	51838.09	3285.213	50195.48	409949.1	7.90826	0.189525	13165.07	2495.109	11917.51	46242.55	3.512519
74 years	68654	2532	0.96312	0.03688	2.3	67388	755023	11	0.35	0.070293	48552.88	3412.941	46846.41	359753.6	7.409522	0.210216	10669.96	2242.995	9548.458	34325.04	3.21698
75 years	66122	2704	0.95911	0.04089	2.5	64770	687635	10.4	0.37	0.077936	45139.94	3518.041	43380.92	312907.2	6.931937	0.233073	8426.961	1964.097	7444.912	24776.58	2.940156
76 years	63418	2875	0.95466	0.04534	2.7	61980	622865	9.82	0.4	0.086418	41621.9	3596.883	39823.45	269526.3	6.475589	0.258438	6462.864	1670.25	5627.739	17331.66	2.681731
77 years	60543	3043	0.94975	0.05025	2.6	59022	560885	9.26	0.42	0.095777	38025.01	3641.903	36204.06	229702.8	6.040835	0.286425	4792.614	1372.724	4106.252	11703.93	2.442076
78 years	57500	3187	0.94456	0.05544	2.3	55906	501863	8.73	0.45	0.105669	34383.11	3633.216	32566.5	193498.8	5.627728	0.316008	3419.89	1080.712	2879.533	7597.674	2.221614
79 years	54313	3305	0.93915	0.06085	2.2	52660	445957	8.21	0.48	0.11598	30749.89	3566.376	28966.71	160932.3	5.233588	0.346845	2339.177	811.3319	1933.511	4718.141	2.017009
80 years	51008	3408	0.93319	0.06681	2.5	49304	393297	7.71	0.53	0.12734	27183.52	3461.545	25452.75	131965.6	4.854617	0.380817	1527.845	581.8294	1236.931	2784.629	1.822586
81 years	47600	3506	0.92635	0.07365	2.8	45847	343993	7.23	0.57	0.140377	23721.97	3330.017	22056.96	106512.8	4.49005	0.419805	946.0158	397.1422	747.4447	1547.699	1.636018
82 years	44094	3602	0.91832	0.08168	2.7	42293	298146	6.76	0.61	0.155682	20391.96	3174.662	18804.62	84455.87	4.141627	0.465576	548.8736	255.5424	421.1024	800.2543	1.457994

83 years	40492	3672	0.9093	0.0907	2.4	38656	255853	6.32	0.66	0.172874	17217.29	2976.426	15729.08	65651.24	3.813099	0.51699	293.3312	151.6493	217.5066	379.1518	1.292572
84 years	36820	3700	0.89952	0.10048	2.5	34970	217197	5.9	0.74	0.191515	14240.87	2727.338	12877.2	49922.16	3.505556	0.572736	141.6819	81.14634	101.1088	161.6453	1.140902
85 years	33120	3688	0.88865	0.11135	3	31276	182227	5.5	0.82	0.212233	11513.53	2443.552	10291.75	37044.96	3.217516	0.634695	60.53559	38.42163	41.32477	60.5365	1.000015
86 years	29432	3638	0.87638	0.12362	3.2	27613	150951	5.13	0.9	0.23562	9069.977	2137.066	8001.445	26753.21	2.949645	0.704634	22.11395	15.58224	14.32283	19.21174	0.868761
87 years	25794	3550	0.86237	0.13763	3	24019	123338	4.78	0.98	0.262323	6932.912	1818.661	6023.582	18751.77	2.704746	0.784491	6.53171	5.124067	3.969676	4.888905	0.748488
88 years	22244	3342	0.84979	0.15021	3.1	20573	99319	4.47	1.1	0.2863	5114.251	1464.211	4382.145	12728.18	2.488768	0.856197	1.407642	1.205219	0.805033	0.91923	0.653028
89 years	18902	3099	0.83601	0.16399	3.3	17353	78746	4.17	1.24	0.312565	3650.04	1140.874	3079.603	8346.038	2.286561	0.934743	0.202423	0.189214	0.107816	0.114197	0.564149
90 years	15803	2825	0.82128	0.17872	3.6	14390	61393	3.89	1.41	0.34064	2509.165	854.7229	2081.804	5266.436	2.09888	1.018704	0.01321	0.013457	0.006481	0.006381	0.483026
91 years	12978	2523	0.80557	0.19443	3.8	11717	47003	3.62	1.61	0.370584	1654.442	613.1092	1347.888	3184.632	1.924897	1.108251	-0.00025	-0.00027	-0.00011	-0.0001	0.407531
92 years	10455	2207	0.78888	0.21112	4.1	9351	35286	3.38	1.86	0.402395	1041.333	419.027	831.8197	1836.744	1.763839	1.203384	2.67E-05	3.22E-05	1.07E-05	9.47E-06	0.354207
93 years	8248	1888	0.77118	0.22882	4.5	7304	25935	3.14	2.18	0.436131	622.3062	271.407	486.6027	1004.925	1.614839	1.304274	-5.4E-06	-7.1E-06	-1.9E-06	-1.2E-06	0.216834
94 years	6360	1574	0.75246	0.24754	5.4	5573	18631	2.93	2.61	0.471811	350.8992	165.5582	268.1201	518.3218	1.477124	1.410978	1.66E-06	2.34E-06	4.87E-07	7.13E-07	0.430627
95 years	4786	1279	0.73272	0.26728	5.8	4147	13058	2.73	3.08	0.509436	185.341	94.41934	138.1314	250.2016	1.349953	1.523496	-6.8E-07	-1E-06	-1.6E-07	2.25E-07	-0.3312
96 years	3507	1010	0.71197	0.28803	6.5	3002	8911	2.54	3.74	0.548985	90.9217	49.91467	65.96437	112.0703	1.232602	1.641771	3.56E-07	5.85E-07	6.38E-08	3.87E-07	1.087786
97 years	2497	774	0.6902	0.3098	8	2110	5909	2.37	4.63	0.590479	41.00703	24.21378	28.90014	46.1059	1.124341	1.76586	-2.3E-07	-4E-07	-2.7E-08	3.24E-07	-1.41588
98 years	1723	573	0.66745	0.33255	8.9	1436	3799	2.2	5.7	0.63384	16.79325	10.64424	11.47113	17.20575	1.024564	1.895535	1.75E-07	3.32E-07	9.14E-09	3.5E-07	2.001607
99 years	1150	410	0.64373	0.35627	10.7	946	2363	2.05	7.3	0.679051	6.149011	4.17549	4.061266	5.734624	0.932609	2.030739	-1.6E-07	-3.2E-07	2.41E-09	3.41E-07	-2.17677
100 years	740	282	0.61908	0.38092	14.1	599	1417	1.91	9.64	0.726034	1.973521	1.432843	1.2571	1.673358	0.847905	2.171244	1.62E-07	3.51E-07	-1.4E-08	3.39E-07	2.096944
101 years	458	186	0.59353	0.40647	16.2	365	818	1.78	12.44	0.774732	0.540679	0.418881	0.331238	0.416258	0.76988	2.316879	-1.9E-07	-4.4E-07	3E-08	3.53E-07	-1.86346
102 years	272	118	0.56714	0.43286	19.4	213	453	1.66	17.26	0.825031	0.121798	0.100487	0.071554	0.085019	0.698038	2.467302	2.49E-07	6.15E-07	-5.8E-08	3.23E-07	1.294743
103 years	154	71	0.53996	0.46004	27.8	119	240	1.55	26.05	0.876836	0.021311	0.018686	0.011968	0.013465	0.631848	2.622228	-3.7E-07	-9.6E-07	1.14E-07	3.81E-07	-1.04164
104 years	83	40	0.51205	0.48795	50.6	63	121	1.45	40.74	0.930033	0.002625	0.002441	0.001404	0.001497	0.570509	2.781315	5.93E-07	1.65E-06	-2.3E-07	2.67E-07	0.45032
105 years	43	22	0.48347	0.51653	49.2	32	58	1.35	53.83	0.984506	0.000184	0.000181	9.32E-05	9.32E-05	0.507747	2.944221	-1.1E-06	-3.1E-06	4.99E-07	4.99E-07	-0.47211
106 years	21	12	0.45431	F	F	15	26	1.26	93.95	#VALUE!	2.85E-06	F	F	NP	NP	#VALUE!	2.05E-06	F	F	NP	NP
107 years	9	5	0.42463	F	F	7	11	1.18	95.42	#VALUE!	#VALUE!	F	F	NP	NP	#VALUE!	#VALUE!	F	F	NP	NP
108 years	4	2	0.39452	F	F	2	4	1.11	91.46	#VALUE!	#VALUE!	F	F	NP	NP	#VALUE!	#VALUE!	F	F	NP	NP

Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution

F too unreliable to be published (indicates a cv of at least 100.0%)."

NP= not possible to calculate becasue of the missing data from the actual life table.

Table 1b: Complete life table, Ontario, 2000 to 2002, females																					
		General Population								AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	493	0.99507	0.00493	3.2	99560	8204363	82.04	0.06	0.009397	100000	939.658	99530.17	7530895	75.30895	0.028101	100000	2810.1	98594.95	6276701	62.76701
1 year	99507	28	0.99971	0.00029	13.1	99493	8104803	81.45	0.06	0.000553	99060.34	54.75461	99032.96	7431365	75.01857	0.001653	97189.9	160.6549	97109.57	6178106	63.56737
2 years	99479	21	0.99979	0.00021	15.1	99467	8005310	80.47	0.06	0.0004	99005.59	39.62798	98985.77	7332332	74.05978	0.001197	97029.25	116.144	96971.17	6080997	62.67179
3 years	99458	17	0.99983	0.00017	16.7	99450	7905843	79.49	0.06	0.000324	98965.96	32.06695	98949.93	7233346	73.08923	0.000969	96913.1	93.90879	96866.15	5984026	61.7463
4 years	99441	12	0.99988	0.00012	19.2	99433	7806393	78.5	0.06	0.000229	98933.89	22.62816	98922.58	7134396	72.11276	0.000684	96819.19	66.22433	96786.08	5887159	60.80571
5 years	99429	9	0.99991	0.00009	31.7	99424	7706960	77.51	0.06	0.000172	98911.26	16.96724	98902.78	7035473	71.12914	0.000513	96752.97	49.63427	96728.15	5790373	59.84698
6 years	99420	8	0.99992	0.00008	43.5	99416	7607536	76.52	0.06	0.000152	98894.3	15.0794	98886.76	6936571	70.14126	0.000456	96703.33	44.09672	96681.29	5693645	58.87744
7 years	99412	7	0.99993	0.00007	43.4	99408	7508120	75.53	0.06	0.000133	98879.22	13.19247	98872.62	6837684	69.15188	0.000399	96659.24	38.56704	96639.95	5596964	57.90408
8 years	99405	6	0.99994	0.00006	41.9	99402	7408712	74.53	0.07	0.000114	98866.03	11.30632	98860.37	6738811	68.16104	0.000342	96620.67	33.04427	96604.15	5500324	56.92699
9 years	99399	7	0.99993	0.00007	38.9	99396	7309310	73.54	0.07	0.000133	98854.72	13.1892	98848.12	6639951	67.16878	0.000399	96587.63	38.53846	96568.36	5403720	55.94629
10 years	99392	7	0.99992	0.00008	36.2	99389	7209914	72.54	0.07	0.000152	98841.53	15.07136	98833.99	6541103	66.17768	0.000456	96549.09	44.02638	96527.07	5307151	54.96843
11 years	99385	8	0.99992	0.00008	34.8	99381	7110525	71.55	0.07	0.000152	98826.46	15.06906	98818.92	6442269	65.18769	0.000456	96505.06	44.00631	96483.06	5210624	53.99328
12 years	99377	11	0.99989	0.00011	34.3	99371	7011144	70.55	0.07	0.00021	98811.39	20.7168	98801.03	6343450	64.19756	0.000627	96461.05	60.48108	96430.81	5114141	53.01768
13 years	99366	13	0.99987	0.00013	26.7	99360	6911773	69.56	0.07	0.000248	98790.67	24.47835	98778.43	6244649	63.21092	0.000741	96400.57	71.43282	96364.86	5017710	52.05063
14 years	99353	16	0.99984	0.00016	21.6	99345	6812413	68.57	0.07	0.000305	98766.19	30.11974	98751.13	6145870	62.22646	0.000912	96329.14	87.85218	96285.21	4921346	51.08886
15 years	99337	20	0.9998	0.0002	21.6	99328	6713068	67.58	0.07	0.000381	98736.07	37.63819	98717.26	6047119	61.24529	0.00114	96241.29	109.7151	96186.43	4825060	50.13504
16 years	99317	22	0.99977	0.00023	22.8	99306	6613740	66.59	0.07	0.000438	98698.44	43.26742	98676.8	5948402	60.26845	0.001311	96131.57	126.0285	96068.56	4728874	49.19168
17 years	99295	25	0.99975	0.00025	22.6	99282	6514434	65.61	0.07	0.000477	98655.17	47.00919	98631.66	5849725	59.29467	0.001425	96005.54	136.8079	95937.14	4632805	48.2556
18 years	99270	26	0.99974	0.00026	20.1	99257	6415152	64.62	0.07	0.000496	98608.16	48.86626	98583.73	5751094	58.32269	0.001482	95868.74	142.0775	95797.7	4536868	47.32375
19 years	99244	26	0.99974	0.00026	17.7	99231	6315895	63.64	0.08	0.000496	98559.29	48.84204	98534.87	5652510	57.35136	0.001482	95726.66	141.8669	95655.73	4441071	46.39325
20 years	99218	26	0.99974	0.00026	18.1	99205	6216664	62.66	0.08	0.000496	98510.45	48.81784	98486.04	5553975	56.37955	0.001482	95584.79	141.6567	95513.96	4345415	45.46136
21 years	99192	27	0.99974	0.00026	20.8	99178	6117459	61.67	0.08	0.000496	98461.63	48.79365	98437.24	5455489	55.40726	0.001482	95443.14	141.4467	95372.41	4249901	44.52809
22 years	99165	26	0.99973	0.00027	22.1	99152	6018281	60.69	0.08	0.000515	98412.84	50.64522	98387.52	5357052	54.43448	0.001539	95301.69	146.6693	95228.35	4154528	43.59344
23 years	99139	27	0.99973	0.00027	20.1	99125	5919129	59.71	0.08	0.000515	98362.19	50.61915	98336.88	5258664	53.46225	0.001539	95155.02	146.4436	95081.8	4059300	42.65986
24 years	99112	28	0.99972	0.00028	17.6	99098	5820004	58.72	0.08	0.000534	98311.58	52.46692	98285.34	5160327	52.48952	0.001596	95008.58	151.6337	94932.76	3964218	41.72485
25 years	99084	28	0.99971	0.00029	17.6	99070	5720906	57.74	0.08	0.000553	98259.11	54.31174	98231.95	5062042	51.51728	0.001653	94856.94	156.7985	94778.54	3869286	40.79075
26 years	99056	30	0.9997	0.0003	19.5	99041	5621836	56.75	0.08	0.000572	98204.8	56.1535	98176.72	4963810	50.54549	0.00171	94700.14	161.9372	94619.18	3774507	39.85746
27 years	99026	30	0.99969	0.00031	20.2	99011	5522795	55.77	0.09	0.000591	98148.64	57.99211	98119.65	4865633	49.57413	0.001767	94538.21	167.049	94454.68	3679888	38.92487
28 years	98996	32	0.99968	0.00032	17.9	98980	5423784	54.79	0.09	0.00061	98090.65	59.82745	98060.74	4767514	48.60314	0.001824	94371.16	172.133	94285.09	3585433	37.99289
29 years	98964	34	0.99966	0.00034	15.4	98946	5324804	53.81	0.09	0.000648	98030.82	63.52789	97999.06	4669453	47.6325	0.001938	94199.02	182.5577	94107.75	3491148	37.0614
30 years	98930	36	0.99964	0.00036	15.1	98912	5225858	52.82	0.09	0.000686	97967.3	67.22124	97933.69	4571454	46.66306	0.002052	94016.47	192.9218	93920.01	3397040	36.1324
31 years	98894	38	0.99961	0.00039	16.4	98876	5126946	51.84	0.09	0.000743	97900.07	72.77304	97863.69	4473520	45.69476	0.002223	93823.55	208.5697	93719.26	3303120	35.20566
32 years	98856	41	0.99958	0.00042	16.4	98835	5028070	50.86	0.09	0.000801	97827.3	78.31271	97788.15	4375656	44.72838	0.002394	93614.98	224.1143	93502.92	3209401	34.28299
33 years	98815	45	0.99955	0.00045	14.1	98792	4929235	49.88	0.09	0.000858	97748.99	83.83931	97707.07	4277868	43.76381	0.002565	93390.86	239.5476	93271.09	3115898	33.36406
34 years	98770	48	0.99951	0.00049	11.9	98747	4830443	48.91	0.1	0.000934	97665.15	91.21339	97619.54	4180161	42.80095	0.002793	93151.31	260.1716	93021.23	3022627	32.44857
35 years	98722	53	0.99947	0.00053	11.7	98695	4731696	47.93	0.1	0.00101	97573.94	98.56724	97524.65	4082542	41.84049	0.003021	92891.14	280.6241	92750.83	2929606	31.53805
36 years	98669	57	0.99942	0.00058	12.5	98641	4633001	46.95	0.1	0.001105	97475.37	107.7571	97421.49	3985017	40.8823	0.003306	92610.52	306.1704	92457.43	2836855	30.6321
37 years	98612	63	0.99936	0.00064	12.2	98580	4534360	45.98	0.1	0.00122	97367.61	118.7729	97308.23	3887596	39.92699	0.003648	92304.35	336.7263	92135.98	2744398	29.73205
38 years	98549	71	0.99929	0.00071	10.3	98514	4435780	45.01	0.1	0.001353	97248.84	131.603	97183.04	3790287	38.97514	0.004047	91967.62	372.193	91781.52	2652262	28.83908
39 years	98478	78	0.99921	0.00079	8.9	98439	4337266	44.04	0.11	0.001506	97117.24	146.2333	97044.12	3693104	38.02728	0.004503	91595.43	412.4542	91389.2	2560480	27.95423
40 years	98400	86	0.99912	0.00088	9.1	98357	4238827	43.08	0.11	0.001677	96971	162.6475	96889.68	3596060	37.08387	0.005016	91182.97	457.3738	90954.29	2469091	27.07842

41 years	98314	95	0.99903	0.00097	9.8	98267	4140470	42.11	0.11	0.001849	96808.36	178.9812	96718.86	3499171	36.14534	0.005529	90725.6	501.6218	90474.79	2378137	26.21241
42 years	98219	105	0.99893	0.00107	9.6	98166	4042203	41.16	0.11	0.002039	96629.37	197.0679	96530.84	3402452	35.21136	0.006099	90223.98	550.276	89948.84	2287662	25.35536
43 years	98114	114	0.99884	0.00116	8.3	98057	3944037	40.2	0.11	0.002211	96432.31	213.208	96325.7	3305921	34.2823	0.006612	89673.7	592.9225	89377.24	2197713	24.50789
44 years	98000	123	0.99875	0.00125	7.3	97939	3845980	39.24	0.12	0.002383	96219.1	229.242	96104.48	3209595	33.35715	0.007125	89080.78	634.7006	88763.43	2108336	23.66768
45 years	97877	132	0.99865	0.00135	7.7	97811	3748041	38.29	0.12	0.002573	95989.86	246.9915	95866.36	3113491	32.43562	0.007695	88446.08	680.5926	88105.78	2019572	22.83394
46 years	97745	144	0.99853	0.00147	8.4	97673	3650230	37.34	0.12	0.002802	95742.86	268.2543	95608.74	3017624	31.51801	0.008379	87765.49	735.387	87397.79	1931466	22.00713
47 years	97601	158	0.99838	0.00162	8.3	97522	3552557	36.4	0.13	0.003088	95474.61	294.7989	95327.21	2922016	30.60516	0.009234	87030.1	803.6359	86628.28	1844069	21.18886
48 years	97443	174	0.99821	0.00179	7.1	97355	3455035	35.46	0.13	0.003412	95179.81	324.7288	95017.45	2826688	29.6984	0.010203	86226.46	879.7686	85786.58	1757440	20.38168
49 years	97269	192	0.99803	0.00197	6.2	97173	3357680	34.52	0.13	0.003755	94855.08	356.1638	94677	2731671	28.79836	0.011229	85346.7	958.358	84867.52	1671654	19.58663
50 years	97077	211	0.99782	0.00218	6.5	96972	3260507	33.59	0.13	0.004155	94498.92	392.6506	94302.59	2636994	27.90502	0.012426	84388.34	1048.609	83864.03	1586786	18.80338
51 years	96866	234	0.99759	0.00241	7	96748	3163535	32.66	0.14	0.004593	94106.27	432.2734	93890.13	2542691	27.01936	0.013737	83339.73	1144.838	82767.31	1502922	18.03368
52 years	96632	258	0.99733	0.00267	6.8	96503	3066787	31.74	0.14	0.005089	93673.99	476.7088	93435.64	2448801	26.14174	0.015219	82194.89	1250.924	81569.43	1420155	17.2779
53 years	96374	286	0.99703	0.00297	5.8	96231	2970284	30.82	0.14	0.005661	93197.29	527.5731	92933.5	2355366	25.2729	0.016929	80943.97	1370.3	80258.82	1338586	16.53719
54 years	96088	316	0.99671	0.00329	5.2	95929	2874053	29.91	0.15	0.006271	92669.71	581.1077	92379.16	2262432	24.41393	0.018753	79573.67	1492.245	78827.54	1258327	15.81336
55 years	95772	349	0.99636	0.00364	5.6	95598	2778124	29.01	0.15	0.006938	92088.61	638.896	91769.16	2170053	23.56484	0.020748	78081.42	1620.033	77271.4	1179499	15.10602
56 years	95423	383	0.99599	0.00401	6.2	95231	2682526	28.11	0.16	0.007643	91449.71	698.9556	91100.23	2078284	22.72597	0.022857	76461.39	1747.678	75587.55	1102228	14.41548
57 years	95040	420	0.99558	0.00442	6.1	94831	2587295	27.22	0.16	0.008425	90750.75	764.5315	90368.49	1987183	21.89716	0.025194	74713.71	1882.337	73772.54	1026640	13.74099
58 years	94620	456	0.99517	0.00483	5.3	94392	2492464	26.34	0.16	0.009206	89986.22	828.4114	89572.02	1896815	21.07895	0.027531	72831.37	2005.121	71828.81	952867.7	13.0832
59 years	94164	494	0.99476	0.00524	4.7	93917	2398072	25.47	0.17	0.009987	89157.81	890.4583	88712.58	1807243	20.27016	0.029868	70826.25	2115.438	69768.53	881038.9	12.43944
60 years	93670	534	0.9943	0.0057	5	93403	2304155	24.6	0.17	0.010864	88267.35	958.9542	87787.88	1718530	19.4696	0.03249	68710.81	2232.414	67594.61	811270.3	11.80703
61 years	93136	580	0.99377	0.00623	5.5	92846	2210752	23.74	0.18	0.011874	87308.4	1036.733	86790.03	1630743	18.67796	0.035511	66478.4	2360.714	65298.04	743675.7	11.18673
62 years	92556	635	0.99314	0.00686	5.4	92238	2117906	22.88	0.18	0.013075	86271.67	1128.016	85707.66	1543952	17.8964	0.039102	64117.68	2507.13	62864.12	678377.7	10.5802
63 years	91921	697	0.99241	0.00759	4.6	91573	2025668	22.04	0.19	0.014467	85143.65	1231.734	84527.78	1458245	17.12688	0.043263	61610.55	2665.457	60277.83	615513.6	9.990391
64 years	91224	766	0.99161	0.00839	4	90841	1934095	21.2	0.19	0.015991	83911.92	1341.864	83240.98	1373717	16.37094	0.047823	58945.1	2818.931	57535.63	555235.7	9.41954
65 years	90458	840	0.99072	0.00928	4.1	90038	1843254	20.38	0.2	0.017688	82570.05	1460.473	81839.82	1290476	15.62886	0.052896	56126.17	2968.85	54641.74	497700.1	8.867524
66 years	89618	920	0.98973	0.01027	4.5	89158	1753216	19.56	0.21	0.019575	81109.58	1587.689	80315.73	1208636	14.90128	0.058539	53157.32	3111.776	51601.43	443058.4	8.334852
67 years	88698	1009	0.98862	0.01138	4.4	88193	1664058	18.76	0.21	0.02169	79521.89	1724.852	78659.46	1128321	14.1888	0.064866	50045.54	3246.254	48422.41	391456.9	7.822014
68 years	87689	1100	0.98746	0.01254	3.7	87138	1575865	17.97	0.22	0.023901	77797.04	1859.446	76867.31	1049661	13.4923	0.071478	46799.29	3345.119	45126.73	343034.5	7.329909
69 years	86589	1191	0.98624	0.01376	3.2	85994	1488727	17.19	0.22	0.026227	75937.59	1991.582	74941.8	972793.7	12.81044	0.078432	43454.17	3408.197	41750.07	297907.8	6.855678
70 years	85398	1290	0.9849	0.0151	3.3	84752	1402733	16.43	0.23	0.028781	73946.01	2128.211	72881.9	897851.9	12.14199	0.08607	40045.97	3446.757	38322.59	256157.7	6.396592
71 years	84108	1401	0.98335	0.01665	3.6	83408	1317981	15.67	0.24	0.031735	71817.8	2279.131	70678.23	824970	11.48699	0.094905	36599.21	3473.448	34862.49	217835.1	5.951907
72 years	82707	1527	0.98154	0.01846	3.5	81944	1234573	14.93	0.25	0.035185	69538.67	2446.701	68315.32	754291.8	10.84708	0.105222	33125.76	3485.559	31382.99	182972.6	5.523575
73 years	81180	1661	0.97954	0.02046	3	80350	1152629	14.2	0.26	0.038997	67091.97	2616.369	65783.78	685976.5	10.22442	0.116622	29640.21	3456.7	27911.86	151589.7	5.114325
74 years	79519	1797	0.97739	0.02261	2.6	78620	1072279	13.48	0.27	0.043095	64475.6	2778.554	63086.32	620192.7	9.61903	0.128877	26183.51	3374.452	24496.28	123677.8	4.7235
75 years	77722	1944	0.97499	0.02501	2.8	76750	993659	12.78	0.29	0.047669	61697.04	2941.04	60226.52	557106.4	9.029709	0.142557	22809.05	3251.59	21183.26	99181.52	4.34834
76 years	75778	2107	0.9722	0.0278	3	74724	916909	12.1	0.3	0.052987	58756	3113.293	57199.36	496879.8	8.456665	0.15846	19557.46	3099.076	18007.93	77998.26	3.988158
77 years	73671	2290	0.96891	0.03109	2.9	72526	842185	11.43	0.32	0.059258	55642.71	3297.25	53994.09	439680.5	7.901852	0.177213	16458.39	2916.64	15000.07	59990.33	3.64497
78 years	71381	2478	0.96529	0.03471	2.5	70142	769659	10.78	0.33	0.066157	52345.46	3463.032	50613.95	385686.4	7.368096	0.197847	13541.75	2679.194	12202.15	44990.27	3.322338
79 years	68903	2659	0.96141	0.03859	2.3	67574	699517	10.15	0.35	0.073553	48882.43	3595.427	47084.72	335072.5	6.854661	0.219963	10862.55	2389.36	9667.873	32788.12	3.018454
80 years	66244	2847	0.95703	0.04297	2.5	64820	631943	9.54	0.38	0.081901	45287	3709.043	43432.48	287987.7	6.35917	0.244929	8473.194	2075.331	7435.528	23120.24	2.728634
81 years	63397	3051	0.95187	0.04813	2.8	61872	567123	8.95	0.41	0.091736	41577.96	3814.187	39670.87	244555.3	5.881849	0.274341	6397.863	1755.196	5520.265	15684.71	2.451555
82 years	60346	3277	0.94569	0.05431	2.7	58708	505251	8.37	0.43	0.103515	37763.77	3909.112	35809.22	204884.4	5.425422	0.309567	4642.667	1437.216	3924.058	10164.45	2.189356

83 years	57069	3501	0.93866	0.06134	2.3	55318	446543	7.82	0.46	0.116914	33854.66	3958.085	31875.62	169075.2	4.994148	0.349638	3205.45	1120.747	2645.077	6240.391	1.946806
84 years	53568	3699	0.93094	0.06906	2.3	51718	391225	7.3	0.5	0.131628	29896.58	3935.237	27928.96	137199.6	4.58914	0.393642	2084.703	820.6267	1674.39	3595.315	1.724617
85 years	49869	3876	0.92228	0.07772	2.7	47931	339507	6.81	0.55	0.148134	25961.34	3845.765	24038.46	109270.6	4.208974	0.443004	1264.076	559.9909	984.0809	1920.925	1.519627
86 years	45993	4028	0.91242	0.08758	2.8	43979	291576	6.34	0.59	0.166927	22115.57	3691.697	20269.73	85232.15	3.853942	0.499206	704.0855	351.4837	528.3436	936.8441	1.330583
87 years	41965	4151	0.9011	0.0989	2.5	39889	247597	5.9	0.63	0.188503	18423.88	3472.963	16687.39	64962.42	3.525991	0.56373	352.6018	198.7722	253.2157	408.5005	1.158532
88 years	37814	4185	0.88932	0.11068	2.5	35722	207708	5.49	0.68	0.210956	14950.91	3153.986	13373.92	48275.03	3.228901	0.630876	153.8296	97.04739	105.3059	155.2848	1.00946
89 years	33629	4124	0.87736	0.12264	2.6	31567	171986	5.11	0.75	0.233752	11796.93	2757.553	10418.15	34901.11	2.958491	0.699048	56.78219	39.69348	36.93545	49.97888	0.880186
90 years	29505	3999	0.86446	0.13554	2.6	27505	140419	4.76	0.83	0.258339	9039.374	2335.225	7871.761	24482.95	2.708479	0.772578	17.08871	13.20236	10.48753	13.04343	0.763278
91 years	25506	3811	0.8506	0.1494	2.7	23601	112914	4.43	0.92	0.284756	6704.149	1909.049	5749.624	16611.19	2.477748	0.85158	3.886349	3.309537	2.231581	2.5559	0.657661
92 years	21695	3563	0.83575	0.16425	2.8	19913	89313	4.12	1.03	0.313061	4795.1	1501.156	4044.521	10861.57	2.26514	0.936225	0.576812	0.540026	0.306799	0.324319	0.562261
93 years	18132	3266	0.81991	0.18009	3	16499	69400	3.83	1.17	0.343252	3293.943	1130.651	2728.618	6817.048	2.069571	1.026513	0.036786	0.037761	0.017905	0.01752	0.476261
94 years	14866	2927	0.80308	0.19692	3.2	13403	52901	3.56	1.34	0.37533	2163.292	811.9474	1757.318	4088.43	1.889911	1.122444	-0.00098	-0.00109	-0.00043	-0.00039	0.39539
95 years	11939	2564	0.78525	0.21475	3.5	10657	39498	3.31	1.55	0.409314	1351.345	553.1237	1074.783	2331.112	1.725031	1.224075	0.000119	0.000146	4.63E-05	4.23E-05	0.354353
96 years	9375	2190	0.76645	0.23355	3.8	8280	28841	3.08	1.81	0.445146	798.2211	355.3252	620.5585	1256.329	1.573911	1.331235	-2.7E-05	-3.6E-05	-8.9E-06	-4E-06	0.149991
97 years	7185	1820	0.74669	0.25332	4.3	6275	20561	2.86	2.13	0.482828	442.8959	213.8425	335.9747	635.7703	1.435485	1.443924	8.86E-06	1.28E-05	2.46E-06	4.93E-06	0.556679
98 years	5365	1470	0.726	0.274	4.8	4631	14286	2.66	2.55	0.522244	229.0534	119.6218	169.2425	299.7957	1.308846	1.5618	-3.9E-06	-6.1E-06	-8.6E-07	2.47E-06	-0.62768
99 years	3895	1151	0.70443	0.29557	5.3	3319	9655	2.48	3.09	0.563356	109.4316	61.64902	78.60713	130.5531	1.193011	1.684749	2.21E-06	3.72E-06	3.48E-07	3.33E-06	1.507256
100 years	2744	873	0.68203	0.31797	6.2	2308	6336	2.31	3.83	0.606051	47.78262	28.9587	33.30327	51.94601	1.087132	1.812429	-1.5E-06	-2.7E-06	-1.4E-07	2.98E-06	-1.97099
101 years	1871	638	0.65885	0.34115	7.6	1552	4028	2.15	4.87	0.650232	18.82393	12.23992	12.70397	18.64274	0.990375	1.944555	1.23E-06	2.39E-06	3.41E-08	3.13E-06	2.541478
102 years	1233	450	0.63497	0.36503	9.3	1008	2476	2.01	6.2	0.695747	6.584009	4.580805	4.293606	5.938771	0.901999	2.080671	-1.2E-06	-2.4E-06	4.69E-08	3.09E-06	-2.66131
103 years	783	305	0.61046	0.38955	11.5	630	1468	1.88	7.98	0.742482	2.003203	1.487343	1.259532	1.645165	0.821267	2.220435	1.26E-06	2.79E-06	-1.4E-07	3.04E-06	2.425323
104 years	478	198	0.58539	0.41461	13.8	379	838	1.75	10.34	0.790247	0.51586	0.407657	0.312032	0.385633	0.747554	2.363277	-1.5E-06	-3.6E-06	2.78E-07	3.18E-06	-2.07757
105 years	280	123	0.55986	0.44014	18.3	218	459	1.64	13.89	0.838907	0.108203	0.090773	0.062817	0.073602	0.680215	2.508798	2.09E-06	5.24E-06	-5.3E-07	2.9E-06	1.390717
106 years	157	73	0.53397	0.46603	21.7	120	241	1.54	18.36	0.888253	0.017431	0.015483	0.009689	0.010784	0.618698	2.656371	-3.2E-06	-8.4E-06	1.03E-06	3.44E-06	-1.09035
107 years	84	42	0.50779	0.49221	27.6	64	121	1.44	26.32	0.938152	0.001948	0.001827	0.001034	0.001095	0.562207	2.805597	5.22E-06	1.46E-05	-2.1E-06	2.4E-06	0.460141
108 years	42	22	0.48143	0.51857	53.7	31	57	1.35	41.29	0.988394	0.00012	0.000119	6.09E-05	6.09E-05	0.505803	2.955849	-9.4E-06	-2.8E-05	4.5E-06	4.5E-06	-0.47792
Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution																					
F too unreliable to be published (indicates a cv of at least 100.0%)."																					

Table 2a: Complete life table, Alberta, 2000 to 2002, males																					
		General Population								AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	720	0.9928	0.0072	4.9	99373	7704335	77.04	0.14	0.013723	100000	1372.32	99313.84	6942106	69.42106	0.04104	100000	4104	97948	5498177	54.98177
1 year	99280	41	0.99959	0.00041	20	99256	7604962	76.6	0.14	0.000781	98627.68	77.07359	98589.14	6842792	69.38004	0.002337	95896	224.109	95783.95	5400229	56.31339
2 years	99239	27	0.99973	0.00027	21.8	99225	7505706	75.63	0.14	0.000515	98550.61	50.71611	98525.25	6744203	68.4339	0.001539	95671.89	147.239	95598.27	5304445	55.44414
3 years	99212	27	0.99973	0.00027	24	99200	7406481	74.65	0.15	0.000515	98499.89	50.69001	98474.55	6645678	67.46888	0.001539	95524.65	147.0124	95451.15	5208847	54.52883
4 years	99185	25	0.99974	0.00026	29.7	99174	7307281	73.67	0.15	0.000496	98449.2	48.78749	98424.81	6547203	66.50336	0.001482	95377.64	141.3497	95306.96	5113396	53.6121
5 years	99160	31	0.99969	0.00031	27.4	99144	7208107	72.69	0.15	0.000591	98400.41	58.14087	98371.34	6448778	65.53609	0.001767	95236.29	168.2825	95152.15	5018089	52.69093
6 years	99129	18	0.99982	0.00018	39	99120	7108963	71.71	0.15	0.000343	98342.27	33.73927	98325.4	6350407	64.57454	0.001026	95068.01	97.53978	95019.24	4922937	51.78332
7 years	99111	7	0.99993	0.00007	79.8	99108	7009843	70.73	0.15	0.000133	98308.53	13.11632	98301.97	6252081	63.59653	0.000399	94970.47	37.89322	94951.52	4827918	50.83599
8 years	99104	6	0.99995	0.00006	96	99101	6910735	69.73	0.16	0.000114	98295.42	11.24106	98289.8	6153779	62.60495	0.000342	94932.57	32.46694	94916.34	4732966	49.85608
9 years	99098	5	0.99995	0	0	99096	6811634	68.74	0.16	0	98284.18	0	98284.18	6055490	61.61205	0	94900.11	0	94900.11	4638050	48.87297
10 years	99093	6	0.99993	0.00007	84.1	99090	6712538	67.74	0.16	0.000133	98284.18	13.11307	98277.62	5957205	60.61205	0.000399	94900.11	37.86514	94881.17	4543150	47.87297
11 years	99087	8	0.99992	0.00008	68.4	99083	6613448	66.74	0.16	0.000152	98271.06	14.98437	98263.57	5858928	59.62007	0.000456	94862.24	43.25718	94840.61	4448268	46.89188
12 years	99079	13	0.99987	0.00013	57.5	99072	6514365	65.75	0.16	0.000248	98256.08	24.34589	98243.9	5760664	58.62909	0.000741	94818.99	70.26087	94783.85	4353428	45.91304
13 years	99066	24	0.99976	0.00024	31.8	99054	6415293	64.76	0.17	0.000457	98231.73	44.93512	98209.26	5662420	57.6435	0.001368	94748.72	129.6163	94683.92	4258644	44.94672
14 years	99042	38	0.99961	0.00039	24.6	99024	6316239	63.77	0.17	0.000743	98186.8	72.98617	98150.3	5564211	56.66965	0.002223	94619.11	210.3383	94513.94	4163960	44.0076
15 years	99004	55	0.99944	0.00056	24.2	98976	6217215	62.8	0.17	0.001067	98113.81	104.7228	98061.45	5466061	55.71143	0.003192	94408.77	301.3528	94258.09	4069446	43.10454
16 years	98949	70	0.99929	0.00071	24.2	98914	6118239	61.83	0.17	0.001353	98009.09	132.6318	97942.77	5367999	54.77042	0.004047	94107.42	380.8527	93916.99	3975188	42.24096
17 years	98879	81	0.99918	0.00082	22.8	98838	6019325	60.88	0.18	0.001563	97876.46	152.9731	97799.97	5270057	53.84397	0.004674	93726.56	438.078	93507.53	3881271	41.41058
18 years	98798	88	0.99912	0.00088	19.6	98754	5920487	59.93	0.18	0.001677	97723.48	163.9096	97641.53	5172257	52.92747	0.005016	93288.49	467.935	93054.52	3787764	40.60269
19 years	98710	91	0.99908	0.00092	16.9	98665	5821733	58.98	0.18	0.001754	97559.57	171.0727	97474.04	5074615	52.01555	0.005244	92820.55	486.751	92577.18	3694709	39.80486
20 years	98619	92	0.99906	0.00094	17.1	98573	5723068	58.03	0.18	0.001792	97388.5	174.4851	97301.26	4977141	51.10604	0.005358	92333.8	494.7245	92086.44	3602132	39.01206
21 years	98527	93	0.99906	0.00094	19.6	98481	5624495	57.09	0.19	0.001792	97214.02	174.1725	97126.93	4879840	50.19687	0.005358	91839.08	492.0738	91593.04	3510045	38.21952
22 years	98434	92	0.99906	0.00094	21.1	98388	5526014	56.14	0.19	0.001792	97039.84	173.8605	96952.91	4782713	49.28607	0.005358	91347	489.4372	91102.28	3418452	37.42271
23 years	98342	92	0.99907	0.00093	19.9	98296	5427626	55.19	0.19	0.001773	96865.98	171.7027	96780.13	4685760	48.37364	0.005301	90857.56	481.636	90616.75	3327350	36.62161
24 years	98250	88	0.9991	0.0009	17.9	98206	5329330	54.24	0.19	0.001715	96694.28	165.8694	96611.35	4588980	47.45865	0.00513	90375.93	463.6285	90144.11	3236733	35.81411
25 years	98162	84	0.99914	0.00086	18.2	98120	5231124	53.29	0.2	0.001639	96528.41	158.2255	96449.3	4492368	46.53934	0.004902	89912.3	440.7501	89691.93	3146589	34.9962
26 years	98078	82	0.99916	0.00084	21	98037	5133004	52.34	0.2	0.001601	96370.19	154.2925	96293.04	4395919	45.61493	0.004788	89471.55	428.3898	89257.36	3056897	34.16614
27 years	97996	82	0.99916	0.00084	22.5	97954	5034967	51.38	0.2	0.001601	96215.89	154.0455	96138.87	4299626	44.68728	0.004788	89043.16	426.3387	88829.99	2967640	33.32811
28 years	97914	86	0.99913	0.00087	20.2	97871	4937013	50.42	0.2	0.001658	96061.85	159.2917	95982.2	4203487	43.75813	0.004959	88616.82	439.4508	88397.1	2878810	32.48604
29 years	97828	90	0.99908	0.00092	17.5	97783	4839142	49.47	0.21	0.001754	95902.56	168.167	95818.47	4107505	42.82999	0.005244	88177.37	462.4021	87946.17	2790413	31.64545
30 years	97738	96	0.99901	0.00099	17.4	97690	4741359	48.51	0.21	0.001887	95734.39	180.645	95644.07	4011687	41.90434	0.005643	87714.97	494.9756	87467.48	2702467	30.80964
31 years	97642	104	0.99894	0.00106	19	97590	4643669	47.56	0.22	0.00202	95553.74	193.053	95457.22	3916043	40.98262	0.006042	87219.99	526.9832	86956.5	2614999	29.98165
32 years	97538	108	0.99888	0.00112	19.4	97484	4546079	46.61	0.22	0.002135	95360.69	203.5684	95258.91	3820585	40.06457	0.006384	86693.01	553.4482	86416.29	2528043	29.16086
33 years	97430	114	0.99883	0.00117	17.3	97373	4448595	45.66	0.22	0.00223	95157.12	212.2023	95051.02	3725326	39.14921	0.006669	86139.56	574.4647	85852.33	2441626	28.34501
34 years	97316	118	0.99879	0.00121	14.9	97257	4351222	44.71	0.23	0.002306	94944.92	218.9677	94835.44	3630275	38.23559	0.006897	85565.1	590.1425	85270.03	2355774	27.53195
35 years	97198	121	0.99875	0.00125	14.7	97138	4253965	43.77	0.23	0.002383	94725.95	225.6846	94613.11	3535440	37.32282	0.007125	84974.95	605.4466	84672.23	2270504	26.71969
36 years	97077	127	0.99869	0.00131	16.1	97013	4156827	42.82	0.24	0.002497	94500.27	235.9539	94382.29	3440827	36.41076	0.007467	84369.51	629.9871	84054.51	2185832	25.90784
37 years	96950	133	0.99863	0.00137	16.5	96884	4059814	41.88	0.24	0.002611	94264.31	246.1449	94141.24	3346445	35.50065	0.007809	83739.52	653.9219	83412.56	2101777	25.09899
38 years	96817	141	0.99855	0.00145	14.6	96746	3962930	40.93	0.25	0.002764	94018.17	259.838	93888.25	3252303	34.59229	0.008265	83085.6	686.7025	82742.25	2018365	24.29259
39 years	96676	149	0.99846	0.00154	12.5	96601	3866184	39.99	0.25	0.002935	93758.33	275.2032	93620.73	3158415	33.68677	0.008778	82398.9	723.2975	82037.25	1935623	23.49088
40 years	96527	159	0.99835	0.00165	12.6	96447	3769583	39.05	0.26	0.003145	93483.13	293.9951	93336.13	3064794	32.78447	0.009405	81675.6	768.159	81291.52	1853585	22.69448

41 years	96368	170	0.99824	0.00176	13.7	96283	3673136	38.12	0.26	0.003355	93189.13	312.6085	93032.83	2971458	31.88632	0.010032	80907.44	811.6634	80501.61	1772294	21.9052
42 years	96198	183	0.9981	0.0019	13.7	96107	3576853	37.18	0.27	0.003621	92876.52	336.343	92708.35	2878425	30.99196	0.01083	80095.78	867.4373	79662.06	1691792	21.12211
43 years	96015	197	0.99795	0.00205	11.9	95917	3480746	36.25	0.27	0.003907	92540.18	361.5822	92359.39	2785717	30.10278	0.011685	79228.34	925.7831	78765.45	1612130	20.3479
44 years	95818	212	0.99778	0.00222	10.5	95712	3384829	35.33	0.28	0.004231	92178.6	390.0371	91983.58	2693358	29.2189	0.012654	78302.56	990.8405	77807.14	1533365	19.58256
45 years	95606	230	0.99759	0.00241	11	95491	3289117	34.4	0.29	0.004593	91788.56	421.6271	91577.75	2601374	28.34094	0.013737	77311.72	1062.031	76780.7	1455557	18.82713
46 years	95376	249	0.99739	0.00261	12.1	95251	3193626	33.48	0.3	0.004975	91366.93	454.5194	91139.67	2509796	27.46942	0.014877	76249.68	1134.367	75682.5	1378777	18.08239
47 years	95127	270	0.99717	0.00283	12.1	94992	3098375	32.57	0.3	0.005394	90912.41	490.3797	90667.22	2418657	26.60425	0.016131	75115.32	1211.685	74509.48	1303094	17.34792
48 years	94857	290	0.99694	0.00306	10.5	94712	3003383	31.66	0.31	0.005832	90422.04	527.3739	90158.35	2327989	25.74582	0.017442	73903.63	1289.027	73259.12	1228585	16.62415
49 years	94567	311	0.99671	0.00329	9.5	94412	2908671	30.76	0.32	0.006271	89894.66	563.706	89612.81	2237831	24.89393	0.018753	72614.61	1361.742	71933.73	1155326	15.91038
50 years	94256	334	0.99646	0.00354	10.1	94089	2814259	29.86	0.33	0.006747	89330.96	602.7374	89029.59	2148218	24.04786	0.020178	71252.86	1437.74	70533.99	1083392	15.20489
51 years	93922	361	0.99615	0.00385	11.2	93741	2720170	28.96	0.34	0.007338	88728.22	651.0965	88402.67	2059189	23.20782	0.021945	69815.12	1532.093	69049.08	1012858	14.50772
52 years	93561	395	0.99578	0.00422	11	93364	2626429	28.07	0.35	0.008043	88077.12	708.4325	87722.9	1970786	22.37569	0.024054	68283.03	1642.48	67461.79	943808.9	13.82201
53 years	93166	432	0.99536	0.00464	9.5	92950	2533065	27.19	0.36	0.008844	87368.69	772.6747	86982.35	1883063	21.55307	0.026448	66640.55	1762.509	65759.3	876347.1	13.15036
54 years	92734	475	0.99488	0.00512	8.7	92497	2440115	26.31	0.37	0.009759	86596.01	845.0663	86173.48	1796081	20.74092	0.029184	64878.04	1893.401	63931.34	810587.8	12.49402
55 years	92259	521	0.99435	0.00565	9.5	91998	2347618	25.45	0.38	0.010769	85750.95	923.4434	85289.23	1709907	19.94039	0.032205	62984.64	2028.42	61970.43	746656.5	11.85458
56 years	91738	574	0.99375	0.00625	10.4	91451	2255620	24.59	0.39	0.011913	84827.5	1010.508	84322.25	1624618	19.15202	0.035625	60956.22	2171.565	59870.44	684686	11.23242
57 years	91164	633	0.99306	0.00694	10.2	90847	2164169	23.74	0.4	0.013228	83817	1108.701	83262.65	1540296	18.37689	0.039558	58784.66	2325.403	57621.95	624815.6	10.62889
58 years	90531	697	0.99229	0.00771	8.7	90183	2073322	22.9	0.41	0.014695	82708.3	1215.42	82100.59	1457033	17.61653	0.043947	56459.25	2481.215	55218.64	567193.6	10.04607
59 years	89834	767	0.99146	0.00854	7.8	89450	1983139	22.08	0.43	0.016277	81492.88	1326.479	80829.64	1374933	16.87181	0.048678	53978.04	2627.543	52664.27	511975	9.484876
60 years	89067	842	0.99055	0.00945	8.3	88646	1893689	21.26	0.44	0.018012	80166.4	1443.933	79444.43	1294103	16.14271	0.053865	51350.49	2765.994	49967.5	459310.7	8.944621
61 years	88225	921	0.98955	0.01045	9.1	87764	1805043	20.46	0.46	0.019918	78722.46	1567.97	77938.48	1214658	15.42963	0.059565	48584.5	2893.936	47137.53	409343.2	8.425387
62 years	87304	1009	0.98845	0.01155	9	86799	1717279	19.67	0.47	0.022014	77154.49	1698.502	76305.24	1136720	14.73304	0.065835	45690.56	3008.038	44186.54	362205.7	7.927363
63 years	86295	1099	0.98726	0.01274	7.7	85746	1630480	18.89	0.48	0.024282	75455.99	1832.256	74539.86	1060415	14.05342	0.072618	42682.53	3099.52	41132.77	318019.2	7.450804
64 years	85196	1193	0.986	0.014	6.7	84600	1544734	18.13	0.5	0.026684	73623.74	1964.576	72641.45	985874.9	13.39072	0.0798	39583.01	3158.724	38003.64	276886.4	6.995082
65 years	84003	1290	0.98464	0.01536	7	83358	1460134	17.38	0.52	0.029276	71659.16	2097.905	70610.21	913233.4	12.74413	0.087552	36424.28	3189.019	34829.77	238882.7	6.558338
66 years	82713	1395	0.98314	0.01686	7.7	82015	1376776	16.65	0.54	0.032135	69561.25	2235.362	68443.57	842623.2	12.1134	0.096102	33235.26	3193.975	31638.28	204053	6.139652
67 years	81318	1506	0.98148	0.01852	7.6	80565	1294761	15.92	0.56	0.035299	67325.89	2376.545	66137.62	774179.7	11.49899	0.105564	30041.29	3171.279	28455.65	172414.7	5.739258
68 years	79812	1618	0.97973	0.02027	6.5	79002	1214196	15.21	0.57	0.038635	64949.35	2509.293	63694.7	708042	10.90145	0.115539	26870.01	3104.534	25317.74	143959	5.35761
69 years	78194	1728	0.9779	0.0221	5.8	77330	1135194	14.52	0.6	0.042123	62440.05	2630.137	61124.99	644347.3	10.31946	0.12597	23765.48	2993.737	22268.61	118641.3	4.99217
70 years	76466	1843	0.9759	0.0241	6.1	75545	1057864	13.83	0.63	0.045935	59809.92	2747.345	58436.24	583222.4	9.751265	0.13737	20771.74	2853.414	19345.03	96372.69	4.639606
71 years	74623	1968	0.97362	0.02638	6.6	73639	982319	13.16	0.66	0.05028	57062.57	2869.122	55628.01	524786.1	9.196678	0.150366	17918.32	2694.307	16571.17	77027.66	4.29882
72 years	72655	2110	0.97096	0.02904	6.5	71599	908680	12.51	0.69	0.05535	54193.45	2999.62	52693.64	469158.1	8.6571	0.165528	15224.02	2520.001	13964.02	60456.49	3.971126
73 years	70545	2257	0.96801	0.03199	5.6	69417	837081	11.87	0.72	0.060973	51193.83	3121.438	49633.11	416464.5	8.135052	0.182343	12704.02	2316.489	11545.77	46492.47	3.659667
74 years	68288	2401	0.96484	0.03516	5.1	67088	767664	11.24	0.76	0.067015	48072.39	3221.569	46461.61	366831.3	7.630811	0.200412	10387.53	2081.785	9346.636	34946.7	3.364294
75 years	65887	2549	0.96131	0.03869	5.6	64613	700576	10.63	0.8	0.073743	44850.82	3307.44	43197.1	320369.7	7.143007	0.220533	8305.743	1831.69	7389.898	25600.06	3.082212
76 years	63338	2705	0.95729	0.04271	6.2	61985	635963	10.04	0.85	0.081405	41543.38	3381.85	39852.46	277172.6	6.671884	0.243447	6474.053	1576.089	5686.008	18210.17	2.812793
77 years	60633	2872	0.95263	0.04737	6	59197	573978	9.47	0.9	0.090287	38161.53	3445.499	36438.78	237320.2	6.218833	0.270009	4897.964	1322.494	4236.717	12524.16	2.557013
78 years	57761	3037	0.94743	0.05257	5.2	56242	514781	8.91	0.95	0.100198	34716.03	3478.492	32976.79	200881.4	5.786416	0.299649	3575.47	1071.386	3039.777	8287.442	2.317861
79 years	54724	3186	0.94178	0.05822	4.9	53132	458539	8.38	1.02	0.110967	31237.54	3466.346	29504.37	167904.6	5.37509	0.331854	2504.084	830.9902	2088.589	5247.665	2.095643
80 years	51538	3321	0.93555	0.06445	5.5	49877	405407	7.87	1.11	0.122842	27771.2	3411.461	26065.46	138400.2	4.98359	0.367365	1673.093	614.636	1365.775	3159.077	1.888165
81 years	48217	3443	0.9286	0.0714	6.1	46495	355530	7.37	1.2	0.136088	24359.73	3315.077	22702.2	112334.8	4.611494	0.40698	1058.457	430.771	843.072	1793.301	1.694259
82 years	44774	3546	0.92081	0.07919	6	43002	309035	6.9	1.29	0.150936	21044.66	3176.399	19456.46	89632.58	4.259161	0.451383	627.6865	283.327	486.023	950.2293	1.51386

83 years	41228	3617	0.91226	0.08774	5.2	39419	266033	6.45	1.39	0.167232	17868.26	2988.152	16374.18	70176.12	3.927418	0.500118	344.3595	172.2204	258.2493	464.2063	1.348028
84 years	37611	3647	0.90303	0.09697	5.5	35787	226614	6.03	1.54	0.184825	14880.11	2750.213	13505	53801.94	3.615696	0.552729	172.1391	95.14627	124.566	205.957	1.196457
85 years	33964	3634	0.89301	0.10699	6.6	32147	190827	5.62	1.71	0.203923	12129.89	2473.563	10893.11	40296.94	3.322119	0.609843	76.99283	46.95354	53.51606	81.39105	1.057125
86 years	30330	3577	0.88206	0.11794	7	28542	158680	5.23	1.87	0.224794	9656.329	2170.681	8570.989	29403.83	3.045032	0.672258	30.03929	20.19415	19.94221	27.87499	0.927951
87 years	26753	3477	0.87004	0.12996	6.5	25014	130138	4.86	2.03	0.247704	7485.648	1854.223	6558.536	20832.84	2.783038	0.740772	9.845137	7.293002	6.198636	7.932778	0.805756
88 years	23276	3408	0.85359	0.14641	6.9	21572	105124	4.52	2.27	0.279057	5631.425	1571.491	4845.679	14274.31	2.53476	0.834537	2.552135	2.129851	1.48721	1.734141	0.679487
89 years	19868	3190	0.83945	0.16055	7.3	18274	83552	4.21	2.53	0.306008	4059.934	1242.373	3438.747	9428.629	2.32236	0.915135	0.422284	0.386447	0.229061	0.246932	0.584753
90 years	16678	2930	0.82431	0.17569	7.5	15213	65278	3.91	2.83	0.334865	2817.56	943.5027	2345.809	5989.882	2.125911	1.001433	0.035837	0.035888	0.017893	0.017871	0.498683
91 years	13748	2637	0.80815	0.19185	8.1	12429	50065	3.64	3.21	0.365666	1874.058	685.2793	1531.418	3644.073	1.944483	1.093545	-5.1E-05	-5.6E-05	-2.3E-05	-2.2E-05	0.419347
92 years	11111	2323	0.79097	0.20903	8.6	9950	37636	3.39	3.65	0.398411	1188.778	473.6225	951.967	2112.655	1.777165	1.191471	4.8E-06	5.72E-06	1.94E-06	1.74E-06	0.362187
93 years	8788	1997	0.77275	0.22725	9.2	7789	27686	3.15	4.21	0.433139	715.1557	309.7615	560.275	1160.688	1.622987	1.295325	-9.2E-07	-1.2E-06	-3.2E-07	-2E-07	0.219758
94 years	6791	1674	0.75349	0.24651	9.9	5954	19897	2.93	4.93	0.469848	405.3942	190.4737	310.1574	600.4132	1.48106	1.405107	2.72E-07	3.82E-07	8.08E-08	1.22E-07	0.448927
95 years	5117	1365	0.7332	0.2668	12.7	4435	13943	2.72	5.9	0.508521	214.9205	109.2916	160.2748	290.2559	1.350526	1.52076	-1.1E-07	-1.7E-07	-2.6E-08	4.11E-08	-0.37393
96 years	3752	1081	0.71189	0.28811	12.1	3211	9508	2.53	6.66	0.549138	105.629	58.00485	76.62655	129.9811	1.230544	1.642227	5.73E-08	9.41E-08	1.03E-08	6.75E-08	1.178177
97 years	2671	829	0.68958	0.31042	13	2256	6297	2.36	8.1	0.591661	47.62413	28.17732	33.53547	53.35455	1.120326	1.769394	-3.7E-08	-6.5E-08	-4.2E-09	5.73E-08	-1.55598
98 years	1842	615	0.66631	0.33369	16.8	1535	4041	2.19	10.37	0.636013	19.44681	12.36843	13.2626	19.81909	1.019143	1.902033	2.83E-08	5.39E-08	1.39E-09	6.15E-08	2.172204
99 years	1227	439	0.64211	0.35789	17.8	1007	2506	2.04	13.04	0.682138	7.078384	4.828437	4.664165	6.556489	0.926269	2.039973	-2.6E-08	-5.2E-08	5.11E-10	6.01E-08	-2.35382
100 years	788	302	0.61703	0.38297	25.7	637	1499	1.9	17.86	0.729941	2.249947	1.642328	1.428783	1.892324	0.841053	2.182929	2.66E-08	5.8E-08	-2.4E-09	5.96E-08	2.244126
101 years	486	199	0.59113	0.40887	33.3	387	862	1.77	23.37	0.779306	0.607619	0.473521	0.370858	0.463541	0.762881	2.330559	-3.1E-08	-7.3E-08	5.19E-09	6.2E-08	-1.97441
102 years	287	125	0.56446	0.43554	36.1	225	475	1.65	29.97	0.830139	0.134098	0.11132	0.078438	0.092683	0.691157	2.482578	4.18E-08	1.04E-07	-1E-08	5.68E-08	1.359679
103 years	162	75	0.53712	0.46288	51.8	125	250	1.54	43.34	0.882249	0.022778	0.020096	0.01273	0.014245	0.625377	2.638416	-6.2E-08	-1.6E-07	1.98E-08	6.69E-08	-1.07985
104 years	87	43	0.50915	0.49085	87.4	65	125	1.44	62.04	0.93556	0.002682	0.002509	0.001427	0.001515	0.564767	2.797845	1.02E-07	2.84E-07	-4.1E-08	4.72E-08	0.464257
105 years	44	23	0.48066	0.51934	84.9	33	60	1.34	60.43	0.989862	0.000173	0.000171	8.73E-05	8.73E-05	0.505069	2.960238	-1.8E-07	-5.4E-07	8.77E-08	8.77E-08	-0.48012
Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution																					
F too unreliable to be published (indicates a cv of at least 100.0%)."																					

Table 2b: Complete life table, Alberta, 2000 to 2002, females																					
			General Population							AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	572	0.99428	0.00572	5.6	99508	8210333	82.1	0.14	0.010902	100000	1090.232	99454.88	7497099	74.97099	0.032604	100000	3260.4	98369.8	6147387	61.47387
1 year	99428	73	0.99926	0.00074	15.6	99386	8110825	81.57	0.14	0.00141	98909.77	139.5063	98840.01	7397644	74.79185	0.004218	96739.6	408.0476	96535.58	6049017	62.52887
2 years	99355	27	0.99973	0.00027	25.8	99335	8011439	80.63	0.14	0.000515	98770.26	50.82915	98744.85	7298804	73.89678	0.001539	96331.55	148.2543	96257.43	5952482	61.79161
3 years	99328	14	0.99986	0.00014	35.4	99322	7912104	79.66	0.14	0.000267	98719.43	26.34229	98706.26	7200059	72.93457	0.000798	96183.3	76.75427	96144.92	5856224	60.88608
4 years	99314	7	0.99993	0.00007	50	99309	7812782	78.67	0.14	0.000133	98693.09	13.16763	98686.51	7101353	71.9539	0.000399	96106.54	38.34651	96087.37	5760080	59.93431
5 years	99307	5	0.99995	0.00005	96.9	99305	7713473	77.67	0.14	9.53E-05	98679.92	9.404197	98675.22	7002667	70.96344	0.000285	96068.2	27.37944	96054.51	5663992	58.95803
6 years	99302	6	0.99994	0	0	99299	7614168	76.68	0.14	0	98670.52	0	98670.52	6903991	69.97015	0	96040.82	0	96040.82	5567938	57.9747
7 years	99296	8	0.99992	0.00008	77.9	99292	7514869	75.68	0.15	0.000152	98670.52	15.04528	98663	6805321	68.97015	0.000456	96040.82	43.79461	96018.92	5471897	56.9747
8 years	99288	8	0.99992	0.00008	75.6	99284	7415577	74.69	0.15	0.000152	98655.47	15.04299	98647.95	6706658	67.9806	0.000456	95997.02	43.77464	95975.14	5375878	56.00046
9 years	99280	8	0.99992	0.00008	69.5	99277	7316293	73.69	0.15	0.000152	98640.43	15.04069	98632.91	6608010	66.99089	0.000456	95953.25	43.75468	95931.37	5279903	55.02578
10 years	99272	9	0.99991	0.00009	63	99267	7217016	72.7	0.15	0.000172	98625.39	16.9182	98616.93	6509377	66.00103	0.000513	95909.49	49.20157	95884.89	5183971	54.05066
11 years	99263	10	0.9999	0.0001	59.2	99259	7117749	71.71	0.15	0.000191	98608.47	18.79477	98599.07	6410760	65.01226	0.00057	95860.29	54.64037	95832.97	5088086	53.07814
12 years	99253	14	0.99986	0.00014	56.8	99246	7018490	70.71	0.15	0.000267	98589.68	26.30767	98576.52	6312161	64.02456	0.000798	95805.65	76.45291	95767.43	4992254	52.10813
13 years	99239	17	0.99982	0.00018	42.6	99231	6919244	69.72	0.16	0.000343	98563.37	33.81512	98546.46	6213584	63.04152	0.001026	95729.2	98.21816	95680.09	4896486	51.14935
14 years	99222	23	0.99977	0.00023	34.1	99210	6820013	68.74	0.16	0.000438	98529.55	43.19339	98507.96	6115038	62.06298	0.001311	95630.98	125.3722	95568.29	4800806	50.20137
15 years	99199	29	0.99971	0.00029	33.9	99184	6720803	67.75	0.16	0.000553	98486.36	54.43735	98459.14	6016530	61.08998	0.001653	95505.61	157.8708	95426.67	4705238	49.26661
16 years	99170	33	0.99967	0.00033	35.6	99154	6621619	66.77	0.16	0.000629	98431.92	61.91171	98400.97	5918071	60.12349	0.001881	95347.74	179.3491	95258.06	4609811	48.34736
17 years	99137	36	0.99963	0.00037	35	99119	6522465	65.79	0.17	0.000705	98370.01	69.3725	98335.33	5819670	59.16102	0.002109	95168.39	200.7101	95068.03	4514553	47.43753
18 years	99101	39	0.99961	0.00039	30.9	99081	6423346	64.82	0.17	0.000743	98300.64	73.0708	98264.1	5721335	58.20241	0.002223	94967.68	211.1131	94862.12	4419485	46.53673
19 years	99062	39	0.9996	0.0004	26.8	99043	6324265	63.84	0.17	0.000762	98227.57	74.8887	98190.12	5623070	57.24534	0.00228	94756.57	216.045	94648.54	4324623	45.63929
20 years	99023	40	0.9996	0.0004	27.1	99003	6225222	62.87	0.17	0.000762	98152.68	74.8316	98115.26	5524880	56.28863	0.00228	94540.52	215.5524	94432.74	4229974	44.74245
21 years	98983	39	0.9996	0.0004	31.2	98963	6126219	61.89	0.17	0.000762	98077.85	74.77455	98040.46	5426765	55.3312	0.00228	94324.97	215.0609	94217.44	4135542	43.84355
22 years	98944	39	0.99961	0.00039	34	98925	6027256	60.92	0.18	0.000743	98003.07	72.8496	97966.65	5328725	54.37304	0.002223	94109.91	209.2063	94005.3	4041324	42.9426
23 years	98905	37	0.99962	0.00038	32.5	98886	5928331	59.94	0.18	0.000724	97930.22	70.9289	97894.76	5230758	53.41311	0.002166	93900.7	203.3889	93799.01	3947319	42.03716
24 years	98868	35	0.99964	0.00036	30	98851	5829445	58.96	0.18	0.000686	97859.29	67.14713	97825.72	5132863	52.45146	0.002052	93697.31	192.2669	93601.18	3853520	41.12732
25 years	98833	33	0.99967	0.00033	30.9	98816	5730594	57.98	0.18	0.000629	97792.15	61.5093	97761.39	5035037	51.48713	0.001881	93505.05	175.883	93417.1	3759919	40.21086
26 years	98800	32	0.99968	0.00032	35.7	98784	5631778	57	0.19	0.00061	97730.64	59.60787	97700.83	4937276	50.51922	0.001824	93329.16	170.2324	93244.05	3666501	39.2857
27 years	98768	32	0.99967	0.00033	37.5	98752	5532994	56.02	0.19	0.000629	97671.03	61.43312	97640.31	4839575	49.54975	0.001881	93158.93	175.2319	93071.31	3573257	38.35657
28 years	98736	35	0.99964	0.00036	32.1	98718	5434242	55.04	0.19	0.000686	97609.6	66.9758	97576.11	4741935	48.58062	0.002052	92983.7	190.8025	92888.3	3480186	37.42792
29 years	98701	41	0.99959	0.00041	27	98680	5335524	54.06	0.2	0.000781	97542.62	76.22566	97504.51	4644359	47.61364	0.002337	92792.9	216.857	92684.47	3387298	36.50385
30 years	98660	46	0.99953	0.00047	26.7	98638	5236844	53.08	0.2	0.000896	97466.4	87.31235	97422.74	4546854	46.65048	0.002679	92576.04	248.0112	92452.03	3294613	35.58819
31 years	98614	52	0.99947	0.00053	28.3	98588	5138206	52.1	0.2	0.00101	97379.08	98.3704	97329.9	4449432	45.69186	0.003021	92328.03	278.923	92188.57	3202161	34.68244
32 years	98562	58	0.99941	0.00059	27.7	98532	5039618	51.13	0.21	0.001125	97280.71	109.3961	97226.01	4352102	44.73756	0.003363	92049.1	309.5611	91894.32	3109973	33.78602
33 years	98504	63	0.99937	0.00063	23.9	98473	4941086	50.16	0.21	0.001201	97171.32	116.6814	97112.98	4254876	43.78736	0.003591	91739.54	329.4367	91574.82	3018078	32.89834
34 years	98441	66	0.99932	0.00068	20.2	98408	4842613	49.19	0.21	0.001296	97054.64	125.7906	96991.74	4157763	42.8394	0.003876	91410.11	354.3056	91232.95	2926504	32.0151
35 years	98375	71	0.99928	0.00072	19.9	98339	4744205	48.23	0.22	0.001372	96928.84	133.0174	96862.34	4060771	41.89435	0.004104	91055.8	373.693	90868.95	2835271	31.13773
36 years	98304	75	0.99923	0.00077	21.6	98267	4645866	47.26	0.22	0.001468	96795.83	142.0595	96724.8	3963909	40.95123	0.004389	90682.11	398.0038	90483.11	2744402	30.26398
37 years	98229	81	0.99918	0.00082	21.7	98188	4547599	46.3	0.23	0.001563	96653.77	151.0621	96578.24	3867184	40.01069	0.004674	90284.1	421.9879	90073.11	2653919	29.39519
38 years	98148	87	0.99912	0.00088	18.9	98105	4449411	45.33	0.23	0.001677	96502.71	161.8621	96421.77	3770606	39.07254	0.005016	89862.12	450.7484	89636.74	2563846	28.53088
39 years	98061	93	0.99905	0.00095	16.2	98015	4351306	44.37	0.24	0.001811	96340.84	174.4444	96253.62	3674184	38.13734	0.005415	89411.37	484.1626	89169.29	2474209	27.67219
40 years	97968	100	0.99898	0.00102	16.3	97918	4253291	43.41	0.24	0.001944	96166.4	186.959	96072.92	3577930	37.20562	0.005814	88927.21	517.0228	88668.69	2385039	26.82013

41 years	97868	108	0.99889	0.00111	17.7	97814	4155373	42.46	0.25	0.002116	95979.44	203.0599	95877.91	3481857	36.27712	0.006327	88410.18	559.3712	88130.5	2296371	25.97405
42 years	97760	118	0.9988	0.0012	17.6	97701	4057559	41.51	0.25	0.002287	95776.38	219.0597	95666.85	3385979	35.35297	0.00684	87850.81	600.8995	87550.36	2208240	25.13625
43 years	97642	127	0.99869	0.00131	15.2	97579	3959858	40.55	0.26	0.002497	95557.32	238.5933	95438.02	3290312	34.43287	0.007467	87249.91	651.4951	86924.16	2120690	24.30593
44 years	97515	139	0.99858	0.00142	13.4	97445	3862279	39.61	0.26	0.002707	95318.73	257.982	95189.74	3194874	33.5178	0.008094	86598.42	700.9276	86247.95	2033766	23.48502
45 years	97376	150	0.99846	0.00154	14.1	97302	3764834	38.66	0.27	0.002935	95060.75	279.0261	94921.23	3099685	32.60741	0.008778	85897.49	754.0082	85520.48	1947518	22.67258
46 years	97226	164	0.99832	0.00168	15.5	97144	3667532	37.72	0.27	0.003202	94781.72	303.4986	94629.97	3004763	31.70193	0.009576	85143.48	815.334	84735.81	1861997	21.86894
47 years	97062	178	0.99816	0.00184	15.3	96973	3570388	36.78	0.28	0.003507	94478.22	331.3389	94312.55	2910134	30.80216	0.010488	84328.15	884.4336	83885.93	1777262	21.07554
48 years	96884	194	0.998	0.002	13.3	96787	3473415	35.85	0.29	0.003812	94146.88	358.8879	93967.44	2815821	29.90881	0.0114	83443.71	951.2583	82968.08	1693376	20.29363
49 years	96690	210	0.99783	0.00217	11.9	96586	3376628	34.92	0.29	0.004136	93787.99	387.909	93594.04	2721854	29.02134	0.012369	82492.45	1020.349	81982.28	1610407	19.52188
50 years	96480	227	0.99764	0.00236	12.6	96366	3280042	34	0.3	0.004498	93400.09	420.1285	93190.02	2628259	28.1398	0.013452	81472.11	1095.963	80924.12	1528425	18.7601
51 years	96253	248	0.99743	0.00257	13.9	96130	3183676	33.08	0.31	0.004898	92979.96	455.4549	92752.23	2535069	27.26469	0.014649	80376.14	1177.43	79787.43	1447501	18.00909
52 years	96005	271	0.99717	0.00283	13.7	95869	3087546	32.16	0.32	0.005394	92524.5	499.0753	92274.96	2442317	26.39644	0.016131	79198.71	1277.554	78559.94	1367714	17.26939
53 years	95734	299	0.99688	0.00312	11.7	95585	2991677	31.25	0.32	0.005947	92025.43	547.2494	91751.8	2350042	25.53688	0.017784	77921.16	1385.75	77228.28	1289154	16.54433
54 years	95435	329	0.99656	0.00344	10.7	95271	2896092	30.35	0.33	0.006557	91478.18	599.7895	91178.28	2258290	24.68666	0.019608	76535.41	1500.706	75785.06	1211925	15.83483
55 years	95106	361	0.9962	0.0038	11.6	94925	2800821	29.45	0.34	0.007243	90878.39	658.214	90549.28	2167112	23.84629	0.02166	75034.7	1625.252	74222.08	1136140	15.14153
56 years	94745	397	0.99581	0.00419	12.8	94547	2705896	28.56	0.35	0.007986	90220.17	720.5109	89859.92	2076563	23.01661	0.023883	73409.45	1753.238	72532.83	1061918	14.46569
57 years	94348	437	0.99537	0.00463	12.6	94130	2611349	27.68	0.36	0.008825	89499.66	789.8148	89104.76	1986703	22.19788	0.026391	71656.21	1891.079	70710.67	989385.5	13.80739
58 years	93911	480	0.99489	0.00511	10.8	93671	2517219	26.8	0.37	0.00974	88709.85	864.0038	88277.85	1897598	21.39107	0.029127	69765.13	2032.049	68749.11	918674.8	13.16811
59 years	93431	527	0.99436	0.00564	9.6	93168	2423548	25.94	0.38	0.01075	87845.84	944.3288	87373.68	1809320	20.59654	0.032148	67733.08	2177.483	66644.34	849925.7	12.54816
60 years	92904	576	0.99379	0.00621	10.2	92616	2330380	25.08	0.39	0.011836	86901.52	1028.589	86387.22	1721947	19.81492	0.035397	65555.6	2320.472	64395.37	783281.4	11.94835
61 years	92328	628	0.99321	0.00679	11.3	92014	2237764	24.24	0.4	0.012942	85872.93	1111.345	85317.25	1635559	19.04628	0.038703	63235.13	2447.389	62011.44	718886	11.36846
62 years	91700	677	0.99261	0.00739	11.2	91361	2145750	23.4	0.41	0.014085	84761.58	1193.896	84164.63	1550242	18.28944	0.042123	60787.74	2560.562	59507.46	656874.6	10.80604
63 years	91023	722	0.99207	0.00793	9.8	90662	2054389	22.57	0.42	0.015115	83567.69	1263.09	82936.14	1466078	17.54359	0.045201	58227.18	2631.927	56911.22	597367.1	10.25925
64 years	90301	762	0.99157	0.00843	8.7	89920	1963727	21.75	0.43	0.016068	82304.59	1322.436	81643.38	1383141	16.80515	0.048051	55595.25	2671.407	54259.55	540455.9	9.72126
65 years	89539	804	0.99102	0.00898	9.1	89138	1873807	20.93	0.45	0.017116	80982.16	1386.081	80289.12	1301498	16.07142	0.051186	52923.84	2708.96	51569.36	486196.3	9.186716
66 years	88735	857	0.99034	0.00966	10	88307	1784669	20.11	0.46	0.018412	79596.08	1465.52	78863.32	1221209	15.34258	0.055062	50214.88	2764.932	48832.42	434627	8.655341
67 years	87878	926	0.98946	0.01054	9.9	87415	1696362	19.3	0.47	0.020089	78130.56	1569.584	77345.77	1142346	14.62098	0.060078	47449.95	2850.698	46024.6	385794.5	8.130557
68 years	86952	1010	0.98838	0.01162	8.5	86447	1608947	18.5	0.49	0.022148	76560.98	1695.651	75713.15	1065000	13.91048	0.066234	44599.25	2953.987	43122.26	339769.9	7.618288
69 years	85942	1103	0.98716	0.01284	7.4	85391	1522500	17.72	0.51	0.024473	74865.32	1832.182	73949.23	989286.7	13.21422	0.073188	41645.27	3047.934	40121.3	296647.7	7.123203
70 years	84839	1207	0.98578	0.01422	7.7	84235	1437109	16.94	0.53	0.027103	73033.14	1979.441	72043.42	915337.5	12.53318	0.081054	38597.33	3128.468	37033.1	256526.4	6.64622
71 years	83632	1320	0.98422	0.01578	8.3	82972	1352874	16.18	0.55	0.030077	71053.7	2137.059	69985.17	843294.1	11.8684	0.089946	35468.87	3190.283	33873.72	219493.3	6.188337
72 years	82312	1444	0.98245	0.01755	8.1	81591	1269902	15.43	0.57	0.03345	68916.64	2305.282	67764	773308.9	11.22093	0.100035	32278.58	3228.988	30664.09	185619.6	5.750549
73 years	80868	1571	0.98057	0.01943	6.9	80082	1188311	14.69	0.59	0.037034	66611.36	2466.857	65377.93	705544.9	10.59196	0.110751	29049.59	3217.272	27440.96	154955.5	5.33417
74 years	79297	1698	0.97858	0.02142	6.1	78448	1108229	13.98	0.61	0.040827	64144.5	2618.797	62835.1	640167	9.980075	0.122094	25832.32	3153.972	24255.34	127514.5	4.936239
75 years	77599	1834	0.97637	0.02363	6.4	76681	1029781	13.27	0.65	0.045039	61525.71	2771.043	60140.18	577331.9	9.383588	0.134691	22678.35	3054.57	21151.07	103259.2	4.553205
76 years	75765	1986	0.97379	0.02621	7	74772	953100	12.58	0.68	0.049956	58754.66	2935.163	57287.08	517191.7	8.802564	0.149397	19623.78	2931.734	18157.91	82108.11	4.184112
77 years	73779	2160	0.97073	0.02927	6.8	72699	878328	11.9	0.71	0.055789	55819.5	3114.093	54262.45	459904.6	8.239139	0.166839	16692.05	2784.884	15299.61	63950.19	3.831177
78 years	71619	2338	0.96735	0.03265	5.8	70449	805629	11.25	0.74	0.062231	52705.41	3279.905	51065.45	405642.1	7.696405	0.186105	13907.16	2588.193	12613.07	48650.59	3.49824
79 years	69281	2512	0.96375	0.03625	5.3	68025	735180	10.61	0.79	0.069093	49425.5	3414.931	47718.04	354576.7	7.173962	0.206625	11318.97	2338.782	10149.58	36037.52	3.183816
80 years	66769	2693	0.95966	0.04034	5.8	65423	667155	9.99	0.84	0.076888	46010.57	3537.663	44241.74	306858.7	6.669308	0.229938	8980.188	2064.886	7947.745	25887.94	2.882784
81 years	64076	2895	0.95482	0.04518	6.3	62628	601732	9.39	0.9	0.086113	42472.91	3657.473	40644.17	262616.9	6.183163	0.257526	6915.302	1780.87	6024.867	17940.2	2.594275
82 years	61181	3122	0.94896	0.05104	6	59620	539104	8.81	0.95	0.097282	38815.43	3776.052	36927.41	221972.7	5.718672	0.290928	5134.432	1493.75	4387.557	11915.33	2.320672

83 years	58059	3352	0.94227	0.05773	5.2	56382	479484	8.26	1.01	0.110033	35039.38	3855.502	33111.63	185045.3	5.281067	0.329061	3640.682	1198.006	3041.679	7527.774	2.067683
84 years	54707	3562	0.9349	0.0651	5.2	52926	423102	7.73	1.1	0.124081	31183.88	3869.315	29249.22	151933.7	4.872187	0.37107	2442.675	906.4035	1989.474	4486.095	1.83655
85 years	51145	3753	0.92661	0.07339	6	49269	370176	7.24	1.2	0.139881	27314.57	3820.798	25404.17	122684.5	4.49154	0.418323	1536.272	642.6578	1214.943	2496.622	1.625117
86 years	47392	3927	0.91713	0.08287	6.2	45429	320907	6.77	1.28	0.15795	23493.77	3710.846	21638.35	97280.31	4.140686	0.472359	893.614	422.1066	682.5607	1281.679	1.434265
87 years	43465	4077	0.9062	0.0938	5.6	41426	275478	6.34	1.36	0.178783	19782.92	3536.846	18014.5	75641.96	3.823599	0.53466	471.5074	252.0961	345.4593	599.1183	1.270645
88 years	39388	3925	0.90037	0.09963	5.5	37426	234052	5.94	1.48	0.189895	16246.08	3085.045	14703.55	57627.47	3.547162	0.567891	219.4112	124.6017	157.1104	253.659	1.15609
89 years	35463	3905	0.88986	0.11014	5.8	33510	196626	5.54	1.63	0.209927	13161.03	2762.854	11779.6	42923.91	3.26144	0.627798	94.80957	59.52126	65.04894	96.54863	1.018343
90 years	31558	3836	0.87846	0.12154	6	29640	163116	5.17	1.8	0.231655	10398.18	2408.792	9193.781	31144.31	2.99517	0.692778	35.28831	24.44697	23.06483	31.49969	0.892638
91 years	27722	3711	0.86612	0.13388	6.4	25866	133476	4.81	2	0.255175	7989.385	2038.694	6970.038	21950.53	2.747461	0.763116	10.84135	8.273204	6.704744	8.434858	0.778027
92 years	24011	3535	0.85281	0.14719	6.5	22244	107610	4.48	2.23	0.280544	5950.691	1669.432	5115.976	14980.49	2.517437	0.838983	2.568141	2.154627	1.490828	1.730114	0.673684
93 years	20476	3307	0.83847	0.16153	6.6	18822	85366	4.17	2.51	0.307876	4281.26	1318.098	3622.211	9864.513	2.304115	0.920721	0.413514	0.380731	0.223149	0.239287	0.578666
94 years	17169	3038	0.82308	0.17692	7	15650	66544	3.88	2.88	0.33721	2963.162	999.2064	2463.559	6242.302	2.106636	1.008444	0.032783	0.03306	0.016253	0.016138	0.492264
95 years	14131	2733	0.8066	0.1934	7.6	12765	50894	3.6	3.35	0.36862	1963.956	723.9541	1601.978	3778.743	1.924047	1.10238	-0.00028	-0.00031	-0.00012	-0.00012	0.416195
96 years	11398	2405	0.78901	0.21099	8.8	10196	38129	3.35	3.95	0.402147	1240.001	498.6628	990.6701	2176.765	1.755454	1.202643	2.83E-05	3.41E-05	1.13E-05	9.03E-06	0.318564
97 years	8993	2066	0.77028	0.22972	9.7	7961	27933	3.11	4.65	0.437846	741.3387	324.5924	579.0425	1186.095	1.599937	1.309404	-5.7E-06	-7.5E-06	-2E-06	-2.3E-06	0.395347
98 years	6927	1729	0.7504	0.2496	10.6	6063	19972	2.88	5.55	0.475738	416.7463	198.2619	317.6153	607.0524	1.456648	1.42272	1.78E-06	2.53E-06	5.13E-07	-2.9E-07	-0.16176
99 years	5198	1406	0.72936	0.27064	12.2	4495	13909	2.68	6.77	0.51584	218.4844	112.703	162.1329	289.4371	1.324749	1.542648	-7.5E-07	-1.2E-06	-1.7E-07	-8E-07	1.065482
100 years	3792	1111	0.70717	0.29283	14.1	3236	9414	2.48	8.39	0.558134	105.7814	59.04022	76.26133	127.3042	1.203464	1.669131	4.08E-07	6.8E-07	6.74E-08	-6.3E-07	-1.54208
101 years	2681	847	0.68384	0.31616	16.4	2257	6178	2.3	10.63	0.602601	46.74122	28.16631	32.65807	51.04284	1.09203	1.802112	-2.7E-07	-4.9E-07	-2.7E-08	-7E-07	2.551837
102 years	1834	625	0.65937	0.34063	20.5	1522	3921	2.14	13.89	0.649241	18.57492	12.05959	12.54512	18.38477	0.989763	1.941591	2.19E-07	4.25E-07	6.39E-09	-6.7E-07	-3.05804
103 years	1209	443	0.63381	0.36619	26.5	987	2399	1.98	18.41	0.697958	6.515323	4.547423	4.241612	5.839645	0.896294	2.087283	-2.1E-07	-4.3E-07	8.99E-09	-6.8E-07	3.278756
104 years	766	301	0.6072	0.3928	29.5	616	1412	1.84	24.47	0.748677	1.9679	1.473321	1.23124	1.598033	0.81205	2.23896	2.24E-07	5.01E-07	-2.7E-08	-6.8E-07	-3.05569
105 years	465	195	0.57957	0.42043	44	367	796	1.71	35.74	0.80134	0.494579	0.396326	0.296416	0.366793	0.741627	2.396451	-2.8E-07	-6.6E-07	5.5E-08	-6.6E-07	2.369897
106 years	270	121	0.55099	0.44901	57.5	210	429	1.59	51.48	0.855813	0.098253	0.084086	0.05621	0.070377	0.71628	2.559357	3.88E-07	9.92E-07	-1.1E-07	-7.1E-07	-1.83904
107 years	149	72	0.52152	0	0	113	219	1.48	78.59	0	0.014167	0	0.014167	0.014167	1	0	-6E-07	0	-6E-07	-6E-07	1

Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution

F too unreliable to be published (indicates a cv of at least 100.0%)."

NP= not possible to calculate becasue of the missing data from the actual life table.

Table 3a: Complete life table, Quebec, 2000 to 2002, males																					
		General Population								AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	528	0.99472	0.00528	4.1	99520	7638585	76.39	0.09	0.010064	100000	1006.368	99496.82	6901616	69.01616	0.030096	100000	3009.6	98495.2	5554696	55.54696
1 year	99472	29	0.99971	0.00029	17.4	99462	7539065	75.79	0.08	0.000553	98993.63	54.71774	98966.27	6802119	68.71269	0.001653	96990.4	160.3251	96910.24	5456201	56.25506
2 years	99443	24	0.99975	0.00025	18.6	99430	7439603	74.81	0.09	0.000477	98938.91	47.14439	98915.34	6703153	67.75042	0.001425	96830.07	137.9829	96761.08	5359290	55.34737
3 years	99419	22	0.99978	0.00022	19.2	99407	7340173	73.83	0.09	0.000419	98891.77	41.4673	98871.04	6604237	66.78248	0.001254	96692.09	121.2519	96631.47	5262529	54.42564
4 years	99397	16	0.99984	0.00016	22.4	99389	7240766	72.85	0.09	0.000305	98850.3	30.14539	98835.23	6505366	65.81028	0.000912	96570.84	88.07261	96526.8	5165898	53.49335
5 years	99381	11	0.99988	0.00012	37.2	99375	7141377	71.86	0.09	0.000229	98820.16	22.60215	98808.86	6406531	64.8302	0.000684	96482.77	65.99421	96449.77	5069371	52.54173
6 years	99370	10	0.99991	0.00009	50.4	99365	7042002	70.87	0.09	0.000172	98797.56	16.94773	98789.08	6307722	63.84492	0.000513	96416.77	49.4618	96392.04	4972921	51.57735
7 years	99360	7	0.99992	0.00008	52.4	99357	6942637	69.87	0.09	0.000152	98780.61	15.06207	98773.08	6208933	62.85579	0.000456	96367.31	43.94349	96345.34	4876529	50.60356
8 years	99353	7	0.99994	0.00006	57.5	99349	6843280	68.88	0.09	0.000114	98765.55	11.29483	98759.9	6110160	61.8653	0.000342	96323.37	32.94259	96306.9	4780184	49.62642
9 years	99346	6	0.99994	0.00006	57.4	99343	6743931	67.88	0.09	0.000114	98754.25	11.29354	98748.6	6011400	60.87232	0.000342	96290.43	32.93133	96273.96	4683877	48.64323
10 years	99340	8	0.99992	0.00008	50.1	99336	6644588	66.89	0.1	0.000152	98742.96	15.05633	98735.43	5912651	59.87922	0.000456	96257.49	43.89342	96235.55	4587603	47.6597
11 years	99332	9	0.99991	0.00009	44.3	99328	6545252	65.89	0.1	0.000172	98727.9	16.93578	98719.43	5813916	58.88828	0.000513	96213.6	49.35758	96188.92	4491368	46.68121
12 years	99323	14	0.99985	0.00015	38	99316	6445924	64.9	0.1	0.000286	98710.96	28.22146	98696.85	5715197	57.8983	0.000855	96164.24	82.22043	96123.13	4395179	45.70492
13 years	99309	23	0.99977	0.00023	24	99297	6346608	63.91	0.1	0.000438	98682.74	43.26054	98661.11	5616500	56.91471	0.001311	96082.02	125.9635	96019.04	4299055	44.7436
14 years	99286	34	0.99966	0.00034	18.9	99269	6247311	62.92	0.1	0.000648	98639.48	63.92233	98607.52	5517839	55.93945	0.001938	95956.06	185.9628	95863.08	4203036	43.80168
15 years	99252	45	0.99954	0.00046	18.8	99230	6148042	61.94	0.1	0.000877	98575.56	86.42711	98532.35	5419231	54.9754	0.002622	95770.1	251.1092	95644.54	4107173	42.88576
16 years	99207	58	0.99942	0.00058	18.8	99177	6048812	60.97	0.1	0.001105	98489.13	108.8778	98434.69	5320699	54.02321	0.003306	95518.99	315.7858	95361.09	4011529	41.99719
17 years	99149	67	0.99932	0.00068	17.5	99116	5949635	60.01	0.1	0.001296	98380.26	127.5087	98316.5	5222264	53.08244	0.003876	95203.2	369.0076	95018.7	3916168	41.13483
18 years	99082	76	0.99924	0.00076	14.6	99043	5850519	59.05	0.11	0.001449	98252.75	142.325	98181.58	5123948	52.15068	0.004332	94834.19	410.8217	94628.78	3821149	40.29295
19 years	99006	82	0.99917	0.00083	12.1	98966	5751476	58.09	0.11	0.001582	98110.42	155.2087	98032.82	5025766	51.22561	0.004731	94423.37	446.717	94200.01	3726520	39.46608
20 years	98924	88	0.99911	0.00089	12	98879	5652510	57.14	0.11	0.001696	97955.21	166.1653	97872.13	4927733	50.30598	0.005073	93976.66	476.7436	93738.28	3632320	38.6513
21 years	98836	93	0.99906	0.00094	13.3	98790	5553631	56.19	0.11	0.001792	97789.05	175.2028	97701.45	4829861	49.39061	0.005358	93499.91	500.9725	93249.43	3538582	37.84583
22 years	98743	95	0.99903	0.00097	13.9	98695	5454841	55.24	0.11	0.001849	97613.85	180.4704	97523.61	4732160	48.47836	0.005529	92998.94	514.1911	92741.84	3445333	37.04701
23 years	98648	95	0.99904	0.00096	13	98601	5356146	54.3	0.11	0.00183	97433.37	178.2797	97344.23	4634636	47.56723	0.005472	92484.75	506.0765	92231.71	3352591	36.2502
24 years	98553	93	0.99906	0.00094	11.7	98506	5257545	53.35	0.11	0.001792	97255.09	174.2461	97167.97	4537292	46.65351	0.005358	91978.67	492.8217	91732.26	3260359	35.4469
25 years	98460	88	0.9991	0.0009	12.2	98417	5159039	52.4	0.12	0.001715	97080.85	166.5325	96997.58	4440124	45.73635	0.00513	91485.85	469.3224	91251.19	3168627	34.63516
26 years	98372	85	0.99914	0.00086	14.3	98329	5060622	51.44	0.12	0.001639	96914.32	158.8581	96834.89	4343126	44.81408	0.004902	91016.53	446.163	90793.45	3077376	33.81117
27 years	98287	83	0.99915	0.00085	15.6	98246	4962293	50.49	0.12	0.00162	96755.46	156.7535	96677.08	4246291	43.88684	0.004845	90570.36	438.8134	90350.96	2986582	32.97527
28 years	98204	85	0.99914	0.00086	14.4	98161	4864047	49.53	0.12	0.001639	96598.7	158.3407	96519.53	4149614	42.95724	0.004902	90131.55	441.8249	89910.64	2896231	32.13338
29 years	98119	86	0.99912	0.00088	12.5	98076	4765886	48.57	0.12	0.001677	96440.36	161.7575	96359.49	4053095	42.02695	0.005016	89689.73	449.8837	89464.78	2806320	31.28921
30 years	98033	90	0.99909	0.00091	12.4	97988	4667810	47.61	0.12	0.001734	96278.61	166.9914	96195.11	3956735	41.09672	0.005187	89239.84	462.8871	89008.4	2716856	30.44443
31 years	97943	93	0.99905	0.00095	13.6	97897	4569822	46.66	0.13	0.001811	96111.62	174.0293	96024.6	3860540	40.16726	0.005415	88776.96	480.7272	88536.59	2627847	29.60056
32 years	97850	97	0.99901	0.00099	14	97802	4471925	45.7	0.13	0.001887	95937.59	181.0285	95847.07	3764515	39.23921	0.005643	88296.23	498.2556	88047.1	2539311	28.75899
33 years	97753	101	0.99896	0.00104	12.5	97703	4374123	44.75	0.13	0.001982	95756.56	189.8125	95661.65	3668668	38.31245	0.005928	87797.97	520.4664	87537.74	2451264	27.91936
34 years	97652	106	0.99891	0.00109	10.6	97599	4276420	43.79	0.13	0.002078	95566.74	198.5437	95467.47	3573007	37.38755	0.006213	87277.51	542.2551	87006.38	2363726	27.08288
35 years	97546	111	0.99886	0.00114	10.1	97491	4178821	42.84	0.14	0.002173	95368.2	207.2198	95264.59	3477539	36.46435	0.006498	86735.25	563.6057	86453.45	2276719	26.24907
36 years	97435	118	0.99879	0.00121	10.9	97375	4081330	41.89	0.14	0.002306	95160.98	219.466	95051.25	3382275	35.54266	0.006897	86171.65	594.3258	85874.48	2190266	25.41748
37 years	97317	125	0.99872	0.00128	11.1	97255	3983955	40.94	0.14	0.00244	94941.52	231.6269	94825.7	3287223	34.62367	0.007296	85577.32	624.3721	85265.13	2104392	24.59053
38 years	97192	132	0.99864	0.00136	9.7	97127	3886700	39.99	0.14	0.002592	94709.89	245.5032	94587.14	3192398	33.70712	0.007752	84952.95	658.5552	84623.67	2019126	23.76759
39 years	97060	140	0.99856	0.00144	8.4	96990	3789573	39.04	0.15	0.002745	94464.39	259.2707	94334.75	3097811	32.79342	0.008208	84294.39	691.8884	83948.45	1934503	22.94936
40 years	96920	149	0.99846	0.00154	8.5	96845	3692583	38.1	0.15	0.002935	94205.11	276.5146	94066.86	3003476	31.8823	0.008778	83602.5	733.8628	83235.57	1850554	22.13515

41 years	96771	160	0.99835	0.00165	9.2	96691	3595738	37.16	0.15	0.003145	93928.6	295.3961	93780.9	2909409	30.97469	0.009405	82868.64	779.3796	82478.95	1767319	21.32675
42 years	96611	172	0.99821	0.00179	9.2	96525	3499047	36.22	0.16	0.003412	93633.2	319.4521	93473.48	2815628	30.07083	0.010203	82089.26	837.5567	81670.48	1684840	20.52448
43 years	96439	188	0.99806	0.00194	8	96345	3402522	35.28	0.16	0.003698	93313.75	345.0407	93141.23	2722155	29.17206	0.011058	81251.7	898.4813	80802.46	1603169	19.7309
44 years	96251	202	0.99789	0.00211	7	96150	3306177	34.35	0.17	0.004022	92968.71	373.8885	92781.77	2629013	28.27847	0.012027	80353.22	966.4082	79870.02	1522367	18.94593
45 years	96049	221	0.9977	0.0023	7.3	95939	3210027	33.42	0.17	0.004384	92594.82	405.9172	92391.86	2536232	27.39064	0.01311	79386.81	1040.761	78866.43	1442497	18.17048
46 years	95828	241	0.99748	0.00252	8	95707	3114088	32.5	0.17	0.004803	92188.91	442.7944	91967.51	2443840	26.50904	0.014364	78346.05	1125.363	77783.37	1363630	17.40522
47 years	95587	265	0.99723	0.00277	7.8	95455	3018381	31.58	0.18	0.00528	91746.11	484.3846	91503.92	2351872	25.63457	0.015789	77220.69	1219.237	76611.07	1285847	16.65159
48 years	95322	291	0.99694	0.00306	6.7	95176	2922926	30.66	0.18	0.005832	91261.73	532.2712	90995.59	2260368	24.76798	0.017442	76001.45	1325.617	75338.64	1209236	15.91069
49 years	95031	321	0.99663	0.00337	5.9	94871	2827750	29.76	0.19	0.006423	90729.46	582.7753	90438.07	2169373	23.91035	0.019209	74675.84	1434.448	73958.61	1133897	15.18426
50 years	94710	352	0.99628	0.00372	6.1	94533	2732879	28.86	0.19	0.00709	90146.68	639.1688	89827.1	2078935	23.06169	0.021204	73241.39	1553.01	72464.88	1059939	14.47185
51 years	94358	389	0.99588	0.00412	6.6	94164	2638346	27.96	0.2	0.007853	89507.51	702.8774	89156.07	1989108	22.2228	0.023484	71688.38	1683.53	70846.61	987473.8	13.77453
52 years	93969	430	0.99543	0.00457	6.4	93754	2544182	27.07	0.2	0.00871	88804.63	773.5257	88417.87	1899951	21.39473	0.026049	70004.85	1823.556	69093.07	916627.2	13.09377
53 years	93539	475	0.99492	0.00508	5.5	93302	2450428	26.2	0.21	0.009682	88031.11	852.3594	87604.93	1811534	20.57833	0.028956	68181.29	1974.257	67194.16	847534.1	12.4306
54 years	93064	523	0.99438	0.00562	4.9	92802	2357126	25.33	0.22	0.010712	87178.75	933.8343	86711.83	1723929	19.77464	0.032034	66207.03	2120.876	65146.6	780340	11.78636
55 years	92541	575	0.99378	0.00622	5.2	92254	2264324	24.47	0.22	0.011855	86244.91	1022.461	85733.68	1637217	18.98334	0.035454	64086.16	2272.111	62950.1	715193.4	11.15987
56 years	91966	634	0.99311	0.00689	5.6	91649	2172070	23.62	0.23	0.013132	85222.45	1119.17	84662.87	1551483	18.2051	0.039273	61814.05	2427.623	60600.24	652243.3	10.5517
57 years	91332	699	0.99234	0.00766	5.5	90983	2080421	22.78	0.24	0.0146	84103.28	1227.905	83489.33	1466820	17.4407	0.043662	59386.42	2592.93	58089.96	591643	9.962597
58 years	90633	770	0.9915	0.0085	4.7	90248	1989438	21.95	0.24	0.016201	82875.38	1342.664	82204.05	1383331	16.6917	0.04845	56793.49	2751.645	55417.67	533553.1	9.394616
59 years	89863	845	0.9906	0.0094	4.2	89440	1899190	21.13	0.25	0.017916	81532.71	1460.773	80802.33	1301127	15.95834	0.05358	54041.85	2895.562	52594.07	478135.4	8.847502
60 years	89018	925	0.9896	0.0104	4.6	88555	1809750	20.33	0.26	0.019822	80071.94	1587.218	79278.33	1220325	15.24035	0.05928	51146.29	3031.952	49630.31	425541.3	8.320082
61 years	88093	1013	0.9885	0.0115	5	87586	1721195	19.54	0.27	0.021919	78484.72	1720.307	77624.57	1141046	14.53845	0.06555	48114.34	3153.895	46537.39	375911	7.812869
62 years	87080	1110	0.98726	0.01274	4.9	86525	1633609	18.76	0.28	0.024282	76764.42	1864.027	75832.4	1063422	13.85306	0.072618	44960.44	3264.937	43327.97	329373.6	7.325854
63 years	85970	1210	0.98593	0.01407	4.2	85366	1547084	18	0.29	0.026817	74900.39	2008.635	73896.07	987589.3	13.18537	0.080199	41695.5	3343.938	40023.53	286045.7	6.860348
64 years	84760	1313	0.9845	0.0155	3.7	84104	1461718	17.25	0.3	0.029543	72891.75	2153.441	71815.03	913693.2	12.53493	0.08835	38351.57	3388.361	36657.39	246022.1	6.414917
65 years	83447	1424	0.98294	0.01706	3.9	82734	1377614	16.51	0.31	0.032516	70738.31	2300.152	69588.24	841878.2	11.9013	0.097242	34963.2	3399.892	33263.26	209364.7	5.988145
66 years	82023	1542	0.9812	0.0188	4.2	81252	1294880	15.79	0.32	0.035833	68438.16	2452.331	67212	772289.9	11.28449	0.10716	31563.31	3382.325	29872.15	176101.5	5.579309
67 years	80481	1671	0.97923	0.02077	4.1	79646	1213628	15.08	0.33	0.039588	65985.83	2612.222	64679.72	705077.9	10.68529	0.118389	28180.99	3336.319	26512.83	146229.3	5.188935
68 years	78810	1807	0.97708	0.02292	3.5	77906	1133982	14.39	0.35	0.043686	63373.61	2768.509	61989.35	640398.2	10.10513	0.130644	24844.67	3245.807	23221.77	119716.5	4.818599
69 years	77003	1942	0.97478	0.02522	3.1	76032	1056076	13.71	0.36	0.048069	60605.1	2913.246	59148.48	578408.9	9.543898	0.143754	21598.86	3104.923	20046.4	96494.73	4.467584
70 years	75061	2082	0.97226	0.02774	3.3	74020	980044	13.06	0.38	0.052872	57691.85	3050.309	56166.7	519260.4	9.000585	0.158118	18493.94	2924.225	17031.83	76448.33	4.133696
71 years	72979	2230	0.96945	0.03055	3.6	71864	906024	12.41	0.4	0.058228	54641.54	3181.684	53050.7	463093.7	8.475121	0.174135	15569.71	2711.232	14214.1	59416.51	3.816159
72 years	70749	2386	0.96628	0.03372	3.5	69556	834160	11.79	0.42	0.06427	51459.86	3307.342	49806.19	410043	7.968211	0.192204	12858.48	2471.452	11622.76	45202.41	3.515376
73 years	68363	2540	0.96285	0.03715	3	67093	764604	11.18	0.44	0.070808	48152.52	3409.579	46447.73	360236.8	7.481162	0.211755	10387.03	2199.506	9287.278	33579.65	3.232844
74 years	65823	2684	0.95922	0.04078	2.8	64481	697511	10.6	0.46	0.077727	44742.94	3477.72	43004.08	313789.1	7.013153	0.232446	8187.525	1903.157	7235.946	24292.37	2.966998
75 years	63139	2827	0.95522	0.04478	3	61726	633030	10.03	0.5	0.085351	41265.22	3522.015	39504.21	270785	6.562064	0.255246	6284.368	1604.06	5482.338	17056.43	2.714104
76 years	60312	2973	0.9507	0.0493	3.3	58825	571304	9.47	0.53	0.093966	37743.2	3546.57	35969.92	231280.8	6.127747	0.28101	4680.308	1315.213	4022.701	11574.09	2.472933
77 years	57339	3125	0.94551	0.05449	3.3	55777	512479	8.94	0.56	0.103858	34196.63	3551.592	32420.84	195310.9	5.711406	0.310593	3365.095	1045.175	2842.507	7551.387	2.244034
78 years	54214	3270	0.93968	0.06032	2.8	52579	456702	8.42	0.6	0.11497	30645.04	3523.258	28883.41	162890	5.31538	0.343824	2319.92	797.6441	1921.098	4708.88	2.02976
79 years	50944	3396	0.93333	0.06667	2.7	49246	404123	7.93	0.65	0.127073	27121.78	3446.447	25398.56	134006.6	4.940922	0.380019	1522.276	578.4937	1233.029	2787.782	1.831325
80 years	47548	3500	0.92639	0.07361	3.1	45797	354877	7.46	0.71	0.140301	23675.34	3321.665	22014.5	108608.1	4.587392	0.419577	943.782	395.9892	745.7874	1554.753	1.647365
81 years	44048	3579	0.91876	0.08124	3.5	42259	309080	7.02	0.77	0.154843	20353.67	3151.633	18777.86	86593.55	4.254444	0.463068	547.7928	253.6653	420.9601	808.966	1.476774
82 years	40469	3627	0.91037	0.08963	3.4	38655	266821	6.59	0.83	0.170835	17202.04	2938.707	15732.69	67815.7	3.942306	0.510891	294.1275	150.2671	218.9939	388.0059	1.319176

83 years	36842	3637	0.90128	0.09872	3	35024	228166	6.19	0.89	0.18816	14263.33	2683.793	12921.44	52083.01	3.651532	0.562704	143.8604	80.95082	103.385	169.012	1.174833
84 years	33205	3602	0.89153	0.10847	3.2	31404	193142	5.82	0.99	0.206744	11579.54	2393.998	10382.54	39161.58	3.381963	0.618279	62.90957	38.89567	43.46174	65.62697	1.043195
85 years	29603	3521	0.88106	0.11894	3.9	27843	161738	5.46	1.11	0.2267	9185.541	2082.359	8144.362	28779.04	3.13308	0.677958	24.01391	16.28042	15.8737	22.16523	0.923017
86 years	26082	3397	0.86977	0.13023	4.2	24383	133895	5.13	1.21	0.248218	7103.182	1763.14	6221.612	20634.68	2.90499	0.742311	7.733486	5.740652	4.86316	6.291537	0.813545
87 years	22685	3230	0.85759	0.14241	3.9	21070	109512	4.83	1.31	0.271433	5340.042	1449.466	4615.309	14413.06	2.699054	0.811737	1.992834	1.617657	1.184006	1.428377	0.716756
88 years	19455	2931	0.84934	0.15066	4	17990	88442	4.55	1.46	0.287158	3890.576	1117.21	3331.971	9797.754	2.51833	0.858762	0.375177	0.322188	0.214083	0.244371	0.651348
89 years	16524	2691	0.83715	0.16285	4.4	15178	70452	4.26	1.64	0.310392	2773.366	860.8309	2342.951	6465.783	2.331385	0.928245	0.052989	0.049187	0.028396	0.030288	0.571584
90 years	13833	2433	0.82411	0.17589	4.6	12616	55274	4	1.85	0.335246	1912.535	641.1704	1591.95	4122.833	2.15569	1.002573	0.003802	0.003812	0.001896	0.001892	0.49761
91 years	11400	2164	0.81016	0.18984	5	10317	42658	3.74	2.12	0.361835	1271.365	460.0243	1041.353	2530.883	1.990682	1.082088	-9.8E-06	-1.1E-05	-4.5E-06	-4.2E-06	0.428753
92 years	9236	1891	0.79526	0.20474	5.5	8291	32341	3.5	2.47	0.390234	811.3404	316.613	653.0339	1489.53	1.835888	1.167018	8.03E-07	9.37E-07	3.34E-07	2.95E-07	0.367939
93 years	7345	1621	0.77936	0.22064	6.3	6534	24050	3.27	2.89	0.42054	494.7274	208.0526	390.7011	836.4961	1.690822	1.257648	-1.3E-07	-1.7E-07	-5E-08	-3.9E-08	0.290697
94 years	5724	1360	0.76244	0.23756	6.8	5044	17516	3.06	3.37	0.452789	286.6748	129.8033	221.7732	445.795	1.555054	1.354092	3.46E-08	4.68E-08	1.12E-08	1.08E-08	0.312361
95 years	4364	1115	0.74445	0.25555	7.7	3807	12472	2.86	4.03	0.487078	156.8715	76.40872	118.6672	224.0218	1.428059	1.456635	-1.2E-08	-1.8E-08	-3.3E-09	-3.7E-10	0.029915
96 years	3249	892	0.72534	0.27466	8.7	2803	8665	2.67	4.87	0.523502	80.46281	42.12244	59.40159	105.3546	1.309358	1.565562	5.59E-09	8.75E-09	1.21E-09	2.96E-09	0.529455
97 years	2357	695	0.7051	0.2949	10.8	2009	5862	2.49	6.03	0.562079	38.34037	21.55033	27.5652	45.95302	1.198554	1.68093	-3.2E-09	-5.3E-09	-5E-10	1.74E-09	-0.55208
98 years	1662	526	0.68368	0.31632	12.4	1398	3853	2.32	7.37	0.602906	16.79004	10.12281	11.72863	18.38781	1.095162	1.803024	2.15E-09	3.88E-09	2.12E-10	2.25E-09	1.045064
99 years	1136	385	0.66107	0.33893	15.5	944	2455	2.16	9.18	0.646001	6.667225	4.307031	4.513709	6.659183	0.998794	1.931901	-1.7E-09	-3.3E-09	-5.9E-11	2.04E-09	-1.17876
100 years	751	272	0.63725	0.36275	17.1	615	1511	2.01	11.16	0.691402	2.360194	1.631841	1.544273	2.145474	0.909025	2.067675	1.61E-09	3.33E-09	-5.4E-11	2.1E-09	1.30144
101 years	479	186	0.61219	0.38781	21.7	386	896	1.87	14.17	0.739166	0.728352	0.538373	0.459166	0.601201	0.825426	2.210517	-1.7E-09	-3.8E-09	1.81E-10	2.15E-09	-1.25064
102 years	293	121	0.58591	0.41409	25.1	232	510	1.74	17.5	0.789256	0.189979	0.149942	0.115008	0.142035	0.747637	2.360313	2.08E-09	4.91E-09	-3.7E-10	1.97E-09	0.946193
103 years	172	76	0.55839	0.44161	28.2	134	278	1.62	22.24	0.841709	0.040037	0.0337	0.023187	0.027027	0.675057	2.517177	-2.8E-09	-7.1E-09	7.32E-10	2.34E-09	-0.82801
104 years	96	45	0.52965	0.47035	30.6	73	144	1.51	30.83	0.896487	0.006338	0.005682	0.003497	0.00384	0.605917	2.680995	4.3E-09	1.15E-08	-1.5E-09	1.61E-09	0.375315
105 years	51	26	0.49971	0.50029	70.7	38	71	1.4	50.64	0.953553	0.000656	0.000626	0.000343	0.000343	0.523224	2.851653	-7.2E-09	-2.1E-08	3.07E-09	3.07E-09	-0.42583
106 years	25	13	0.4686	0.5314	68.5	19	33	1.3	47.97	1.012848	3.05E-05	F	F	NP	NP	3.02898	1.34E-08	F	F	NP	NP
Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution																					
F too unreliable to be published (indicates a cv of at least 100.0%)."																					

Table 3b: Complete life table, Quebec, 2000 to 2002: females																						
			General Population							AVERAGE COPD						SEVERE COPD						
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex	
0 years	100000	415	0.99585	0.00415	4.8	99626	8200226	82	0.08	0.00791	100000	790.99	99604.51	7517293	75.17293	0.023655	100000	2365.5	98817.25	6251348	62.51348	
1 year	99585	34	0.99966	0.00034	15.9	99564	8100600	81.34	0.08	0.000648	99209.01	64.29141	99176.86	7417688	74.76829	0.001938	97634.5	189.2157	97539.89	6152531	63.01595	
2 years	99551	18	0.99981	0.00019	20.5	99543	8001036	80.37	0.08	0.000362	99144.72	35.90427	99126.77	7318511	73.81645	0.001083	97445.28	105.5332	97392.52	6054991	62.13734	
3 years	99533	14	0.99987	0.00013	25.9	99527	7901493	79.39	0.08	0.000248	99108.81	24.55718	99096.54	7219384	72.84301	0.000741	97339.75	72.12876	97303.69	5957599	61.20417	
4 years	99519	10	0.99989	0.00011	33.4	99516	7801966	78.4	0.08	0.00021	99084.26	20.77401	99073.87	7120288	71.86094	0.000627	97267.62	60.9868	97237.13	5860295	60.24918	
5 years	99509	14	0.99987	0.00013	31.4	99502	7702450	77.4	0.08	0.000248	99063.48	24.54595	99051.21	7021214	70.8759	0.000741	97206.64	72.03012	97170.62	5763058	59.28667	
6 years	99495	9	0.9999	0.0001	45	99490	7602948	76.42	0.08	0.000191	99038.94	18.87682	99029.5	6922163	69.89335	0.00057	97134.61	55.36673	97106.92	5665887	58.33026	
7 years	99486	7	0.99994	0.00006	58.3	99483	7503458	75.42	0.08	0.000114	99020.06	11.32393	99014.4	6823133	68.90658	0.000342	97079.24	33.2011	97062.64	5568780	57.36325	
8 years	99479	6	0.99994	0.00006	56.7	99476	7403975	74.43	0.08	0.000114	99008.74	11.32264	99003.08	6724119	67.9144	0.000342	97046.04	33.18974	97029.44	5471718	56.3827	
9 years	99473	6	0.99994	0.00006	53.3	99470	7304499	73.43	0.08	0.000114	98997.41	11.32134	98991.75	6625116	66.92211	0.000342	97012.85	33.17839	96996.26	5374688	55.40182	
10 years	99467	7	0.99993	0.00007	49.7	99464	7205029	72.44	0.08	0.000133	98986.09	13.20672	98979.49	6526124	65.92971	0.000399	96979.67	38.69489	96960.32	5277692	54.4206	
11 years	99460	7	0.99993	0.00007	47.4	99456	7105565	71.44	0.09	0.000133	98972.89	13.20496	98966.28	6427145	64.93844	0.000399	96940.97	38.67945	96921.63	5180731	53.44212	
12 years	99453	10	0.9999	0.0001	46.8	99448	7006109	70.45	0.09	0.000191	98959.68	18.86172	98950.25	6328178	63.94704	0.00057	96902.3	55.23431	96874.68	5083810	52.46326	
13 years	99443	13	0.99987	0.00013	34.3	99436	6906661	69.45	0.09	0.000248	98940.82	24.51556	98928.56	6229228	62.95913	0.000741	96847.06	71.76367	96811.18	4986935	51.49289	
14 years	99430	18	0.99983	0.00017	27.4	99421	6807225	68.46	0.09	0.000324	98916.3	32.05086	98900.28	6130299	61.97461	0.000969	96775.3	93.77526	96728.41	4890124	50.53071	
15 years	99412	21	0.99978	0.00022	27.2	99402	6707804	67.47	0.09	0.000419	98884.25	41.46414	98863.52	6031399	60.99454	0.001254	96681.52	121.2386	96620.9	4793396	49.57923	
16 years	99391	27	0.99974	0.00026	28.2	99377	6608402	66.49	0.09	0.000496	98842.79	48.98253	98818.3	5932536	60.01991	0.001482	96560.28	143.1023	96488.73	4696775	48.64085	
17 years	99364	29	0.9997	0.0003	27.3	99350	6509025	65.51	0.09	0.000572	98793.81	56.4903	98765.56	5833717	59.04942	0.00171	96417.18	164.8734	96334.74	4600286	47.71231	
18 years	99335	31	0.99968	0.00032	23.7	99319	6409675	64.53	0.09	0.00061	98737.32	60.22186	98707.2	5734952	58.08292	0.001824	96252.31	175.5642	96164.53	4503951	46.79318	
19 years	99304	33	0.99967	0.00033	20.1	99287	6310356	63.55	0.09	0.000629	98677.09	62.06592	98646.06	5636245	57.11806	0.001881	96076.74	180.7204	95986.38	4407787	45.87777	
20 years	99271	34	0.99966	0.00034	19.9	99255	6211069	62.57	0.1	0.000648	98615.03	63.90648	98583.07	5537599	56.1537	0.001938	95896.02	185.8465	95803.1	4311800	44.96329	
21 years	99237	34	0.99966	0.00034	22.4	99220	6111814	61.59	0.1	0.000648	98551.12	63.86507	98519.19	5439015	55.18979	0.001938	95710.18	185.4863	95617.43	4215997	44.04962	
22 years	99203	34	0.99965	0.00035	23.9	99186	6012594	60.61	0.1	0.000667	98487.26	65.70085	98454.41	5340496	54.22525	0.001995	95524.69	190.5718	95429.4	4120380	43.13419	
23 years	99169	34	0.99966	0.00034	22.5	99152	5913408	59.63	0.1	0.000648	98421.56	63.7811	98389.66	5242042	53.26112	0.001938	95334.12	184.7575	95241.74	4024950	42.21941	
24 years	99135	33	0.99967	0.00033	20.5	99119	5814256	58.65	0.1	0.000629	98357.77	61.86507	98326.84	5143652	52.29533	0.001881	95149.36	178.9759	95059.87	3929709	41.30042	
25 years	99102	31	0.99968	0.00032	21.2	99087	5715137	57.67	0.1	0.00061	98295.91	59.95264	98265.93	5045325	51.32793	0.001824	94970.38	173.226	94883.77	3834649	40.37731	
26 years	99071	30	0.99969	0.00031	24.7	99056	5616050	56.69	0.1	0.000591	98235.96	58.0437	98206.93	4947059	50.35895	0.001767	94797.16	167.5066	94713.41	3739765	39.45018	
27 years	99041	31	0.99969	0.00031	26.6	99025	5516994	55.7	0.11	0.000591	98177.91	58.0094	98148.91	4848853	49.38843	0.001767	94629.65	167.2106	94546.05	3645052	38.51913	
28 years	99010	31	0.99968	0.00032	24.2	98994	5417969	54.72	0.11	0.00061	98119.9	59.84529	98089.98	4750704	48.41733	0.001824	94462.44	172.2995	94376.29	3550506	37.58643	
29 years	98979	33	0.99967	0.00033	21.2	98962	5318975	53.74	0.11	0.000629	98060.06	61.67782	98029.22	4652614	47.44657	0.001881	94290.14	177.3598	94201.46	3456129	36.65419	
30 years	98946	34	0.99965	0.00035	21.2	98930	5220013	52.76	0.11	0.000667	97998.38	65.37472	97965.69	4554584	46.47612	0.001995	94112.78	187.755	94018.91	3361928	35.72233	
31 years	98912	37	0.99963	0.00037	22.9	98893	5121083	51.77	0.11	0.000705	97933.01	69.06431	97898.47	4456619	45.50681	0.002109	93925.03	198.0879	93825.98	3267909	34.79274	
32 years	98875	41	0.99959	0.00041	22.3	98855	5022190	50.79	0.11	0.000781	97863.94	76.47676	97825.7	4358720	44.53857	0.002337	93726.94	219.0399	93617.42	3174083	33.86521	
33 years	98834	46	0.99953	0.00047	18.3	98811	4923335	49.81	0.12	0.000896	97787.46	87.59997	97743.66	4260895	43.57301	0.002679	93507.9	250.5077	93382.65	3080465	32.94337	
34 years	98788	54	0.99946	0.00054	14.8	98760	4824524	48.84	0.12	0.001029	97699.86	100.5566	97649.59	4163151	42.61163	0.003078	93257.39	287.0463	93113.87	2987083	32.03052	
35 years	98734	62	0.99937	0.00063	14.1	98703	4725764	47.86	0.12	0.001201	97599.31	117.1953	97540.71	4065501	41.65502	0.003591	92970.35	333.8565	92803.42	2893969	31.12787	
36 years	98672	70	0.99929	0.00071	14.7	98638	4627061	46.89	0.12	0.001353	97482.11	131.9186	97416.15	3967961	40.7045	0.004047	92636.49	374.8999	92449.04	2801166	30.23825	
37 years	98602	76	0.99922	0.00078	14.4	98564	4528423	45.93	0.13	0.001487	97350.19	144.7286	97277.83	3870544	39.75898	0.004446	92261.59	410.195	92056.49	2708716	29.35909	
38 years	98526	83	0.99916	0.00084	12.6	98484	4429859	44.96	0.13	0.001601	97205.47	155.6298	97127.65	3773267	38.81743	0.004788	91851.39	439.7845	91631.5	2616660	28.48797	
39 years	98443	87	0.99912	0.00088	10.9	98400	4331375	44	0.13	0.001677	97049.84	162.7797	96968.45	3676139	37.87888	0.005016	91411.61	458.5206	91182.35	2525029	27.62262	
40 years	98356	91	0.99907	0.00093	11.1	98311	4232975	43.04	0.13	0.001773	96887.06	171.7401	96801.19	3579171	36.94168	0.005301	90953.09	482.1423	90712.02	2433846	26.75936	

41 years	98265	97	0.99901	0.00099	12.1	98217	4134664	42.08	0.14	0.001887	96715.32	182.496	96624.07	3482369	36.00639	0.005643	90470.95	510.5276	90215.68	2343134	25.8993
42 years	98168	107	0.99891	0.00109	11.8	98114	4036447	41.12	0.14	0.002078	96532.82	200.5508	96432.54	3385745	35.07351	0.006213	89960.42	558.9241	89680.96	2252918	25.04344
43 years	98061	120	0.99878	0.00122	9.9	98001	3938333	40.16	0.14	0.002325	96332.27	224.0034	96220.27	3289313	34.14549	0.006954	89401.5	621.698	89090.65	2163237	24.19688
44 years	97941	136	0.99861	0.00139	8.5	97873	3840332	39.21	0.14	0.002649	96108.27	254.6235	95980.95	3193092	33.22391	0.007923	88779.8	703.4023	88428.1	2074147	23.36282
45 years	97805	155	0.99842	0.00158	8.8	97728	3742459	38.26	0.15	0.003011	95853.64	288.6613	95709.31	3097111	32.31084	0.009006	88076.4	793.216	87679.79	1985719	22.54541
46 years	97650	173	0.99823	0.00177	9.4	97563	3644731	37.32	0.15	0.003374	95564.98	322.3999	95403.78	3001402	31.40692	0.010089	87283.18	880.6	86842.88	1898039	21.74576
47 years	97477	191	0.99804	0.00196	9.3	97381	3547168	36.39	0.15	0.003736	95242.58	355.8034	95064.68	2905998	30.51155	0.011172	86402.58	965.2896	85919.93	1811196	20.96229
48 years	97286	207	0.99788	0.00212	8	97183	3449787	35.46	0.16	0.004041	94886.78	383.4109	94695.07	2810934	29.62408	0.012084	85437.29	1032.424	84921.08	1725276	20.19348
49 years	97079	220	0.99773	0.00227	7.1	96969	3352604	34.53	0.16	0.004327	94503.37	408.8802	94298.93	2716239	28.74224	0.012939	84404.87	1092.115	83858.81	1640355	19.43437
50 years	96859	236	0.99757	0.00243	7.4	96741	3255635	33.61	0.17	0.004632	94094.49	435.8061	93876.58	2621940	27.86497	0.013851	83312.75	1153.965	82735.77	1556496	18.68257
51 years	96623	252	0.99739	0.00261	8.1	96497	3158894	32.69	0.17	0.004975	93658.68	465.9201	93425.72	2528063	26.9923	0.014877	82158.79	1222.276	81547.65	1473760	17.93795
52 years	96371	274	0.99716	0.00284	8.1	96234	3062397	31.78	0.17	0.005413	93192.76	504.4561	92940.53	2434637	26.12475	0.016188	80936.51	1310.2	80281.41	1392213	17.2013
53 years	96097	299	0.99689	0.00311	6.9	95948	2966163	30.87	0.18	0.005928	92688.3	549.4248	92413.59	2341697	25.26421	0.017727	79626.31	1411.536	78920.54	1311931	16.47611
54 years	95798	327	0.99658	0.00342	6.2	95634	2870215	29.96	0.18	0.006519	92138.88	600.6091	91838.57	2249283	24.41188	0.019494	78214.77	1524.719	77452.41	1233011	15.76442
55 years	95471	359	0.99624	0.00376	6.5	95291	2774581	29.06	0.19	0.007167	91538.27	656.0145	91210.26	2157445	23.56877	0.021432	76690.05	1643.621	75868.24	1155558	15.06791
56 years	95112	392	0.99588	0.00412	7.1	94916	2679290	28.17	0.19	0.007853	90882.26	713.6729	90525.42	2066234	22.73529	0.023484	75046.43	1762.39	74165.24	1079690	14.38696
57 years	94720	428	0.99548	0.00452	7	94506	2584374	27.28	0.2	0.008615	90168.58	776.8132	89780.18	1975709	21.91128	0.025764	73284.04	1888.09	72340	1005525	13.72093
58 years	94292	466	0.99507	0.00493	6.1	94059	2489868	26.41	0.2	0.009397	89391.77	839.9769	88971.78	1885929	21.09734	0.028101	71395.95	2006.298	70392.8	933185	13.07056
59 years	93826	502	0.99464	0.00536	5.5	93575	2395809	25.53	0.21	0.010216	88551.79	904.6593	88099.46	1796957	20.29272	0.030552	69389.66	2119.993	68329.66	862792.2	12.43402
60 years	93324	544	0.99418	0.00582	5.9	93052	2302234	24.67	0.21	0.011093	87647.13	972.2626	87161	1708858	19.49702	0.033174	67269.66	2231.604	66153.86	794462.5	11.81012
61 years	92780	589	0.99365	0.00635	6.5	92486	2209182	23.81	0.22	0.012103	86674.87	1049.035	86150.35	1621697	18.71011	0.036195	65038.06	2354.053	63861.03	728308.7	11.19819
62 years	92191	643	0.99302	0.00698	6.4	91869	2116696	22.96	0.23	0.013304	85625.84	1139.156	85056.26	1535546	17.93321	0.039786	62684.01	2493.946	61437.03	664447.6	10.59996
63 years	91548	703	0.99233	0.00767	5.5	91196	2024827	22.12	0.23	0.014619	84486.68	1235.112	83869.12	1450490	17.16827	0.043719	60190.06	2631.449	58874.34	603010.6	10.01844
64 years	90845	766	0.99157	0.00843	4.8	90462	1933631	21.28	0.24	0.016068	83251.57	1337.651	82582.74	1366621	16.41556	0.048051	57558.61	2765.749	56175.74	544136.3	9.453603
65 years	90079	836	0.99073	0.00927	5	89661	1843169	20.46	0.25	0.017669	81913.92	1447.306	81190.26	1284038	15.67546	0.052839	54792.86	2895.2	53345.26	487960.5	8.905549
66 years	89243	911	0.98979	0.01021	5.4	88788	1753508	19.65	0.25	0.01946	80466.61	1565.901	79683.66	1202848	14.94841	0.058197	51897.66	3020.288	50387.52	434615.3	8.374467
67 years	88332	996	0.98872	0.01128	5.3	87834	1664720	18.85	0.26	0.0215	78900.71	1696.34	78052.54	1123164	14.23516	0.064296	48877.37	3142.62	47306.06	384227.8	7.861056
68 years	87336	1084	0.98759	0.01241	4.5	86794	1576886	18.06	0.27	0.023653	77204.37	1826.15	76291.29	1045112	13.53695	0.070737	45734.75	3235.139	44117.18	336921.7	7.366864
69 years	86252	1173	0.9864	0.0136	3.9	85665	1490092	17.28	0.28	0.025922	75378.22	1953.924	74401.26	968820.4	12.85279	0.07752	42499.62	3294.57	40852.33	292804.5	6.88958
70 years	85079	1270	0.98508	0.01492	4.1	84444	1404427	16.51	0.29	0.028438	73424.3	2088.005	72380.29	894419.1	12.18151	0.085044	39205.04	3334.154	37537.97	251952.2	6.426525
71 years	83809	1378	0.98355	0.01645	4.4	83121	1319983	15.75	0.3	0.031354	71336.29	2236.657	70217.96	822038.8	11.52343	0.093765	35870.89	3363.434	34189.17	214414.2	5.977387
72 years	82431	1505	0.98175	0.01825	4.3	81678	1236862	15	0.31	0.034785	69099.63	2403.596	67897.84	751820.9	10.88024	0.104025	32507.46	3381.588	30816.66	180225	5.544114
73 years	80926	1639	0.97975	0.02025	3.7	80107	1155184	14.27	0.33	0.038597	66696.04	2574.234	65408.92	683923	10.25433	0.115425	29125.87	3361.853	27444.94	149408.4	5.129748
74 years	79287	1775	0.97761	0.02239	3.2	78399	1075077	13.56	0.34	0.042675	64121.8	2736.42	62753.59	618514.1	9.645925	0.127623	25764.02	3288.081	24119.97	121963.4	4.733868
75 years	77512	1923	0.9752	0.0248	3.4	76551	996678	12.86	0.36	0.047269	61385.38	2901.613	59934.58	555760.5	9.053629	0.14136	22475.93	3177.198	20887.34	97843.46	4.353254
76 years	75589	2087	0.97239	0.02761	3.7	74545	920127	12.17	0.38	0.052625	58483.77	3077.689	56944.93	495825.9	8.478009	0.157377	19298.74	3037.177	17780.15	76956.13	3.987625
77 years	73502	2275	0.96904	0.03096	3.6	72365	845582	11.5	0.4	0.05901	55406.08	3269.5	53771.33	438881	7.92117	0.176472	16261.56	2869.71	14826.7	59175.98	3.63901
78 years	71227	2471	0.96531	0.03469	3.1	69991	773217	10.86	0.42	0.066119	52136.58	3447.226	50412.97	385109.7	7.386554	0.197733	13391.85	2648.011	12067.84	44349.27	3.311662
79 years	68756	2664	0.96126	0.03874	2.8	67423	703226	10.23	0.44	0.073838	48689.36	3595.146	46891.78	334696.7	6.874125	0.220818	10743.84	2372.433	9557.622	32281.43	3.004646
80 years	66092	2862	0.9567	0.0433	3.1	64661	635803	9.62	0.48	0.08253	45094.21	3721.616	43233.4	287804.9	6.382303	0.24681	8371.406	2066.147	7338.332	22723.81	2.714455
81 years	63230	3071	0.95144	0.04856	3.4	61695	571142	9.03	0.51	0.092555	41372.59	3829.255	39457.97	244571.5	5.911438	0.276792	6305.259	1745.245	5432.636	15385.47	2.440102
82 years	60159	3292	0.94527	0.05473	3.3	58513	509447	8.47	0.54	0.104315	37543.34	3916.348	35585.16	205113.6	5.463381	0.311961	4560.014	1422.546	3848.741	9952.838	2.182633

83 years	56867	3507	0.93833	0.06167	2.8	55114	450934	7.93	0.58	0.117543	33626.99	3952.618	31650.68	169528.4	5.041438	0.351519	3137.467	1102.879	2586.028	6104.098	1.945549
84 years	53360	3695	0.93075	0.06925	2.8	51512	395820	7.42	0.63	0.131991	29674.37	3916.735	27716.01	137877.7	4.646356	0.394725	2034.588	803.1027	1633.037	3518.07	1.729131
85 years	49665	3857	0.92234	0.07766	3.3	47736	344308	6.93	0.68	0.14802	25757.64	3812.645	23851.32	110161.7	4.276856	0.442662	1231.485	545.1317	958.9194	1885.033	1.530699
86 years	45808	3990	0.91289	0.08711	3.4	43813	296572	6.47	0.73	0.166032	21944.99	3643.564	20123.21	86310.39	3.933033	0.496527	686.3535	340.7931	515.957	926.1141	1.349325
87 years	41818	4090	0.90221	0.09779	3.1	39773	252759	6.04	0.79	0.186388	18301.43	3411.162	16595.85	66187.18	3.616503	0.557403	345.5605	192.6164	249.2522	410.1571	1.186933
88 years	37728	4050	0.89265	0.10735	3.1	35703	212986	5.65	0.86	0.204609	14890.27	3046.684	13366.93	49591.33	3.330452	0.611895	152.944	93.58568	106.1512	160.9049	1.052051
89 years	33678	3995	0.88137	0.11863	3.2	31681	177283	5.26	0.94	0.226109	11843.58	2677.938	10504.61	36224.4	3.058568	0.676191	59.35834	40.13758	39.28955	54.75369	0.922426
90 years	29683	3883	0.86918	0.13082	3.3	27741	145602	4.91	1.04	0.249343	9165.645	2285.389	8022.951	25719.79	2.806108	0.745674	19.22076	14.33242	12.05455	15.46413	0.804554
91 years	25800	3714	0.85605	0.14395	3.5	23943	117861	4.57	1.17	0.274369	6880.256	1887.727	5936.393	17696.84	2.572119	0.820515	4.88834	4.010957	2.882862	3.409582	0.697493
92 years	22086	3491	0.84195	0.15805	3.6	20340	93918	4.25	1.31	0.301243	4992.529	1503.966	4240.546	11760.44	2.355608	0.900885	0.877384	0.790422	0.482173	0.52672	0.60033
93 years	18595	3219	0.82687	0.17313	3.8	16986	73578	3.96	1.49	0.329986	3488.563	1151.176	2912.975	7519.898	2.155586	0.986841	0.086962	0.085818	0.044053	0.044547	0.51226
94 years	15376	2910	0.81076	0.18924	4.2	13921	56592	3.68	1.72	0.360691	2337.387	843.0755	1915.849	4606.923	1.970971	1.078668	0.001144	0.001234	0.000527	0.000494	0.431694
95 years	12466	2572	0.79364	0.20636	4.4	11180	42671	3.42	1.99	0.393322	1494.312	587.7458	1200.439	2691.073	1.800878	1.176252	-9E-05	-0.00011	-3.7E-05	-3.3E-05	0.368282
96 years	9894	2222	0.77548	0.22452	4.8	8783	31491	3.18	2.35	0.427935	906.5657	387.9513	712.5901	1490.635	1.644266	1.279764	1.59E-05	2.03E-05	5.71E-06	3.92E-06	0.247329
97 years	7672	1870	0.75629	0.24371	5.7	6737	22708	2.96	2.81	0.464511	518.6144	240.9022	398.1633	778.0447	1.500237	1.389147	-4.4E-06	-6.2E-06	-1.4E-06	-1.8E-06	0.403157
98 years	5802	1531	0.73608	0.26392	6.3	5037	15971	2.75	3.36	0.503032	277.7122	139.698	207.8632	379.8814	1.367896	1.504344	1.73E-06	2.6E-06	4.28E-07	-4.3E-07	-0.25114
99 years	4271	1218	0.71487	0.28513	7.2	3662	10934	2.56	4.1	0.543458	138.0142	75.00489	100.5118	172.0182	1.246381	1.625241	-8.7E-07	-1.4E-06	-1.6E-07	-8.6E-07	0.98934
100 years	3053	938	0.69268	0.30732	8.7	2584	7272	2.38	5.1	0.585752	63.00931	36.90782	44.5554	71.5065	1.134856	1.751724	5.45E-07	9.54E-07	6.76E-08	-7E-07	-1.28264
101 years	2115	699	0.66954	0.33046	10.1	1766	4688	2.22	6.33	0.629857	26.10148	16.4402	17.88139	26.9511	1.032551	1.883622	-4.1E-07	-7.7E-07	-2.4E-08	-7.7E-07	1.871405
102 years	1416	502	0.64551	0.35449	12.2	1165	2922	2.06	8.05	0.675658	9.661288	6.527726	6.397425	9.069716	0.938769	2.020593	3.62E-07	7.31E-07	-3.7E-09	-7.4E-07	-2.05203
103 years	914	347	0.62063	0.37937	14.8	741	1757	1.92	10.41	0.723079	3.133562	2.265814	2.000655	2.67229	0.852796	2.162409	-3.7E-07	-8E-07	3E-08	-7.4E-07	2.000534
104 years	567	229	0.59496	0.40504	17.1	452	1016	1.79	13.78	0.772006	0.867748	0.669907	0.532795	0.671635	0.773998	2.308728	4.29E-07	9.91E-07	-6.6E-08	-7.7E-07	-1.79088
105 years	338	146	0.56857	0.43143	23.1	265	564	1.67	19.69	0.822306	0.197841	0.162686	0.116498	0.13884	0.701777	2.459151	-5.6E-07	-1.4E-06	1.29E-07	-7E-07	1.250465
106 years	192	88	0.54153	0.45847	32.9	148	299	1.56	29	0.873844	0.035155	0.03072	0.019795	0.022342	0.635525	2.613279	8.2E-07	2.14E-06	-2.5E-07	-8.3E-07	-1.01432
107 years	104	51	0.51392	0.48608	43.9	78	151	1.46	43.42	0.926468	0.004435	0.004109	0.002381	0.002547	0.574267	2.770656	-1.3E-06	-3.7E-06	5.1E-07	-5.8E-07	0.438657
108 years	53	27	0.48584	0.51416	85.4	40	73	1.36	70.31	0.979989	0.000326	0.00032	0.000166	0.000166	0.510006	2.930712	2.34E-06	6.86E-06	-1.1E-06	-1.1E-06	-0.46536

Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution

F too unreliable to be published (indicates a cv of at least 100.0%)."

NP= not possible to calculate becasue of the missing data from the actual life table.

Table 4a: Complete life table, British Columbia, 2000 to 2002, males																						
		General Population								AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	461	0.99539	0.00461	5.9	99600	7806628	78.07	0.12	0.008787	100000	878.666	99560.67	7058476	70.58476	0.026277	100000	2627.7	98686.15	5666741	56.66741
1 year	99539	28	0.99971	0.00029	27.1	99523	7707028	77.43	0.12	0.000553	99121.33	54.78833	99093.94	6958915	70.20603	0.001653	97372.3	160.9564	97291.82	5568055	57.18315
2 years	99511	15	0.99985	0.00015	27.5	99503	7607505	76.45	0.12	0.000286	99066.55	28.32313	99052.38	6859821	69.24458	0.000855	97211.34	83.1157	97169.79	5470763	56.277
3 years	99496	14	0.99986	0.00014	28.7	99490	7508002	75.46	0.12	0.000267	99038.22	26.42736	99025.01	6760769	68.26424	0.000798	97128.23	77.50833	97089.47	5373593	55.32473
4 years	99482	13	0.99987	0.00013	27.9	99475	7408512	74.47	0.12	0.000248	99011.8	24.53314	98999.53	6661744	67.28232	0.000741	97050.72	71.91458	97014.76	5276504	54.36852
5 years	99469	9	0.99992	0.00008	57.3	99465	7309037	73.48	0.12	0.000152	98987.26	15.09358	98979.72	6562744	66.29888	0.000456	96978.8	44.22234	96956.69	5179489	53.40846
6 years	99460	7	0.99993	0.00007	78.3	99456	7209572	72.49	0.12	0.000133	98972.17	13.20487	98965.57	6463764	65.30891	0.000399	96934.58	38.6769	96915.24	5082532	52.4326
7 years	99453	7	0.99993	0.00007	76.2	99450	7110116	71.49	0.12	0.000133	98958.96	13.2031	98952.36	6364799	64.31756	0.000399	96895.91	38.66147	96876.58	4985617	51.45333
8 years	99446	6	0.99993	0.00007	70	99443	7010666	70.5	0.13	0.000133	98945.76	13.20134	98939.16	6265846	63.32607	0.000399	96857.24	38.64604	96837.92	4888741	50.47367
9 years	99440	8	0.99992	0.00008	63.9	99436	6911223	69.5	0.13	0.000152	98932.56	15.08524	98925.02	6166907	62.33446	0.000456	96818.6	44.14928	96796.52	4791903	49.49362
10 years	99432	10	0.9999	0.0001	57.1	99427	6811787	68.51	0.13	0.000191	98917.47	18.85367	98908.05	6067982	61.34389	0.00057	96774.45	55.16144	96746.87	4695106	48.51597
11 years	99422	10	0.9999	0.0001	52.7	99417	6712360	67.51	0.13	0.000191	98898.62	18.85008	98889.2	5969074	60.35549	0.00057	96719.29	55.12999	96691.72	4598359	47.54335
12 years	99412	16	0.99984	0.00016	48.3	99404	6612943	66.52	0.13	0.000305	98879.77	30.15437	98864.69	5870185	59.3669	0.000912	96664.16	88.15771	96620.08	4501667	46.57018
13 years	99396	23	0.99977	0.00023	32.4	99385	6513539	65.53	0.14	0.000438	98849.62	43.33369	98827.95	5771320	58.38485	0.001311	96576	126.6111	96512.69	4405047	45.61224
14 years	99373	32	0.99968	0.00032	25.5	99358	6414154	64.55	0.14	0.00061	98806.28	60.26393	98776.15	5672492	57.41024	0.001824	96449.39	175.9237	96361.43	4308535	44.67146
15 years	99341	42	0.99957	0.00043	25.1	99320	6314796	63.57	0.14	0.00082	98746.02	80.93026	98705.55	5573716	56.44497	0.002451	96273.46	235.9663	96155.48	4212173	43.75217
16 years	99299	52	0.99947	0.00053	25.3	99273	6215476	62.59	0.14	0.00101	98665.09	99.6695	98615.25	5475011	55.49086	0.003021	96037.5	290.1293	95892.43	4116018	42.85844
17 years	99247	62	0.99938	0.00062	23.5	99216	6116203	61.63	0.14	0.001182	98565.42	116.4767	98507.18	5376395	54.54647	0.003534	95747.37	338.3712	95578.18	4020125	41.9868
18 years	99185	69	0.9993	0.0007	19.5	99150	6016987	60.66	0.14	0.001334	98448.94	131.3506	98383.27	5277888	53.61041	0.00399	95409	380.6819	95218.66	3924547	41.13393
19 years	99116	77	0.99922	0.00078	16.6	99078	5917837	59.71	0.15	0.001487	98317.59	146.1668	98244.51	5179505	52.68137	0.004446	95028.32	422.4959	94817.07	3829329	40.29671
20 years	99039	84	0.99915	0.00085	17	98997	5818759	58.75	0.15	0.00162	98171.42	159.0475	98091.9	5081261	51.75906	0.004845	94605.82	458.3652	94376.64	3734511	39.47444
21 years	98955	90	0.99909	0.00091	18.9	98910	5719762	57.8	0.15	0.001734	98012.38	169.9985	97927.38	4983169	50.84224	0.005187	94147.46	488.3429	93903.28	3640135	38.66419
22 years	98865	94	0.99905	0.00095	19.6	98818	5620852	56.85	0.15	0.001811	97842.38	177.1632	97753.8	4885241	49.92971	0.005415	93659.11	507.1641	93405.53	3546232	37.86318
23 years	98771	95	0.99904	0.00096	18	98724	5522034	55.91	0.15	0.00183	97665.22	178.7039	97575.86	4787487	49.01937	0.005472	93151.95	509.7275	92897.08	3452826	37.0666
24 years	98676	94	0.99905	0.00095	16	98629	5423310	54.96	0.16	0.001811	97486.51	176.5188	97398.25	4689912	48.10831	0.005415	92642.22	501.6576	92391.39	3359929	36.26779
25 years	98582	91	0.99907	0.00093	16.3	98536	5324681	54.01	0.16	0.001773	97309.99	172.4897	97223.75	4592513	47.19467	0.005301	92140.56	488.4371	91896.34	3267538	35.46253
26 years	98491	90	0.99909	0.00091	18.7	98446	5226145	53.06	0.16	0.001734	97137.5	168.4811	97053.26	4495290	46.27759	0.005187	91652.13	475.3996	91414.43	3175641	34.64885
27 years	98401	90	0.99909	0.00091	20.2	98356	5127699	52.11	0.16	0.001734	96969.02	168.1889	96884.93	4398236	45.35713	0.005187	91176.73	472.9337	90940.26	3084227	33.82691
28 years	98311	91	0.99907	0.00093	18.4	98265	5029343	51.16	0.16	0.001773	96800.83	171.5872	96715.04	4301351	44.43507	0.005301	90703.79	480.8208	90463.38	2993286	33.00068
29 years	98220	94	0.99904	0.00096	15.9	98173	4931078	50.2	0.17	0.00183	96629.25	176.8083	96540.84	4204636	43.51308	0.005472	90222.97	493.7001	89976.12	2902823	32.17388
30 years	98126	97	0.99901	0.00099	15.5	98077	4832905	49.25	0.17	0.001887	96452.44	182	96361.44	4108096	42.59193	0.005643	89729.27	506.3423	89476.1	2812847	31.34815
31 years	98029	102	0.99897	0.00103	17	97978	4734828	48.3	0.17	0.001963	96270.44	188.9962	96175.94	4011734	41.67151	0.005871	89222.93	523.8278	88961.02	2723371	30.52322
32 years	97927	106	0.99892	0.00108	17.5	97875	4636850	47.35	0.17	0.002058	96081.44	197.7817	95982.55	3915558	40.75249	0.006156	88699.1	546.0317	88426.09	2634410	29.70052
33 years	97821	111	0.99886	0.00114	15.5	97765	4538975	46.4	0.18	0.002173	95883.66	208.3398	95779.49	3819576	39.83552	0.006498	88153.07	572.8186	87866.66	2545984	28.8814
34 years	97710	118	0.99879	0.00121	13.2	97651	4441210	45.45	0.18	0.002306	95675.32	220.6522	95564.99	3723796	38.92118	0.006897	87580.25	604.041	87278.23	2458117	28.06703
35 years	97592	125	0.99872	0.00128	12.9	97530	4343559	44.51	0.18	0.00244	95454.67	232.8788	95338.23	3628231	38.00999	0.007296	86976.21	634.5784	86658.92	2370839	27.25848
36 years	97467	132	0.99864	0.00136	14	97401	4246029	43.56	0.19	0.002592	95221.79	246.8301	95098.37	3532893	37.10173	0.007752	86341.63	669.3203	86006.97	2284180	26.45514
37 years	97335	140	0.99856	0.00144	14.3	97265	4148628	42.62	0.19	0.002745	94974.96	260.6721	94844.62	3437795	36.19685	0.008208	85672.31	703.1983	85320.71	2198173	25.65792
38 years	97195	147	0.99848	0.00152	12.6	97121	4051363	41.68	0.19	0.002897	94714.29	274.3987	94577.09	3342950	35.2951	0.008664	84969.11	736.1724	84601.03	2112852	24.86612
39 years	97048	155	0.9984	0.0016	11	96971	3954242	40.75	0.2	0.00305	94439.89	288.0039	94295.89	3248373	34.3962	0.00912	84232.94	768.2044	83848.84	2028251	24.07907
40 years	96893	163	0.99832	0.00168	11.1	96812	3857271	39.81	0.2	0.003202	94151.88	301.4819	94001.14	3154077	33.49988	0.009576	83464.74	799.2583	83065.11	1944402	23.29609

41 years	96730	172	0.99822	0.00178	12.2	96644	3760459	38.88	0.21	0.003393	93850.4	318.4044	93691.2	3060076	32.60589	0.010146	82665.48	838.7239	82246.12	1861337	22.5165
42 years	96558	183	0.9981	0.0019	12.3	96466	3663815	37.94	0.21	0.003621	93532	338.7168	93362.64	2966385	31.71518	0.01083	81826.75	886.1837	81383.66	1779091	21.74217
43 years	96375	197	0.99796	0.00204	10.8	96276	3567349	37.02	0.21	0.003888	93193.28	362.3578	93012.1	2873022	30.82864	0.011628	80940.57	941.177	80469.98	1697708	20.97474
44 years	96178	211	0.99781	0.00219	9.4	96073	3471073	36.09	0.22	0.004174	92830.92	387.4893	92637.18	2780010	29.94702	0.012483	79999.39	998.6324	79500.08	1617238	20.21562
45 years	95967	226	0.99764	0.00236	9.7	95854	3375000	35.17	0.22	0.004498	92443.43	415.8254	92235.52	2687373	29.07045	0.013452	79000.76	1062.718	78469.4	1537737	19.46484
46 years	95741	244	0.99745	0.00255	10.6	95619	3279146	34.25	0.23	0.00486	92027.61	447.2818	91803.97	2595137	28.19955	0.014535	77938.04	1132.829	77371.63	1459268	18.72344
47 years	95497	262	0.99725	0.00275	10.6	95366	3183527	33.34	0.24	0.005242	91580.33	480.0183	91340.32	2503333	27.33484	0.015675	76805.21	1203.922	76203.25	1381896	17.99222
48 years	95235	282	0.99704	0.00296	9.3	95094	3088161	32.43	0.24	0.005642	91100.31	513.9661	90843.32	2411993	26.47623	0.016872	75601.29	1275.545	74963.52	1305693	17.27078
49 years	94953	301	0.99683	0.00317	8.2	94802	2993067	31.52	0.25	0.006042	90586.34	547.3245	90312.68	2321150	25.62361	0.018069	74325.75	1342.992	73654.25	1230730	16.55859
50 years	94652	322	0.9966	0.0034	8.5	94492	2898265	30.62	0.25	0.00648	90039.02	583.4888	89747.27	2230837	24.77633	0.01938	72982.75	1414.406	72275.55	1157075	15.85409
51 years	94330	347	0.99632	0.00368	9.3	94156	2803773	29.72	0.26	0.007014	89455.53	627.4482	89141.8	2141090	23.93468	0.020976	71568.35	1501.218	70817.74	1084800	15.15754
52 years	93983	378	0.99598	0.00402	9.2	93794	2709617	28.83	0.27	0.007662	88828.08	680.6114	88487.77	2051948	23.10022	0.022914	70067.13	1605.518	69264.37	1013982	14.47158
53 years	93605	412	0.99559	0.00441	7.9	93399	2615823	27.95	0.27	0.008405	88147.47	740.92	87777.01	1963460	22.27472	0.025137	68461.61	1720.92	67601.15	944717.8	13.79923
54 years	93193	451	0.99516	0.00484	7.2	92968	2522424	27.07	0.28	0.009225	87406.55	806.3289	87003.38	1875683	21.4593	0.027588	66740.69	1841.242	65820.07	877116.6	13.14216
55 years	92742	494	0.99468	0.00532	7.8	92495	2429456	26.2	0.29	0.01014	86600.22	878.1193	86161.16	1788680	20.65445	0.030324	64899.45	1968.011	63915.45	811296.5	12.50082
56 years	92248	540	0.99414	0.00586	8.6	91978	2336961	25.33	0.3	0.011169	85722.1	957.4439	85243.38	1702518	19.8609	0.033402	62931.44	2102.036	61880.42	747381.1	11.87612
57 years	91708	593	0.99354	0.00646	8.4	91411	2244983	24.48	0.31	0.012313	84764.66	1043.687	84242.81	1617275	19.07959	0.036822	60829.4	2239.86	59709.47	685500.7	11.26923
58 years	91115	647	0.99289	0.00711	7.2	90792	2153572	23.64	0.32	0.013552	83720.97	1134.558	83153.69	1533032	18.31121	0.040527	58589.54	2374.458	57402.31	625791.2	10.68094
59 years	90468	706	0.99219	0.00781	6.5	90115	2062780	22.8	0.33	0.014886	82586.41	1229.37	81971.73	1449879	17.5559	0.044517	56215.09	2502.527	54963.82	568388.9	10.11097
60 years	89762	769	0.99144	0.00856	6.9	89377	1972665	21.98	0.34	0.016315	81357.04	1327.369	80693.36	1367907	16.81363	0.048792	53712.56	2620.743	52402.19	513425	9.558752
61 years	88993	836	0.9906	0.0094	7.6	88575	1883288	21.16	0.35	0.017916	80029.67	1433.844	79312.75	1287213	16.0842	0.05358	51091.82	2737.499	49723.07	461022.9	9.023419
62 years	88157	910	0.98968	0.01032	7.5	87702	1794713	20.36	0.36	0.01967	78595.83	1545.974	77822.84	1207901	15.36851	0.058824	48354.32	2844.394	46932.12	411299.8	8.505958
63 years	87247	983	0.98873	0.01127	6.4	86756	1707011	19.57	0.37	0.021481	77049.86	1655.079	76222.32	1130078	14.66684	0.064239	45509.92	2923.512	44048.17	364367.7	8.006335
64 years	86264	1058	0.98774	0.01226	5.7	85735	1620255	18.78	0.38	0.023368	75394.78	1761.792	74513.88	1053856	13.97783	0.069882	42586.41	2976.023	41098.4	320319.5	7.521637
65 years	85206	1138	0.98665	0.01335	5.9	84637	1534520	18.01	0.39	0.025445	73632.98	1873.599	72696.19	979341.7	13.30031	0.076095	39610.39	3014.152	38103.31	279221.1	7.049189
66 years	84068	1228	0.98539	0.01461	6.4	83455	1449883	17.25	0.41	0.027847	71759.39	1998.259	70760.26	906645.5	12.63452	0.083277	36596.23	3047.625	35072.42	241117.8	6.588596
67 years	82840	1335	0.98388	0.01612	6.3	82172	1366428	16.49	0.42	0.030725	69761.13	2143.391	68689.43	835885.2	11.98211	0.091884	33548.61	3082.58	32007.32	206045.4	6.141697
68 years	81505	1453	0.98218	0.01782	5.4	80778	1284256	15.76	0.43	0.033965	67617.74	2296.631	66469.42	767195.8	11.34607	0.101574	30466.03	3094.556	28918.75	174038.1	5.712529
69 years	80052	1574	0.98033	0.01967	4.7	79266	1203478	15.03	0.45	0.037491	65321.1	2448.955	64096.63	700726.4	10.72741	0.112119	27371.47	3068.862	25837.04	145119.3	5.301845
70 years	78478	1705	0.97827	0.02173	4.9	77625	1124212	14.33	0.47	0.041417	62872.15	2604	61570.15	636629.8	10.12578	0.123861	24302.61	3010.146	22797.54	119282.3	4.908208
71 years	76773	1850	0.97591	0.02409	5.3	75848	1046587	13.63	0.5	0.045916	60268.15	2767.245	58884.53	575059.6	9.541683	0.137313	21292.46	2923.732	19830.6	96484.73	4.531403
72 years	74923	2008	0.9732	0.0268	5.2	73919	970739	12.96	0.52	0.051081	57500.91	2937.192	56032.31	516175.1	8.976817	0.15276	18368.73	2806.008	16965.73	76654.13	4.173077
73 years	72915	2173	0.97019	0.02981	4.4	71829	896820	12.3	0.54	0.056818	54563.71	3100.193	53013.62	460142.8	8.433128	0.169917	15562.72	2644.372	14240.54	59688.4	3.835344
74 years	70742	2339	0.96694	0.03306	4	69572	824991	11.66	0.57	0.063012	51463.52	3242.838	49842.1	407129.2	7.911024	0.188442	12918.35	2434.36	11701.17	45447.86	3.518085
75 years	68403	2508	0.96334	0.03666	4.3	67150	755419	11.04	0.61	0.069874	48220.68	3369.37	46536	357287.1	7.409415	0.208962	10483.99	2190.756	9388.615	33746.69	3.218878
76 years	65895	2681	0.95931	0.04069	4.7	64554	688269	10.44	0.64	0.077555	44851.31	3478.45	43112.09	310751.1	6.928472	0.231933	8293.237	1923.475	7331.499	24358.08	2.937101
77 years	63214	2860	0.95476	0.04524	4.6	61784	623715	9.87	0.68	0.086227	41372.86	3567.476	39589.12	267639	6.46895	0.257868	6369.762	1642.558	5548.483	17026.58	2.673032
78 years	60354	3030	0.94979	0.05021	3.9	58839	561931	9.31	0.72	0.0957	37805.39	3617.985	35996.39	228049.8	6.032205	0.286197	4727.204	1352.912	4050.748	11478.09	2.428094
79 years	57324	3185	0.94444	0.05556	3.7	55731	503092	8.78	0.77	0.105897	34187.4	3620.356	32377.22	192053.5	5.617667	0.316692	3374.292	1068.611	2839.987	7427.346	2.201157
80 years	54139	3325	0.93859	0.06141	4.2	52477	447361	8.26	0.84	0.117047	30567.05	3577.795	28778.15	159676.2	5.223803	0.350037	2305.681	807.0736	1902.144	4587.359	1.98959
81 years	50814	3450	0.9321	0.0679	4.6	49089	394884	7.77	0.9	0.129417	26989.25	3492.879	25242.81	130898.1	4.850008	0.38703	1498.607	580.006	1208.604	2685.215	1.791807
82 years	47364	3561	0.92482	0.07518	4.5	45583	345795	7.3	0.96	0.143293	23496.37	3366.867	21812.94	105655.3	4.496663	0.428526	918.6013	393.6445	721.779	1476.611	1.607455

83 years	43803	3642	0.91685	0.08315	3.9	41982	300212	6.85	1.04	0.158484	20129.5	3190.202	18534.4	83842.33	4.165146	0.473955	524.9568	248.8059	400.5538	754.8315	1.437893
84 years	40161	3683	0.90829	0.09171	4.1	38320	258230	6.43	1.15	0.174799	16939.3	2960.977	15458.81	65307.93	3.855408	0.522747	276.1509	144.357	203.9724	354.2777	1.282914
85 years	36478	3685	0.89898	0.10102	4.9	34635	219910	6.03	1.27	0.192544	13978.32	2691.444	12632.6	49849.11	3.566172	0.575814	131.7938	75.88874	93.84947	150.3053	1.140458
86 years	32793	3647	0.8888	0.1112	5.2	30969	185275	5.65	1.38	0.211947	11286.88	2392.223	10090.77	37216.51	3.297325	0.63384	55.9051	35.43489	38.18766	56.45588	1.009852
87 years	29146	3567	0.87761	0.12239	4.8	27363	154306	5.29	1.5	0.233275	8894.658	2074.904	7857.206	27125.74	3.049667	0.697623	20.47021	14.28049	13.32997	18.26822	0.89243
88 years	25579	3375	0.86807	0.13193	5	23891	126943	4.96	1.66	0.251459	6819.753	1714.885	5962.311	19268.54	2.825401	0.752001	6.189721	4.654677	3.862383	4.938257	0.797816
89 years	22204	3191	0.85627	0.14373	5.4	20609	103052	4.64	1.87	0.273949	5104.868	1398.475	4405.63	13306.23	2.606576	0.819261	1.535045	1.257602	0.906244	1.075874	0.700875
90 years	19013	2974	0.84356	0.15644	5.7	17525	82443	4.34	2.11	0.298175	3706.392	1105.152	3153.816	8900.597	2.401418	0.891708	0.277442	0.247398	0.153744	0.16963	0.611407
91 years	16039	2729	0.82986	0.17014	6	14675	64918	4.05	2.4	0.324287	2601.24	843.548	2179.466	5746.78	2.209246	0.969798	0.030045	0.029137	0.015476	0.015886	0.52876
92 years	13310	2461	0.81514	0.18486	6.4	12079	50243	3.77	2.78	0.352343	1757.692	619.3108	1448.037	3567.314	2.029544	1.053702	0.000907	0.000956	0.000429	0.00041	0.452267
93 years	10849	2177	0.79933	0.20067	7.5	9761	38164	3.52	3.26	0.382477	1138.381	435.4047	920.679	2119.277	1.861658	1.143819	-4.9E-05	-5.6E-05	-2.1E-05	-1.9E-05	0.388842
94 years	8672	1887	0.78239	0.21761	8	7729	28403	3.28	3.81	0.414765	702.9767	291.5699	557.1917	1198.598	1.705032	1.240377	7.01E-06	8.69E-06	2.66E-06	1.91E-06	0.2729
95 years	6785	1599	0.76426	0.23574	9.4	5985	20674	3.05	4.55	0.44932	411.4068	184.8535	318.9801	641.4063	1.559056	1.343718	-1.7E-06	-2.3E-06	-5.5E-07	-7.5E-07	0.444764
96 years	5186	1323	0.7449	0.2551	10.3	4524	14689	2.83	5.4	0.486221	226.5533	110.1549	171.4759	322.4263	1.423181	1.45407	5.79E-07	8.42E-07	1.58E-07	-2E-07	-0.3393
97 years	3863	1065	0.72427	0.27573	11.5	3330	10165	2.63	6.58	0.525541	116.3984	61.17219	85.81233	150.9504	1.296842	1.571661	-2.6E-07	-4.1E-07	-5.6E-08	-3.5E-07	1.348391
98 years	2798	833	0.70232	0.29768	13.9	2381	6835	2.44	8.23	0.567378	55.22624	31.33416	39.55916	65.13808	1.179477	1.696776	1.5E-07	2.55E-07	2.28E-08	-3E-07	-1.98408
99 years	1965	631	0.67903	0.32097	17.2	1650	4454	2.27	10.39	0.611769	23.89208	14.61643	16.58387	25.57892	1.070602	1.829529	-1E-07	-1.9E-07	-8.9E-09	-3.2E-07	3.065107
100 years	1334	461	0.65437	0.34563	19.4	1104	2804	2.1	13.09	0.658771	9.275651	6.110528	6.220387	8.995052	0.969749	1.970091	8.69E-08	1.71E-07	1.3E-09	-3.1E-07	-3.59224
101 years	873	324	0.62832	0.37168	27.5	710	1700	1.95	17.31	0.708422	3.165123	2.242243	2.044002	2.774665	0.876637	2.118576	-8.4E-08	-1.8E-07	5E-09	-3.1E-07	3.718413
102 years	549	219	0.60087	0.39913	26.3	440	990	1.8	21.3	0.760742	0.92288	0.702073	0.571843	0.730663	0.791721	2.275041	9.43E-08	2.14E-07	-1.3E-08	-3.2E-07	-3.37724
103 years	330	141	0.57202	0.42798	32.8	259	550	1.67	30.83	0.81573	0.220807	0.180119	0.130747	0.15882	0.719272	2.439486	-1.2E-07	-2.9E-07	2.64E-08	-3.1E-07	2.540876
104 years	189	87	0.54178	0.45822	48.2	145	291	1.55	48.37	0.873367	0.040688	0.035536	0.02292	0.028073	0.689949	2.611854	1.73E-07	4.52E-07	-5.3E-08	-3.3E-07	-1.91778
105 years	102	50	0.51018	0	0	77	146	1.43	79.31	0	0.005152	0	0.005152	0.005152	1	0	-2.8E-07	0	-2.8E-07	-2.8E-07	1

Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution

F too unreliable to be published (indicates a cv of at least 100.0%)."

Table 4b: Complete life table, British Columbia, 2000 to 2002, Females																					
			General Population							AVERAGE COPD						SEVERE COPD					
Age x	lx	dx	px	qx	cv(qx)	Lx	Tx	ex	cv(ex)	qxx1.906	lx	dx	Lx	Tx	ex	qxx5.7	lx	dx	Lx	Tx	ex
0 years	100000	360	0.9964	0.0036	6.9	99690	8285346	82.85	0.11	0.006862	100000	686.16	99656.92	7606704	76.06704	0.02052	100000	2052	98974	6339209	63.39209
1 year	99640	31	0.99969	0.00031	20.7	99623	8185656	82.15	0.11	0.000591	99313.84	58.68058	99284.5	7507047	75.58913	0.001767	97948	173.0741	97861.46	6240235	63.70967
2 years	99609	15	0.99984	0.00016	33.3	99598	8086033	81.18	0.11	0.000305	99255.16	30.26885	99240.02	7407762	74.63352	0.000912	97774.93	89.17073	97730.34	6142373	62.82156
3 years	99594	11	0.99989	0.00011	38.7	99589	7986435	80.19	0.11	0.00021	99224.89	20.80349	99214.49	7308522	73.65614	0.000627	97685.76	61.24897	97655.13	6044643	61.87845
4 years	99583	8	0.99992	0.00008	54	99577	7886846	79.2	0.11	0.000152	99204.09	15.12664	99196.52	7209308	72.67148	0.000456	97624.51	44.51677	97602.25	5946988	60.91695
5 years	99575	11	0.99989	0.00011	48.4	99570	7787269	78.2	0.11	0.00021	99188.96	20.79596	99178.56	7110111	71.68249	0.000627	97579.99	61.18265	97549.4	5849385	59.94452
6 years	99564	8	0.99992	0.00008	69.1	99560	7687699	77.21	0.11	0.000152	99168.16	15.12116	99160.6	7010933	70.69741	0.000456	97518.81	44.46858	97496.57	5751836	58.98181
7 years	99556	6	0.99994	0.00006	81.7	99553	7588139	76.22	0.11	0.000114	99153.04	11.33914	99147.37	6911772	69.70812	0.000342	97474.34	33.33622	97457.67	5654339	58.00849
8 years	99550	6	0.99994	0.00006	78.6	99547	7488586	75.22	0.11	0.000114	99141.7	11.33785	99136.04	6812625	68.71603	0.000342	97441	33.32482	97424.34	5556882	57.02817
9 years	99544	6	0.99994	0.00006	72.3	99541	7389039	74.23	0.12	0.000114	99130.37	11.33655	99124.7	6713489	67.72384	0.000342	97407.68	33.31343	97391.02	5459457	56.04751
10 years	99538	8	0.99992	0.00008	65.2	99534	7289498	73.23	0.12	0.000152	99119.03	15.11367	99111.47	6614364	66.73152	0.000456	97374.36	44.40271	97352.16	5362066	55.06651
11 years	99530	8	0.99992	0.00008	60.6	99526	7189964	72.24	0.12	0.000152	99103.92	15.11137	99096.36	6515253	65.74163	0.000456	97329.96	44.38246	97307.77	5264714	54.0914
12 years	99522	11	0.99988	0.00012	57.8	99516	7090438	71.24	0.12	0.000229	99088.8	22.66359	99077.47	6416156	64.75157	0.000684	97285.58	66.54334	97252.31	5167406	53.11585
13 years	99511	16	0.99984	0.00016	41.4	99503	6990922	70.25	0.12	0.000305	99066.14	30.21121	99051.04	6317079	63.76627	0.000912	97219.04	88.66376	97174.7	5070154	52.15187
14 years	99495	21	0.99979	0.00021	32.5	99485	6891419	69.26	0.12	0.0004	99035.93	39.64012	99016.11	6218028	62.78557	0.001197	97130.37	116.2651	97072.24	4972979	51.19902
15 years	99474	26	0.99973	0.00027	32	99460	6791934	68.28	0.12	0.000515	98996.29	50.94547	98970.82	6119012	61.81051	0.001539	97014.11	149.3047	96939.45	4875907	50.25978
16 years	99448	32	0.99968	0.00032	33	99432	6692474	67.3	0.13	0.00061	98945.34	60.34874	98915.17	6020041	60.84208	0.001824	96864.8	176.6814	96776.46	4778968	49.33647
17 years	99416	36	0.99964	0.00036	32	99398	6593042	66.32	0.13	0.000686	98885	67.85093	98851.07	5921126	59.87891	0.002052	96688.12	198.404	96588.92	4682191	48.42571
18 years	99380	38	0.99962	0.00038	28	99361	6493644	65.34	0.13	0.000724	98817.14	71.57128	98781.36	5822274	58.91968	0.002166	96489.72	208.9967	96385.22	4585602	47.52426
19 years	99342	39	0.99961	0.00039	24.3	99323	6394283	64.37	0.13	0.000743	98745.57	73.40153	98708.87	5723493	57.96202	0.002223	96280.72	214.032	96173.7	4489217	46.62634
20 years	99303	40	0.9996	0.0004	24.9	99283	6294960	63.39	0.13	0.000762	98672.17	75.22766	98634.56	5624784	57.00477	0.00228	96066.69	219.032	95957.17	4393043	45.7291
21 years	99263	39	0.9996	0.0004	28.6	99244	6195677	62.42	0.13	0.000762	98596.94	75.17031	98559.36	5526150	56.04788	0.00228	95847.66	218.5327	95738.39	4297086	44.83246
22 years	99224	40	0.9996	0.0004	30.7	99203	6096433	61.44	0.14	0.000762	98521.77	75.113	98484.22	5427590	55.09026	0.00228	95629.12	218.0344	95520.11	4201348	43.93377
23 years	99184	40	0.9996	0.0004	28.7	99164	5997230	60.47	0.14	0.000762	98446.66	75.05573	98409.13	5329106	54.13191	0.00228	95411.09	217.5373	95302.32	4105828	43.03303
24 years	99144	39	0.99961	0.00039	25.6	99124	5898066	59.49	0.14	0.000743	98371.61	73.12355	98335.04	5230697	53.17283	0.002223	95193.55	211.6153	95087.74	4010525	42.13022
25 years	99105	38	0.99962	0.00038	25.7	99086	5798942	58.51	0.14	0.000724	98298.48	71.19562	98262.88	5132362	52.21202	0.002166	94981.94	205.7309	94879.07	3915438	41.22297
26 years	99067	37	0.99962	0.00038	29.4	99049	5699856	57.54	0.14	0.000724	98227.29	71.14406	98191.71	5034099	51.2495	0.002166	94776.2	205.2853	94673.56	3820559	40.31137
27 years	99030	37	0.99962	0.00038	31.6	99011	5600807	56.56	0.15	0.000724	98156.14	71.09253	98120.6	4935907	50.28628	0.002166	94570.92	204.8406	94468.5	3725885	39.39779
28 years	98993	38	0.99962	0.00038	28.9	98974	5501796	55.58	0.15	0.000724	98085.05	71.04104	98049.53	4837787	49.32237	0.002166	94366.08	204.3969	94263.88	3631417	38.48222
29 years	98955	39	0.99961	0.00039	25.1	98936	5402822	54.6	0.15	0.000743	98014.01	72.85773	97977.58	4739737	48.35775	0.002223	94161.68	209.3214	94057.02	3537153	37.56467
30 years	98916	40	0.99959	0.00041	24.6	98896	5303886	53.62	0.15	0.000781	97941.15	76.53709	97902.88	4641760	47.39335	0.002337	93952.36	219.5667	93842.58	3443096	36.64725
31 years	98876	42	0.99957	0.00043	26.7	98855	5204990	52.64	0.16	0.00082	97864.61	80.20788	97824.51	4543857	46.43003	0.002451	93732.79	229.7391	93617.92	3349253	35.73192
32 years	98834	45	0.99954	0.00046	26.8	98811	5106135	51.66	0.16	0.000877	97784.41	85.73346	97741.54	4446032	45.4677	0.002622	93503.06	245.165	93380.47	3255635	34.81849
33 years	98789	49	0.9995	0.0005	23.1	98764	5007324	50.69	0.16	0.000953	97698.67	93.10683	97652.12	4348291	44.50716	0.00285	93257.89	265.785	93125	3162255	33.90871
34 years	98740	54	0.99946	0.00054	19.4	98713	4908560	49.71	0.16	0.001029	97605.57	100.4596	97555.34	4250639	43.54914	0.003078	92992.11	286.2297	92848.99	3069130	33.0042
35 years	98686	59	0.9994	0.0006	19	98656	4809847	48.74	0.17	0.001144	97505.11	111.5068	97449.35	4153083	42.5935	0.00342	92705.88	317.0541	92547.35	2976281	32.10455
36 years	98627	65	0.99934	0.00066	20.3	98594	4711191	47.77	0.17	0.001258	97393.6	122.5173	97332.34	4055634	41.64169	0.003762	92388.82	347.5667	92215.04	2883733	31.21301
37 years	98562	70	0.99929	0.00071	20.2	98527	4612597	46.8	0.17	0.001353	97271.08	131.6331	97205.27	3958302	40.69351	0.004047	92041.25	372.491	91855.01	2791518	30.32899
38 years	98492	76	0.99923	0.00077	17.5	98454	4514070	45.83	0.18	0.001468	97139.45	142.5638	97068.17	3861096	39.74797	0.004389	91668.76	402.3342	91467.6	2699663	29.4502
39 years	98416	81	0.99918	0.00082	15.1	98375	4415616	44.87	0.18	0.001563	96996.88	151.5984	96921.09	3764028	38.80566	0.004674	91266.43	426.5793	91053.14	2608196	28.57782
40 years	98335	87	0.99912	0.00088	15.3	98292	4317241	43.9	0.18	0.001677	96845.29	162.4367	96764.07	3667107	37.86562	0.005016	90839.85	455.6527	90612.02	2517143	27.70967

41 years	98248	93	0.99905	0.00095	16.7	98202	4218949	42.94	0.19	0.001811	96682.85	175.0636	96595.32	3570343	36.9284	0.005415	90384.2	489.4304	90139.48	2426531	26.84685
42 years	98155	101	0.99897	0.00103	16.6	98105	4120747	41.98	0.19	0.001963	96507.79	189.4622	96413.06	3473748	35.99448	0.005871	89894.77	527.7722	89630.88	2336391	25.99029
43 years	98054	110	0.99887	0.00113	14.2	97999	4022642	41.02	0.19	0.002154	96318.32	207.4485	96214.6	3377335	35.0643	0.006441	89366.99	575.6128	89079.19	2246760	25.14083
44 years	97944	121	0.99876	0.00124	12.4	97884	3924643	40.07	0.2	0.002363	96110.88	227.1523	95997.3	3281120	34.1389	0.007068	88791.38	627.5775	88477.59	2157681	24.30057
45 years	97823	133	0.99864	0.00136	12.8	97756	3826759	39.12	0.2	0.002592	95883.72	248.546	95759.45	3185123	33.2186	0.007752	88163.8	683.4458	87822.08	2069203	23.46999
46 years	97690	146	0.99851	0.00149	13.9	97618	3729003	38.17	0.21	0.00284	95635.18	271.5982	95499.38	3089363	32.30363	0.008493	87480.36	742.9707	87108.87	1981381	22.64944
47 years	97544	159	0.99836	0.00164	13.7	97464	3631385	37.23	0.21	0.003126	95363.58	298.0913	95214.53	2993864	31.39421	0.009348	86737.39	810.8211	86331.98	1894272	21.83917
48 years	97385	175	0.99821	0.00179	11.7	97297	3533921	36.29	0.22	0.003412	95065.49	324.3387	94903.32	2898649	30.49108	0.010203	85926.57	876.7088	85488.21	1807940	21.04053
49 years	97210	191	0.99804	0.00196	10.3	97115	3436624	35.35	0.22	0.003736	94741.15	353.9302	94564.18	2803746	29.59375	0.011172	85049.86	950.177	84574.77	1722452	20.25226
50 years	97019	207	0.99786	0.00214	10.7	96915	3339509	34.42	0.23	0.004079	94387.22	384.9904	94194.72	2709182	28.70285	0.012198	84099.68	1025.848	83586.76	1637877	19.47543
51 years	96812	227	0.99766	0.00234	11.7	96699	3242594	33.49	0.23	0.00446	94002.23	419.2537	93792.6	2614987	27.81835	0.013338	83073.83	1108.039	82519.81	1554291	18.70975
52 years	96585	248	0.99743	0.00257	11.5	96461	3145895	32.57	0.24	0.004898	93582.97	458.4087	93353.77	2521195	26.94074	0.014649	81965.79	1200.717	81365.44	1471771	17.95592
53 years	96337	273	0.99717	0.00283	9.9	96200	3049434	31.65	0.24	0.005394	93124.57	502.312	92873.41	2427841	26.07089	0.016131	80765.08	1302.821	80113.67	1390405	17.21543
54 years	96064	300	0.99688	0.00312	9	95913	2953234	30.74	0.25	0.005947	92622.25	550.7986	92346.85	2334967	25.20957	0.017784	79462.26	1413.157	78755.68	1310292	16.48949
55 years	95764	328	0.99657	0.00343	9.7	95600	2857321	29.84	0.26	0.006538	92071.46	601.9245	91770.49	2242620	24.35739	0.019551	78049.1	1525.938	77286.13	1231536	15.77899
56 years	95436	360	0.99623	0.00377	10.7	95256	2761721	28.94	0.26	0.007186	91469.53	657.2653	91140.9	2150850	23.51439	0.021489	76523.16	1644.406	75700.96	1154250	15.08367
57 years	95076	393	0.99586	0.00414	10.6	94880	2666465	28.05	0.27	0.007891	90812.27	716.5851	90453.97	2059709	22.68096	0.023598	74878.76	1766.989	73995.26	1078549	14.40394
58 years	94683	429	0.99547	0.00453	9.1	94468	2571585	27.16	0.28	0.008634	90095.68	777.9023	89706.73	1969255	21.85738	0.025821	73111.77	1887.819	72167.86	1004554	13.73997
59 years	94254	467	0.99505	0.00495	8.1	94021	2477117	26.28	0.28	0.009435	89317.78	842.6864	88896.44	1879548	21.04338	0.028215	71223.95	2009.584	70219.16	932385.9	13.09091
60 years	93787	507	0.9946	0.0054	8.6	93533	2383096	25.41	0.29	0.010292	88475.09	910.621	88019.78	1790652	20.23905	0.03078	69214.36	2130.418	68149.15	862166.8	12.45647
61 years	93280	551	0.9941	0.0059	9.5	93005	2289563	24.55	0.3	0.011245	87564.47	984.6975	87072.12	1702632	19.44433	0.03363	67083.95	2256.033	65955.93	794017.6	11.83618
62 years	92729	598	0.99354	0.00646	9.4	92430	2196558	23.69	0.31	0.012313	86579.77	1066.036	86046.76	1615560	18.65979	0.036822	64827.91	2387.093	63634.37	728061.7	11.23068
63 years	92131	649	0.99296	0.00704	8.1	91807	2104128	22.84	0.31	0.013418	85513.74	1147.444	84940.02	1529513	17.88617	0.040128	62440.82	2505.625	61188.01	664427.3	10.64091
64 years	91482	699	0.99236	0.00764	7.2	91132	2012321	22	0.32	0.014562	84366.29	1228.528	83752.03	1444573	17.12264	0.043548	59935.19	2610.058	58630.16	603239.3	10.06486
65 years	90783	754	0.99169	0.00831	7.5	90406	1921189	21.16	0.33	0.015839	83137.77	1316.807	82479.36	1360821	16.36827	0.047367	57325.14	2715.32	55967.48	544609.2	9.500355
66 years	90029	818	0.99092	0.00908	8.2	89620	1830783	20.34	0.34	0.017306	81820.96	1416.033	81112.94	1278342	15.62365	0.051756	54609.82	2826.386	53196.62	488641.7	8.947873
67 years	89211	891	0.99001	0.00999	8	88765	1741163	19.52	0.35	0.019041	80404.92	1530.985	79639.43	1197229	14.89	0.056943	51783.43	2948.704	50309.08	435445.1	8.408965
68 years	88320	972	0.98899	0.01101	6.9	87834	1652398	18.71	0.36	0.020985	78873.94	1655.174	78046.35	1117590	14.16931	0.062757	48834.73	3064.721	47302.37	385136	7.886519
69 years	87348	1058	0.9879	0.0121	6	86819	1564564	17.91	0.38	0.023063	77218.77	1780.865	76328.33	1039543	13.46231	0.06897	45770.01	3156.757	44191.63	337833.6	7.381114
70 years	86290	1150	0.98667	0.01333	6.1	85716	1477745	17.13	0.39	0.025407	75437.9	1916.649	74479.58	963214.8	12.76831	0.075981	42613.25	3237.797	40994.35	293642	6.890861
71 years	85140	1256	0.98525	0.01475	6.6	84512	1392029	16.35	0.41	0.028114	73521.25	2066.94	72487.78	888735.3	12.08814	0.084075	39375.45	3310.491	37720.21	252647.6	6.416374
72 years	83884	1376	0.9836	0.0164	6.4	83196	1307517	15.59	0.42	0.031258	71454.31	2233.547	70337.54	816247.5	11.42335	0.09348	36064.96	3371.352	34379.28	214927.4	5.959453
73 years	82508	1502	0.98179	0.01821	5.5	81757	1224321	14.84	0.43	0.034708	69220.76	2402.532	68019.5	745909.9	10.77581	0.103797	32693.61	3393.498	30996.86	180548.1	5.52243
74 years	81006	1632	0.97985	0.02015	4.8	80190	1142564	14.1	0.45	0.038406	66818.23	2566.214	65535.12	677890.4	10.14529	0.114855	29300.11	3365.264	27617.48	149551.3	5.104121
75 years	79374	1772	0.97767	0.02233	5	78487	1062374	13.38	0.48	0.042561	64252.02	2734.629	62884.7	612355.3	9.530523	0.127281	25934.85	3301.013	24284.34	121933.8	4.701544
76 years	77602	1931	0.97513	0.02487	5.4	76637	983887	12.68	0.5	0.047402	61517.39	2916.061	60059.36	549470.6	8.931956	0.141759	22633.83	3208.549	21029.56	97649.47	4.314315
77 years	75671	2112	0.97209	0.02791	5.2	74615	907250	11.99	0.53	0.053196	58601.33	3117.383	57042.64	489411.3	8.351539	0.159087	19425.28	3090.31	17880.13	76619.92	3.94434
78 years	73559	2298	0.96875	0.03125	4.4	72410	832635	11.32	0.55	0.059563	55483.94	3304.762	53831.56	432368.6	7.79268	0.178125	16334.97	2909.667	14880.14	58739.79	3.595953
79 years	71261	2481	0.96519	0.03481	4	70020	760225	10.67	0.59	0.066348	52179.18	3461.977	50448.19	378537.1	7.254561	0.198417	13425.31	2663.809	12093.4	43859.65	3.266939
80 years	68780	2674	0.96113	0.03887	4.4	67444	690205	10.03	0.63	0.074086	48717.2	3609.274	46912.57	328088.9	6.734559	0.221559	10761.5	2384.306	9569.344	31766.25	2.951843
81 years	66106	2890	0.95627	0.04373	4.7	64660	622761	9.42	0.67	0.083349	45107.93	3759.718	43228.07	281176.3	6.233412	0.249261	8377.19	2088.107	7333.137	22196.9	2.649684
82 years	63216	3140	0.95034	0.04966	4.5	61646	558101	8.83	0.71	0.094652	41348.21	3913.689	39391.37	237948.2	5.75474	0.283062	6289.084	1780.201	5398.983	14863.77	2.363423

83 years	60076	3393	0.94352	0.05648	3.8	58380	496455	8.26	0.76	0.107651	37434.52	4029.859	35419.59	198556.9	5.304111	0.321936	4508.883	1451.572	3783.097	9464.784	2.099142
84 years	56683	3627	0.93601	0.06399	3.9	54869	438075	7.73	0.82	0.121965	33404.66	4074.198	31367.57	163137.3	4.883667	0.364743	3057.311	1115.133	2499.745	5681.687	1.858393
85 years	53056	3846	0.92751	0.07249	4.5	51133	383206	7.22	0.9	0.138166	29330.47	4052.471	27304.23	131769.7	4.492588	0.413193	1942.178	802.4945	1540.931	3181.942	1.638337
86 years	49210	4048	0.91775	0.08225	4.6	47186	332073	6.75	0.97	0.156769	25277.99	3962.793	23296.6	104465.5	4.132664	0.468825	1139.684	534.3123	872.5277	1641.011	1.439882
87 years	45162	4225	0.90643	0.09357	4.1	43050	284887	6.31	1.03	0.178344	21315.2	3801.447	19414.48	81168.87	3.808027	0.533349	605.3716	322.8743	443.9344	768.483	1.26944
88 years	40937	4096	0.89994	0.10006	4.2	38889	241837	5.91	1.13	0.190714	17513.75	3340.124	15843.69	61754.39	3.526051	0.570342	282.4972	161.12	201.9372	324.5486	1.148856
89 years	36841	4081	0.88924	0.11076	4.3	34800	202948	5.51	1.24	0.211109	14173.63	2992.175	12677.54	45910.7	3.239163	0.631332	121.3772	76.62931	83.06255	122.6113	1.010168
90 years	32760	4009	0.87763	0.12237	4.5	30755	168148	5.13	1.38	0.233237	11181.46	2607.932	9877.489	33233.16	2.972168	0.697509	44.74789	31.21206	29.14186	39.5488	0.883814
91 years	28751	3879	0.86507	0.13493	4.6	26811	137393	4.78	1.54	0.257177	8573.524	2204.91	7471.069	23355.67	2.724162	0.769101	13.53583	10.41042	8.330622	10.40694	0.768843
92 years	24872	3693	0.85152	0.14848	4.8	23025	110582	4.45	1.73	0.283003	6368.614	1802.336	5467.446	15884.6	2.4942	0.846336	3.125411	2.645147	1.802837	2.076316	0.664334
93 years	21179	3454	0.83695	0.16305	5.4	19452	87557	4.13	1.98	0.310773	4566.278	1419.077	3856.739	10417.15	2.281323	0.929385	0.480263	0.446349	0.257088	0.273479	0.569435
94 years	17725	3167	0.82132	0.17868	5.5	16142	68105	3.84	2.25	0.340564	3147.201	1071.824	2611.289	6560.415	2.084524	1.018476	0.033914	0.03454	0.016644	0.01639	0.483292
95 years	14558	2844	0.8046	0.1954	6.1	13136	51963	3.57	2.61	0.372432	2075.377	772.9377	1688.908	3949.126	1.902847	1.11378	-0.00063	-0.0007	-0.00028	-0.00025	0.40429
96 years	11714	2498	0.78678	0.21322	6.8	10465	38827	3.31	3.05	0.406397	1302.44	529.3079	1037.786	2260.218	1.735373	1.215354	7.13E-05	8.66E-05	2.8E-05	2.43E-05	0.341188
97 years	9216	2139	0.76784	0.23216	7.3	8146	28362	3.08	3.58	0.442497	773.1316	342.1084	602.0774	1222.432	1.581144	1.323312	-1.5E-05	-2E-05	-5.2E-06	-3.6E-06	0.237445
98 years	7077	1785	0.74778	0.25222	8.6	6184	20216	2.86	4.3	0.480731	431.0232	207.2064	327.42	620.3549	1.439261	1.437654	4.96E-06	7.14E-06	1.4E-06	1.55E-06	0.31208
99 years	5292	1447	0.72658	0.27342	9.6	4569	14032	2.65	5.15	0.521139	223.8169	116.6396	165.4971	292.9349	1.308815	1.558494	-2.2E-06	-3.4E-06	-4.8E-07	1.53E-07	-0.07062
100 years	3845	1137	0.70428	0.29572	10.6	3276	9463	2.46	6.28	0.563642	107.1773	60.40964	76.97245	127.4378	1.189038	1.685604	1.21E-06	2.05E-06	1.91E-07	6.33E-07	0.521711
101 years	2708	864	0.68087	0.31913	13	2276	6187	2.28	7.92	0.608262	46.76762	28.44696	32.54415	50.46535	1.079066	1.819041	-8.3E-07	-1.5E-06	-7.5E-08	4.42E-07	-0.53167
102 years	1844	634	0.6564	0.3436	15	1527	3911	2.12	9.99	0.654902	18.32067	11.99823	12.32155	17.9212	0.978196	1.95852	6.81E-07	1.33E-06	1.41E-08	5.18E-07	0.759604
103 years	1210	447	0.63089	0.36911	18.4	986	2384	1.97	13.09	0.703524	6.322432	4.447981	4.098442	5.599652	0.88568	2.103927	-6.5E-07	-1.4E-06	3.39E-08	5.03E-07	-0.77084
104 years	763	302	0.6044	0.3956	26.4	613	1398	1.83	17.63	0.754014	1.874452	1.413362	1.167771	1.50121	0.80088	2.25492	7.21E-07	1.63E-06	-9.2E-08	4.69E-07	0.651198
105 years	461	195	0.57699	0.42301	31.9	364	785	1.7	22.02	0.806257	0.46109	0.371757	0.275211	0.33344	0.723156	2.411157	-9E-07	-2.2E-06	1.86E-07	5.61E-07	-0.62048
106 years	266	120	0.54871	0.45129	32.1	206	421	1.58	27.15	0.860159	0.089333	0.07684	0.050913	0.058228	0.651815	2.572353	1.28E-06	3.28E-06	-3.7E-07	3.75E-07	0.294018
107 years	146	70	0.51965	0.48035	39.5	111	215	1.47	39.74	0.915547	0.012492	0.011437	0.006774	0.007316	0.585623	2.737995	-2E-06	-5.5E-06	7.41E-07	7.41E-07	-0.369
108 years	76	39	0.48988	0.51012	85.7	57	104	1.37	65.33	0.972289	0.001055	0.001026	0.000542	0.000542	0.513856						

Note: Estimates with a coefficient of variation (cv) greater than 33.3% are to be used with caution

F too unreliable to be published (indicates a cv of at least 100.0%)."

NP= not possible to calculate becasue of the missing data from the actual life table.

Appendix B: Mortality Rates and Death Counts

	Mortality rate/1000 population											
	Female				**Ottawa**		**Toronto**		**Hamilton**		**Essex**	
Age x	M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_cou**	**pop'n size**	**Death_cou**	**pop'n size**	**Death_cou**	**pop'n size**	**Death_counts**
0-4	1.030528	336	0.001031	326046.5	21,860	**22.52734**	65,880	**67.89117**	13,160	13.56175	11,275	11.6192
5--9	0.1	31	0.0001	310000	22,775	**2.2775**	64,940	**6.494**	14,270	1.427	11,980	1.198
10--14	0.1	39	0.0001	390000	25,490	**2.549**	68,295	**6.8295**	16,310	1.631	13,145	1.3145
15--19	0.2	90	0.0002	450000	26,945	**5.389**	71,230	**14.246**	17,090	3.418	13,120	2.624
20-24	0.3	111	0.0003	370000	29,350	**8.805**	87,985	**26.3955**	17,045	5.1135	13,215	3.9645
25-29	0.3	126	0.0003	420000	27,460	**8.238**	99,900	**29.97**	15,535	4.6605	12,365	3.7095
30-34	0.4	161	0.0004	402500	28,835	**11.534**	101,640	**40.656**	15,685	6.274	13,685	5.474
35-39	0.6	285	0.0006	475000	30,610	**18.366**	103,580	**62.148**	17,740	10.644	14,380	8.628
40-44	0.9	502	0.0009	557777.8	35,530	**31.977**	106,855	**96.1695**	20,890	18.801	16,090	14.481
45-49	1.5	795	0.0015	530000	34,885	**52.3275**	99,460	**149.19**	20,530	30.795	15,080	22.62
50-54	2.7	1229	0.0027	455185.2	30,600	**82.62**	88,270	**238.329**	18,550	50.085	13,640	36.828
55-59	3.8	1510	0.0038	397368.4	26,930	**102.334**	77,905	**296.039**	16,385	62.263	12,305	46.759
60-64	6.5	1940	0.0065	298461.5	19,460	**126.49**	58,075	**377.4875**	12,490	81.185	9,295	60.4175
65-69	9.9	2396	0.0099	242020.2	14,910	**147.609**	51,320	**508.068**	10,350	102.465	7,715	76.3785
70-74	16.4	3508	0.0164	213902.4	12,825	**210.33**	46,865	**768.586**	9,650	158.26	6,690	109.716
75-79	28.1	5302	0.0281	188683.3	11,450	**321.745**	42,690	**1199.589**	9,275	260.6275	6,140	172.534
80-84	48.6	7342	0.0486	151070	9,835	**477.981**	34,380	**1670.868**	7,760	377.136	5,185	251.991
85+	124.8232	16335	0.124823	130865	9,370	**1169.594**	28,635	**3574.314**	6,150	767.663	4,175	521.137
Total						**2802.693**		**9133.27**		**1956.01**		**1351.394**

	Male				Ottawa		Toronto		Hamilton		Essex		
Age x	**M/1000**	**#of Death**	**M**	**Pop'n**	**pop'n size**	**Death_cou**	**pop'n size**	**Death_cou**	**pop'n size**	**Death_cou**	**pop'n size**	**Death_counts**	
0-4	1.3238	443	0.001324	334642.7	22,515	**29.80536**	69,095	**91.46796**	13,780	18.24196	11,930	15.79293	
5--9	0.1	44	0.0001	440000	23,460	**2.346**	68,655	**6.8655**	15,140	1.514	12,830	1.283	
10--14	0.1	51	0.0001	510000	26,655	**2.6655**	72,755	**7.2755**	17,230	1.723	13,790	1.379	
15--19	0.5	215	0.0005	430000	27,645	**13.8225**	74,970	**37.485**	17,805	8.9025	13,970	6.985	
20-24	0.7	307	0.0007	438571.4	29,140	**20.398**	84,465	**59.1255**	17,340	12.138	13,160	9.212	
25-29	0.6	253	0.0006	421666.7	25,935	**15.561**	90,355	**54.213**	14,795	8.877	12,020	7.212	
30-34	0.7	309	0.0007	441428.6	26,755	**18.7285**	94,030	**65.821**	14,935	10.4545	13,185	9.2295	
35-39	0.9	451	0.0009	501111.1	29,140	**26.226**	99,445	**89.5005**	17,020	15.318	14,445	13.0005	
40-44	1.5	820	0.0015	546666.7	34,290	**51.435**	105,745	**158.6175**	20,335	30.5025	16,280	24.42	
45-49	2.5	1277	0.0025	510800	32,655	**81.6375**	94,525	**236.3125**	20,305	50.7625	15,430	38.575	
50-54	4.1	1,786	0.0041	435609.8	28,675	**117.5675**	80,170	**328.697**	17,575	72.0575	13,270	54.407	
55-59	6.2	2,378	0.0062	383548.4	25,620	**158.844**	70,215	**435.333**	15,475	95.945	11,940	74.028	
60-64	10.4	2,997	0.0104	288173.1	18,050	**187.72**	51,385	**534.404**	11,740	122.096	9,120	94.848	
65-69	15.8	3,529	0.0158	223354.4	13,190	**208.402**	42,520	**671.816**	9,390	148.362	6,900	109.02	
70-74	25.8	4,862	0.0258	188449.6	11,020	**284.316**	38,295	**988.011**	8,205	211.689	5,875	151.575	
75-79	42.9	6,488	0.0429	151235.4	8,420	**361.218**	32,210	**1381.809**	6,930	297.297	4,835	207.4215	
80-84	72.1	7,048	0.0721	97753.12	5,935	**427.9135**	22,070	**1591.247**	4,860	350.406	3,140	226.394	
85+	150.52	9,217	0.15052	61234.39	3,905	**587.7806**	14,465	**2177.272**	2,820	424.4664	1,815	273.1938	
Total						**2596.387**		**8915.273**		**1880.753**		**1317.976**	

	Mortality rate/1000 population							Mortality rate/1000 population					
	Female				**Division No. 6 (Calgary)**			**Male**				**Division No. 6 (Calga**	
Age x	M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_counts**		M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_cou**
0-4	1.253961	122	0.001254	97,292	34,650	**43.44976**		1.467327	156	0.001467	106315.8	36,115	**52.9925**
5--9	0.1	11	0.0001	110000	33,975	**3.3975**		0.2	19	0.0002	95000	35,625	**7.125**
10--14	0.1	14	0.0001	140000	36,535	**3.6535**		0.2	22	0.0002	110000	38,615	**7.723**
15--19	0.4	48	0.0004	120000	38,945	**15.578**		0.8	94	0.0008	117500	40,685	**32.548**
20-24	0.4	49	0.0004	122500	42,600	**17.04**		1	138	0.001	138000	44,015	**44.015**
25-29	0.3	44	0.0003	146666.7	44,470	**13.341**		1	143	0.001	143000	44,525	**44.525**
30-34	0.5	61	0.0005	122000	45,585	**22.7925**		0.9	121	0.0009	134444.4	45,655	**41.0895**
35-39	0.8	93	0.0008	116250	45,635	**36.508**		1.3	167	0.0013	128461.5	46,660	**60.658**
40-44	1.4	183	0.0014	130714.3	49,900	**69.86**		1.7	243	0.0017	142941.2	49,225	**83.6825**
45-49	1.7	228	0.0017	134117.6	50,255	**85.4335**		3.1	427	0.0031	137741.9	50,565	**156.7515**
50-54	2.8	322	0.0028	115000	42,080	**117.824**		4.4	523	0.0044	118863.6	43,345	**190.718**
55-59	4.1	380	0.0041	92682.93	32,695	**134.0495**		6.3	605	0.0063	96031.75	33,430	**210.609**
60-64	6.6	445	0.0066	67424.24	22,150	**146.19**		10	676	0.01	67600	21,915	**219.15**
65-69	10.5	549	0.0105	52285.71	16,865	**177.0825**		15.6	787	0.0156	50448.72	15,705	**244.998**
70-74	16.2	726	0.0162	44814.81	14,530	**235.386**		26.6	1,095	0.0266	41165.41	12,995	**345.667**
75-79	27.2	1,053	0.0272	38713.24	12,665	**344.488**		42.9	1,404	0.0429	32727.27	10,145	**435.2205**
80-84	47.6	1,415	0.0476	29726.89	9,400	**447.44**		74.3	1,508	0.0743	20296.1	6,145	**456.5735**
85+	123.7887	3540	0.12379	28597.12	8,575	**1061.499**		155.2757	2,128	0.155276	13704.66	4,060	**630.4192**
Total						**2975.013**							**3264.465**

	Mortality rate/1000 population								Mortality rate/1000 population						
	Female				De-Quebec		De-Montreal		Male				De-Quebec		De-Montr
Age x	M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_cou**	**pop'n size**	**Death_cou**	M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_cou**	**pop'n size**
0-4	0.995238	209	0.000995	210000	**10,745**	**10.69383**	**46,395**	**46.17407**	1.16627	259	0.001166	222075.5	**11,090**	**12.93394**	**48,145**
5--9	0.1	15	0.0001	150000	**11,285**	**1.1285**	**44,990**	**4.499**	0.1	23	0.0001	230000	**11,800**	**1.18**	**47,110**
10--14	0.1	24	0.0001	240000	**14,230**	**1.423**	**48,790**	**4.879**	0.2	42	0.0002	210000	**14,485**	**2.897**	**50,765**
15--19	0.3	64	0.0003	213333.3	**14,890**	**4.467**	**49,835**	**14.9505**	0.6	143	0.0006	238333.3	**14,775**	**8.865**	**51,375**
20-24	0.3	68	0.0003	226666.7	**19,080**	**5.724**	**69,300**	**20.79**	0.7	187	0.0007	267142.9	**18,615**	**13.0305**	**65,160**
25-29	0.3	85	0.0003	283333.3	**19,180**	**5.754**	**78,200**	**23.46**	0.8	207	0.0008	258750	**19,815**	**15.852**	**75,050**
30-34	0.3	80	0.0003	266666.7	**15,155**	**4.5465**	**68,205**	**20.4615**	0.9	231	0.0009	256666.7	**16,005**	**14.4045**	**68,890**
35-39	0.6	164	0.0006	273333.3	**15,650**	**9.39**	**66,650**	**39.99**	1.2	308	0.0012	256666.7	**15,860**	**19.032**	**69,805**
40-44	1	316	0.001	316000	**20,580**	**20.58**	**70,220**	**70.22**	1.6	521	0.0016	325625	**19,945**	**31.912**	**73,880**
45-49	1.8	593	0.0018	329444.4	**22,830**	**41.094**	**71,170**	**128.106**	2.5	827	0.0025	330800	**21,575**	**53.9375**	**69,870**
50-54	2.7	801	0.0027	296666.7	**22,595**	**61.0065**	**66,865**	**180.5355**	4	1,158	0.004	289500	**20,355**	**81.42**	**61,935**
55-59	4.2	1106	0.0042	263333.3	**20,570**	**86.394**	**60,055**	**252.231**	6.3	1,606	0.0063	254920.6	**18,795**	**118.4085**	**54,690**
60-64	6.2	1345	0.0062	216935.5	**17,335**	**107.477**	**48,520**	**300.824**	10.3	2,107	0.0103	204563.1	**15,285**	**157.4355**	**42,010**
65-69	10.2	1679	0.0102	164607.8	**12,715**	**129.693**	**40,780**	**415.956**	16.9	2,535	0.0169	150000	**10,675**	**180.4075**	**33,070**
70-74	16.5	2382	0.0165	144363.6	**11,480**	**189.42**	**38,950**	**642.675**	27.2	3,285	0.0272	120772.1	**8,690**	**236.368**	**29,865**
75-79	27.7	3535	0.0277	127617.3	**10,220**	**283.094**	**36,850**	**1020.745**	44.9	4,165	0.0449	92761.69	**6,480**	**290.952**	**24,325**
80-84	48.3	4684	0.0483	96977.23	**8,225**	**397.2675**	**29,635**	**1431.371**	76.9	4,358	0.0769	56671	**4,275**	**328.7475**	**16,315**
85+	116	10055	0.116	86681.03	**7,755**	**899.58**	**26,540**	**3078.64**	148.1561	5072	0.148156	34234.17	**2,335**	**345.9444**	**10,235**
Total						**2258.733**		**7696.507**						**1913.728**	

	Mortality rate/1000 population							Mortality rate/1000 population					
	Female				**Greater Vancouver Regional Di**			**Male**				**Greater Vancouver R**	
Age x	M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_counts**		M/1000	#of Death	M	Pop'n	**pop'n size**	**Death_cou**
0-4	1.0526	95	0.001053	90250	51,300	**53.99838**		1.04507	106	0.001045	101428.6	53,980	**56.41288**
5--9	0.1	15	0.0001	150000	54,360	**5.436**		0.1	9	0.0001	90000	57,915	**5.7915**
10--14	0.1	11	0.0001	110000	61,890	**6.189**		0.1	20	0.0001	200000	66,295	**6.6295**
15--19	0.3	46	0.0003	153333.3	66,850	**20.055**		0.6	91	0.0006	151666.7	70,340	**42.204**
20-24	0.3	45	0.0003	150000	74,090	**22.227**		0.9	142	0.0009	157777.8	74,420	**66.978**
25-29	0.3	46	0.0003	153333.3	73,535	**22.0605**		0.9	131	0.0009	145555.6	69,765	**62.7885**
30-34	0.4	59	0.0004	147500	76,345	**30.538**		0.9	124	0.0009	137777.8	70,065	**63.0585**
35-39	0.6	103	0.0006	171666.7	85,845	**51.507**		1.3	198	0.0013	152307.7	79,795	**103.7335**
40-44	1	186	0.001	186000	93,355	**93.355**		1.9	342	0.0019	180000	88,790	**168.701**
45-49	1.7	312	0.0017	183529.4	91,855	**156.1535**		2.6	463	0.0026	178076.9	86,395	**224.627**
50-54	2.4	398	0.0024	165833.3	81,745	**196.188**		4.2	675	0.0042	160714.3	78,380	**329.196**
55-59	3.7	545	0.0037	147297.3	70,995	**262.6815**		6.3	909	0.0063	144285.7	68,655	**432.5265**
60-64	5.7	614	0.0057	107719.3	49,780	**283.746**		9.7	1,027	0.0097	105876.3	48,365	**469.1405**
65-69	9.5	811	0.0095	85368.42	39,970	**379.715**		15.1	1,243	0.0151	82317.88	36,610	**552.811**
70-74	15.2	1110	0.0152	73026.32	33,720	**512.544**		22.7	1,603	0.0227	70616.74	30,845	**700.1815**
75-79	26.7	1737	0.0267	65056.18	29,880	**797.796**		40.7	2,303	0.0407	56584.77	24,305	**989.2135**
80-84	48.4	2568	0.0484	53057.85	24,590	**1190.156**		66.2	2,458	0.0662	37129.91	16,060	**1063.172**
85+	122.018	6315	0.122018	51754.65	24,020	**2930.872**		144.2346	3,828	0.11423	26540.1	11,465	**1309.647**
Total						7015.218							6646.812

Appendix C: Detailed Analyses for the eight Cities

Analyses for Toronto City

Table 1A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Toronto.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.64	0.79
5-9	0.04	0.05
10-14	0.03	0.04
15-19	0.06	0.07
20-24	0.11	0.13
25-29	0.14	0.18
30-34	0.23	0.28
35-39	0.37	0.46
40-44	0.76	0.94
45-49	1.30	1.61
50-54	2.13	2.63
55-59	2.91	3.59
60-64	3.73	4.61
65-69	4.90	6.05
70-74	7.34	9.07
75-79	10.79	13.33
80-84	13.60	16.80
85+	23.87	29.49
Total	72.95	90.12

Table 1B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Toronto.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	3.38	9.04
35-44	16.85	45.07
45-54	50.98	136.33
55-64	98.80	264.20
65-74	182.02	486.74
75-84	362.88	970.39
85+	355.15	949.72
Total	1070.06	2861.50

Table 1C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Toronto.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	110.94	22.73
35-44	235.66	49.08
45-54	205.49	283.47
55-64	146.05	199.26
65-74	101.49	287.17
75-84	74.48	465.40
85+	24.44	147.84
Total	898.55	1454.95

Table 1D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Toronto assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	50.98	19.94	9.79	46.48	19.45	9.76	38.14	18.23	9.72
5-9	2.84	1.16	0.58	2.59	1.13	0.57	2.15	1.05	0.57
10-14	2.24	0.96	0.49	2.03	0.93	0.48	1.66	0.86	0.48
15-19	3.58	1.62	0.84	3.21	1.56	0.83	2.57	1.42	0.81
20-24	6.32	3.00	1.58	5.64	2.87	1.57	4.46	2.58	1.52
25-29	7.92	3.94	2.14	7.01	3.75	2.12	5.46	3.31	2.04
30-34	11.50	6.05	3.39	10.07	5.69	3.32	7.66	4.91	3.13
35-39	17.12	9.51	5.52	14.80	8.84	5.37	10.95	7.43	4.95
40-44	30.90	18.22	10.96	26.27	16.67	10.57	18.73	13.47	9.51
45-49	46.79	29.22	18.21	39.05	26.24	17.36	26.72	20.29	15.20
50-54	66.65	44.04	28.92	54.48	38.70	27.25	35.58	28.42	22.20
55-59	77.89	54.54	37.25	62.02	46.61	34.44	38.23	32.06	26.43
60-64	84.05	62.19	44.82	65.01	51.46	40.16	37.65	32.95	28.77
65-69	90.80	70.82	53.72	67.95	56.44	46.16	36.74	33.35	30.23

70-74	108.84	89.27	71.87	78.33	68.02	58.06	39.16	36.66	34.28
75-79	124.18	106.64	90.50	85.34	77.08	69.05	38.80	37.27	36.03
80-84	117.64	105.18	93.56	76.53	71.43	66.73	31.11	30.46	30.21
85+	150.74	139.38	129.28	91.53	87.69	83.70	31.58	31.36	31.36
*	1000.98	765.68	603.40	738.34	584.56	477.50	407.38	336.07	287.44
***	27.44	20.99	16.54	20.24	16.02	13.09	11.16	9.21	7.88

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	62.98	24.63	12.09	57.42	24.03	12.06	47.12	22.52	62.98
5-9	3.51	1.43	0.71	3.20	1.39	0.71	2.66	1.30	3.51
10-14	2.77	1.18	0.60	2.51	1.15	0.60	2.05	1.06	2.77
15-19	4.42	2.00	1.04	3.96	1.92	1.03	3.17	1.75	4.42
20-24	7.81	3.70	1.96	6.97	3.54	1.94	5.52	3.18	7.81
25-29	9.78	4.87	2.64	8.66	4.63	2.62	6.74	4.09	9.78
30-34	14.21	7.48	4.19	12.44	7.03	4.10	9.46	6.07	14.21
35-39	21.15	11.75	6.82	18.29	10.93	6.64	13.53	9.17	21.15

40-44	38.17	22.51	13.54	32.45	20.60	13.05	23.14	16.64	38.17
45-49	57.80	36.10	22.50	48.25	32.42	21.45	33.01	25.06	57.80
50-54	82.34	54.41	35.72	67.31	47.82	33.66	43.96	35.11	82.34
55-59	96.22	67.38	46.01	76.62	57.58	42.55	47.23	39.61	96.22
60-64	103.84	76.83	55.37	80.32	63.58	49.61	46.52	40.70	103.84
65-69	112.17	87.49	66.36	83.94	69.72	57.03	45.39	41.20	112.17
70-74	134.46	110.28	88.79	96.77	84.04	71.73	48.38	45.29	134.46
75-79	153.42	131.75	111.81	105.43	95.23	85.31	47.94	46.04	153.42
80-84	145.34	129.94	115.58	94.55	88.24	82.43	38.44	37.63	145.34
85+	186.23	172.19	159.71	113.07	108.33	103.41	39.02	38.74	186.23
*	1236.60	945.92	745.44	912.14	722.17	589.90	503.28	415.18	1236.60
***	27.44	20.99	16.54	20.24	16.02	13.09	11.16	9.21	27.44

* total life years lost.
*** weighted average life years lost per death; weight is number of deaths in age group

Table 1E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Toronto.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	171.06	90.03	50.41	457.44	240.74	134.81
35-44	768.65	428.06	248.59	2055.48	1144.69	664.76
45-54	1833.79	1144.76	713.32	4903.82	3061.24	1907.51
55-64	2646.44	1852.90	1265.10	7076.95	4954.93	3383.07
65-74	3377.20	2633.81	1997.50	9031.12	7043.19	5341.61
75-84	4198.91	3602.70	3055.27	11228.49	9634.14	8170.23
85+	2242.49	2073.40	1923.21	5996.75	5544.57	5142.95
*	15238.53	11825.65	9253.40	40750.05	31623.50	24744.94
***	28.48	22.10	17.29	28.48	22.10	17.29

* total life years lost.
*** average life years lost per death

Table 1F: QALYs Gained per Avoided Incidence of CB and AMI in city of Toronto.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.90	3.81	1.81	3.20	1.90	1.16
35-44	7.07	3.60	1.79	2.86	1.79	1.14
45-54	5.45	3.11	1.66	2.21	1.54	1.06
55-64	3.90	2.50	1.46	1.55	1.18	0.89
65-74	2.49	1.77	1.16	1.04	0.88	0.72
75-84	1.32	1.13	0.95	0.62	0.57	0.51
85+	0.72	0.66	0.61	0.38	0.37	0.35

Analyses for Ottawa City

Table 2A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Ottawa.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.13	0.16
5-9	0.01	0.01
10-14	0.01	0.01
15-19	0.01	0.02
20-24	0.02	0.03
25-29	0.02	0.03
30-34	0.04	0.05
35-39	0.07	0.08
40-44	0.15	0.19
45-49	0.28	0.34
50-54	0.46	0.56
55-59	0.63	0.78
60-64	0.78	0.97
65-69	0.90	1.11
70-74	1.26	1.55
75-79	1.74	2.15
80-84	2.30	2.84
85+	4.44	5.49
Total	13.24	16.36

Table 2B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Ottawa.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	0.60	1.58
35-44	3.34	8.76
45-54	11.18	29.36
55-64	21.60	56.74
65-74	32.94	86.51
75-84	61.66	161.92
85+	67.81	178.08
Total	199.13	522.94

Table2 C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Ottawa.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	25.24	5.94
35-44	59.06	14.02
45-54	57.64	89.84
55-64	40.96	63.92
65-74	23.41	72.14
75-84	15.57	100.82
85+	5.49	33.77
Total	227.35	380.45

Table 2D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Ottawa assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	10.20	3.99	1.96	9.30	3.89	1.95	7.63	3.65	1.94
5-9	0.60	0.24	0.12	0.55	0.24	0.12	0.45	0.22	0.12
10-14	0.50	0.22	0.11	0.46	0.21	0.11	0.37	0.19	0.11
15-19	0.81	0.37	0.19	0.73	0.35	0.19	0.58	0.32	0.18
20-24	1.31	0.62	0.33	1.17	0.59	0.32	0.92	0.53	0.31
25-29	1.35	0.67	0.37	1.20	0.64	0.36	0.93	0.57	0.35
30-34	1.99	1.05	0.59	1.74	0.98	0.57	1.32	0.85	0.54
35-39	3.07	1.70	0.99	2.65	1.58	0.96	1.96	1.33	0.89
40-44	6.17	3.64	2.19	5.25	3.33	2.11	3.74	2.69	1.90
45-49	9.91	6.19	3.86	8.27	5.56	3.68	5.66	4.30	3.22
50-54	14.30	9.46	6.21	11.69	8.31	5.85	7.63	6.10	4.76
55-59	16.90	11.84	8.09	13.45	10.11	7.48	8.28	6.95	5.73
60-64	17.60	13.03	9.39	13.60	10.78	8.41	7.87	6.89	6.02
65-69	16.63	12.98	9.85	12.44	10.34	8.46	6.71	6.10	5.53

70-74	18.62	15.28	12.31	13.39	11.63	9.93	6.69	6.26	5.86
75-79	20.03	17.20	14.59	13.77	12.44	11.14	6.27	6.02	5.82
80-84	19.96	17.84	15.86	12.99	12.12	11.32	5.29	5.18	5.14
85+	28.30	26.15	24.24	17.22	16.49	15.73	5.98	5.93	5.93
*	188.24	142.45	111.23	139.86	109.59	88.70	78.31	64.08	54.36
***	28.46	21.53	16.81	21.15	16.57	13.41	11.84	9.69	8.22

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	12.59	4.92	2.42	11.48	4.80	2.41	9.42	4.50	2.40
5-9	0.74	0.30	0.15	0.67	0.29	0.15	0.56	0.27	0.15
10-14	0.62	0.27	0.14	0.56	0.26	0.13	0.46	0.24	0.13
15-19	1.00	0.45	0.24	0.90	0.44	0.23	0.72	0.40	0.23
20-24	1.61	0.77	0.40	1.44	0.73	0.40	1.14	0.66	0.39
25-29	1.67	0.83	0.45	1.48	0.79	0.45	1.15	0.70	0.43
30-34	2.46	1.29	0.72	2.15	1.22	0.71	1.64	1.05	0.67
35-39	3.79	2.11	1.22	3.28	1.96	1.19	2.43	1.64	1.10

40-44	7.62	4.49	2.70	6.48	4.11	2.61	4.62	3.32	2.34
45-49	12.24	7.64	4.76	10.22	6.87	4.54	6.99	5.31	3.98
50-54	17.67	11.68	7.67	14.44	10.26	7.23	9.43	7.53	5.89
55-59	20.87	14.62	9.99	16.61	12.49	9.24	10.23	8.58	7.08
60-64	21.74	16.09	11.60	16.80	13.31	10.39	9.72	8.51	7.44
65-69	20.54	16.03	12.17	15.36	12.77	10.45	8.29	7.53	6.83
70-74	22.99	18.87	15.20	16.54	14.37	12.27	8.26	7.73	7.23
75-79	24.74	21.24	18.02	17.01	15.36	13.75	7.74	7.43	7.18
80-84	24.65	22.03	19.59	16.05	14.97	13.98	6.54	6.40	6.34
85+	34.96	32.30	29.94	21.27	20.37	19.43	7.38	7.33	7.33
*	232.51	175.94	137.39	172.75	135.37	109.56	96.72	79.14	67.14
***	28.46	21.53	16.81	21.15	16.57	13.41	11.84	9.69	8.22

* total life years lost.
*** average life years lost per death

Table 2E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Ottawa.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	30.37	15.98	8.95	79.75	41.98	23.51
35-44	152.19	84.74	49.21	399.68	222.55	129.23
45-54	401.94	250.95	156.39	1055.55	659.05	410.71
55-64	577.70	404.72	276.49	1517.14	1062.87	726.12
65-74	609.71	475.79	361.04	1601.19	1249.51	948.14
75-84	715.19	613.40	520.03	1878.22	1610.89	1365.68
85+	432.08	399.19	370.07	1134.71	1048.35	971.87
*	2919.18	2244.78	1742.18	7666.25	5895.19	4575.25
***	29.36	22.57	17.51	29.36	22.57	17.51

* total life years lost.
*** average life years lost per death

Table 2F: QALYs Gained per Avoided Incidence of CB and AMI in city of Ottawa.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.81	3.79	7.68	3.17	0.26	1.16
35-44	6.98	3.58	7.50	2.83	0.24	1.14
45-54	5.36	3.08	1.06	2.18	0.26	1.05
55-64	3.82	2.46	0.93	1.52	0.20	0.88
65-74	2.42	1.73	0.37	1.01	0.24	0.71
75-84	1.28	1.09	0.14	0.61	0.23	0.50
85+	0.70	0.65	0.10	0.38	0.18	0.35

Analyses for Windsor City

Table 3A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Windsor.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.16	0.15
5-9	0.01	0.01
10-14	0.01	0.01
15-19	0.02	0.01
20-24	0.02	0.02
25-29	0.03	0.02
30-34	0.04	0.04
35-39	0.07	0.07
40-44	0.16	0.15
45-49	0.29	0.27
50-54	0.48	0.45
55-59	0.69	0.64
60-64	0.91	0.84
65-69	1.09	1.02
70-74	1.55	1.44
75-79	2.22	2.10
80-84	2.70	2.64
85+	4.21	4.36
Total	14.66	14.25

Table 3B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Windsor.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	0.41	1.09
35-44	2.22	5.90
45-54	7.20	19.14
55-64	14.66	38.99
65-74	24.46	65.05
75-84	47.10	125.26
85+	43.34	115.26
Total	139.40	370.69

Table 3C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Windsor.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	27.58	2.76
35-44	63.56	6.38
45-54	59.50	40.00
55-64	43.92	29.52
65-74	27.29	38.59
75-84	18.20	59.74
85+	4.94	17.70
Total	245.00	194.69

Table 3D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Windsor assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	9.39	3.67	1.80	8.56	3.58	1.80	7.02	3.36	1.79
5-9	0.56	0.23	0.11	0.51	0.22	0.11	0.43	0.21	0.11
10-14	0.46	0.20	0.10	0.42	0.19	0.10	0.34	0.18	0.10
15-19	0.71	0.32	0.17	0.64	0.31	0.17	0.51	0.28	0.16
20-24	1.04	0.49	0.26	0.92	0.47	0.26	0.73	0.42	0.25
25-29	1.09	0.54	0.29	0.96	0.51	0.29	0.75	0.45	0.28
30-34	1.69	0.89	0.50	1.48	0.84	0.49	1.13	0.72	0.46
35-39	2.60	1.45	0.84	2.25	1.34	0.82	1.66	1.13	0.75
40-44	5.04	2.97	1.79	4.29	2.72	1.72	3.05	2.20	1.55
45-49	7.91	4.94	3.08	6.60	4.44	2.94	4.51	3.43	2.57
50-54	11.44	7.57	4.97	9.35	6.65	4.68	6.10	4.87	3.81
55-59	13.73	9.62	6.58	10.92	8.22	6.08	6.72	5.64	4.66
60-64	15.25	11.30	8.15	11.78	9.34	7.30	6.81	5.96	5.21
65-69	15.22	11.88	9.02	11.38	9.46	7.74	6.14	5.58	5.06

70-74	17.27	14.18	11.42	12.42	10.79	9.22	6.20	5.80	5.43
75-79	19.52	16.77	14.24	13.41	12.11	10.86	6.09	5.85	5.66
80-84	18.53	16.56	14.72	12.06	11.25	10.51	4.91	4.81	4.77
85+	22.45	20.74	19.23	13.65	13.07	12.47	4.73	4.70	4.70
*	163.89	124.32	97.27	121.60	95.52	77.55	67.84	55.60	47.32
***	28.44	21.57	16.87	21.10	16.57	13.46	11.77	9.65	8.21

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	11.60	4.54	2.23	10.57	4.42	2.22	8.68	4.15	2.21
5-9	0.70	0.28	0.14	0.64	0.28	0.14	0.53	0.26	0.14
10-14	0.57	0.24	0.12	0.51	0.23	0.12	0.42	0.22	0.12
15-19	0.88	0.40	0.21	0.79	0.38	0.20	0.63	0.35	0.20
20-24	1.28	0.61	0.32	1.14	0.58	0.32	0.90	0.52	0.31
25-29	1.34	0.67	0.36	1.19	0.64	0.36	0.92	0.56	0.35
30-34	2.09	1.10	0.62	1.83	1.03	0.60	1.39	0.89	0.57
35-39	3.21	1.79	1.04	2.78	1.66	1.01	2.05	1.39	0.93

40-44	6.23	3.67	2.21	5.29	3.36	2.13	3.77	2.71	1.92
45-49	9.77	6.11	3.81	8.15	5.49	3.63	5.57	4.24	3.18
50-54	14.13	9.35	6.14	11.55	8.21	5.79	7.53	6.02	4.71
55-59	16.96	11.89	8.12	13.50	10.15	7.51	8.31	6.97	5.75
60-64	18.84	13.96	10.07	14.56	11.54	9.02	8.41	7.37	6.44
65-69	18.80	14.68	11.14	14.06	11.69	9.57	7.59	6.89	6.25
70-74	21.34	17.51	14.11	15.34	13.33	11.39	7.66	7.17	6.71
75-79	24.12	20.72	17.59	16.57	14.97	13.42	7.52	7.23	6.99
80-84	22.89	20.46	18.19	14.90	13.90	12.98	6.07	5.94	5.89
85+	27.73	25.62	23.76	16.87	16.15	15.41	5.85	5.80	5.80
*	202.48	153.59	120.17	150.23	118.01	95.81	83.81	68.69	58.47
***	28.44	21.57	16.87	21.10	16.57	13.46	11.77	9.65	8.21

* total life years lost.

*** average life years lost per death

Table 3E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Windsor.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	20.77	10.94	6.13	55.23	29.08	16.29
35-44	101.16	56.36	32.74	269.00	149.87	87.05
45-54	258.41	161.45	100.67	687.17	429.34	267.70
55-64	391.51	274.41	187.55	1041.11	729.72	498.75
65-74	452.43	353.12	268.00	1203.11	939.03	712.66
75-84	545.40	467.90	396.77	1450.34	1244.26	1055.10
85+	275.64	254.71	236.15	733.00	677.32	627.98
*	2045.31	1578.89	1228.00	5438.95	4198.63	3265.54
***	29.36	22.66	17.62	29.36	22.66	17.62

* total life years lost.
*** average life years lost per death

Table 3F: QALYs Gained per Avoided Incidence of CB and AMI in city of Windsor.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.70	3.76	1.80	3.19	1.89	1.16
35-44	6.87	3.55	1.77	2.86	1.79	1.14
45-54	5.26	3.05	1.64	2.20	1.54	1.06
55-64	3.72	2.41	1.44	1.54	1.18	0.89
65-74	2.33	1.68	1.11	1.04	0.87	0.71
75-84	1.21	1.04	0.89	0.62	0.57	0.51
85+	0.67	0.62	0.57	0.38	0.37	0.35

Analyses for Hamilton City

Table 4A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Hamilton.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.12	0.15
5-9	0.01	0.01
10-14	0.01	0.01
15-19	0.01	0.02
20-24	0.02	0.02
25-29	0.02	0.03
30-34	0.03	0.04
35-39	0.06	0.07
40-44	0.14	0.17
45-49	0.26	0.32
50-54	0.43	0.53
55-59	0.59	0.73
60-64	0.78	0.96
65-69	0.98	1.20
70-74	1.45	1.79
75-79	2.19	2.70
80-84	2.84	3.51
85+	4.64	5.73
Total	14.57	18.00

Table 4B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Hamilton.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	0.58	1.55
35-44	3.42	9.17
45-54	11.85	31.83
55-64	23.64	63.48
65-74	41.85	112.39
75-84	86.83	233.19
85+	80.07	215.03
Total	248.24	666.63

Table 4C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Hamilton.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	18.95	3.94
35-44	47.03	9.82
45-54	47.63	66.79
55-64	34.71	48.31
65-74	23.27	66.95
75-84	17.84	111.87
85+	5.55	33.46
Total	194.98	341.15

Table 4D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Hamilton assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	9.54	3.73	1.83	8.69	3.64	1.83	7.14	3.41	1.82
5-9	0.59	0.24	0.12	0.53	0.23	0.12	0.44	0.22	0.12
10-14	0.50	0.21	0.11	0.45	0.21	0.11	0.37	0.19	0.11
15-19	0.80	0.36	0.19	0.72	0.35	0.19	0.57	0.32	0.18
20-24	1.18	0.56	0.30	1.06	0.54	0.29	0.84	0.48	0.28
25-29	1.18	0.59	0.32	1.05	0.56	0.32	0.81	0.49	0.30
30-34	1.69	0.89	0.50	1.48	0.84	0.49	1.12	0.72	0.46
35-39	2.75	1.53	0.89	2.38	1.42	0.86	1.76	1.19	0.79
40-44	5.61	3.31	1.99	4.77	3.03	1.92	3.40	2.45	1.73
45-49	9.25	5.78	3.60	7.72	5.19	3.44	5.28	4.01	3.01
50-54	13.43	8.88	5.83	10.97	7.80	5.49	7.16	5.72	4.47
55-59	15.76	11.04	7.55	12.55	9.43	6.98	7.73	6.48	5.35
60-64	17.52	12.97	9.35	13.54	10.73	8.38	7.83	6.86	5.99
65-69	18.02	14.07	10.68	13.47	11.20	9.17	7.27	6.60	5.99

70-74	21.45	17.60	14.17	15.43	13.40	11.44	7.70	7.21	6.75
75-79	25.17	21.61	18.34	17.30	15.63	14.00	7.87	7.56	7.31
80-84	24.63	22.02	19.58	16.03	14.96	13.97	6.52	6.38	6.33
85+	29.42	27.20	25.22	17.89	17.13	16.35	6.19	6.15	6.15
*	198.49	152.58	120.56	146.02	116.27	95.32	80.01	66.45	57.13
***	27.26	20.95	16.55	20.05	15.96	13.09	10.98	9.12	7.84

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	11.78	4.61	2.26	10.74	4.49	2.26	8.82	4.21	2.25
5-9	0.72	0.29	0.15	0.66	0.29	0.15	0.55	0.27	0.14
10-14	0.62	0.26	0.13	0.56	0.26	0.13	0.46	0.24	0.13
15-19	0.99	0.45	0.23	0.89	0.43	0.23	0.71	0.39	0.22
20-24	1.46	0.69	0.37	1.30	0.66	0.36	1.03	0.60	0.35
25-29	1.46	0.73	0.40	1.29	0.69	0.39	1.01	0.61	0.38
30-34	2.08	1.10	0.61	1.82	1.03	0.60	1.39	0.89	0.57
35-39	3.39	1.89	1.09	2.93	1.75	1.06	2.17	1.47	0.98

40-44	6.93	4.09	2.46	5.89	3.74	2.37	4.20	3.02	2.13
45-49	11.43	7.14	4.45	9.54	6.41	4.25	6.52	4.96	3.72
50-54	16.59	10.97	7.20	13.56	9.64	6.79	8.85	7.07	5.53
55-59	19.47	13.64	9.32	15.50	11.65	8.62	9.54	8.01	6.61
60-64	21.64	16.02	11.55	16.73	13.25	10.35	9.68	8.47	7.40
65-69	22.26	17.38	13.19	16.64	13.83	11.33	8.98	8.16	7.40
70-74	26.49	21.74	17.51	19.06	16.56	14.14	9.52	8.91	8.34
75-79	31.10	26.70	22.66	21.37	19.30	17.29	9.72	9.34	9.03
80-84	30.42	27.20	24.19	19.80	18.48	17.26	8.06	7.89	7.82
85+	36.35	33.60	31.15	22.10	21.16	20.19	7.65	7.59	7.59
*	245.20	188.50	148.94	180.39	143.64	117.76	98.85	82.09	70.58
***	27.26	20.95	16.55	20.05	15.96	13.09	10.98	9.12	7.84

* total life years lost.

*** average life years lost per death

Table 4E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Hamilton.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	29.13	15.34	8.59	78.23	41.19	23.07
35-44	155.76	86.74	50.37	418.29	232.93	135.27
45-54	425.83	265.96	165.78	1143.53	714.22	445.20
55-64	632.01	442.79	302.51	1697.22	1189.09	812.38
65-74	774.50	604.41	458.65	2079.87	1623.11	1231.67
75-84	1005.78	862.83	731.63	2700.95	2317.06	1964.73
85+	507.97	469.48	435.35	1364.11	1260.76	1169.10
*	3530.98	2747.55	2152.88	9482.20	7378.35	5781.42
***	28.45	22.14	17.35	28.45	22.14	17.35

* total life years lost.

*** average life years lost per death

Table 4F: QALYs Gained per Avoided Incidence of CB and AMI in city of Hamilton.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.90	3.81	1.81	3.19	1.89	1.16
35-44	7.07	3.60	1.79	2.86	1.79	1.14
45-54	5.44	3.11	1.66	2.21	1.54	1.06
55-64	3.89	2.49	1.46	1.54	1.18	0.89
65-74	2.48	1.77	1.16	1.04	0.87	0.71
75-84	1.32	1.13	0.95	0.62	0.57	0.51
85+	0.72	0.67	0.62	0.38	0.37	0.35

Analyses for Calgary City

Table 5A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Calgary.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.27	0.33
5-9	0.02	0.03
10-14	0.02	0.02
15-19	0.04	0.04
20-24	0.05	0.06
25-29	0.06	0.08
30-34	0.09	0.12
35-39	0.16	0.20
40-44	0.32	0.40
45-49	0.57	0.70
50-54	0.80	0.99
55-59	0.95	1.18
60-64	1.04	1.28
65-69	1.22	1.50
70-74	1.69	2.08
75-79	2.26	2.80
80-84	2.62	3.24
85+	4.88	6.03
Total	17.06	21.08

Table 5B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Calgary.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	1.58	4.18
35-44	8.23	21.78
45-54	23.03	60.96
55-64	33.56	88.82
65-74	48.94	129.55
75-84	82.32	217.90
85+	82.26	217.72
Total	279.92	740.91

Table 5C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Calgary.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	60.69	12.62
35-44	124.21	26.13
45-54	119.46	163.87
55-64	90.88	122.28
65-74	63.16	175.16
75-84	47.43	288.54
85+	16.28	94.88
Total	522.11	883.47

Table 5D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Calgary assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	21.47	8.39	4.12	19.58	8.18	4.10	16.08	7.67	4.09
5-9	1.52	0.62	0.31	1.39	0.61	0.31	1.15	0.57	0.31
10-14	1.24	0.53	0.27	1.12	0.52	0.27	0.91	0.48	0.27
15-19	2.36	1.06	0.55	2.12	1.02	0.55	1.70	0.93	0.53
20-24	3.06	1.45	0.77	2.73	1.39	0.76	2.16	1.25	0.74
25-29	3.42	1.72	0.93	3.02	1.63	0.93	2.34	1.43	0.89
30-34	4.73	2.49	1.40	4.14	2.34	1.37	3.15	2.02	1.29
35-39	7.50	4.18	2.42	6.48	3.88	2.36	4.79	3.25	2.17
40-44	13.29	7.80	4.68	11.32	7.15	4.51	8.10	5.80	4.07
45-49	20.22	12.65	7.90	16.87	11.36	7.52	11.52	8.76	6.58
50-54	25.00	16.55	10.89	20.41	14.53	10.25	13.30	10.64	8.33
55-59	25.43	17.82	12.18	20.24	15.22	11.26	12.46	10.46	8.63
60-64	23.34	17.28	12.46	18.04	14.29	11.16	10.44	9.14	7.98

65-69	22.52	17.58	13.34	16.85	14.00	11.46	9.10	8.26	7.49
70-74	24.86	20.41	16.46	17.86	15.53	13.28	8.90	8.34	7.80
75-79	25.94	22.29	18.93	17.80	16.09	14.43	8.07	7.75	7.50
80-84	22.57	20.19	17.97	14.67	13.69	12.80	5.95	5.83	5.78
85+	30.85	28.52	26.45	18.74	17.95	17.13	6.47	6.42	6.42
*	279.33	201.56	152.03	213.37	159.39	124.45	126.57	99.01	80.88
***	32.73	23.62	17.82	25.01	18.68	14.58	14.84	11.60	9.48

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	26.52	10.36	5.08	24.18	10.11	5.07	19.86	9.48	5.05
5-9	1.88	0.77	0.39	1.71	0.75	0.38	1.42	0.70	0.38
10-14	1.53	0.66	0.34	1.38	0.64	0.33	1.12	0.59	0.33
15-19	2.91	1.31	0.68	2.61	1.27	0.67	2.10	1.15	0.66
20-24	3.79	1.80	0.95	3.38	1.72	0.94	2.67	1.54	0.91
25-29	4.23	2.12	1.15	3.73	2.01	1.14	2.89	1.77	1.10
30-34	5.84	3.08	1.73	5.11	2.90	1.69	3.89	2.50	1.59

35-39	9.27	5.16	2.99	8.01	4.79	2.91	5.92	4.02	2.68
40-44	16.41	9.64	5.78	13.98	8.83	5.57	10.00	7.16	5.03
45-49	24.98	15.63	9.75	20.83	14.03	9.29	14.23	10.82	8.13
50-54	30.88	20.45	13.45	25.22	17.95	12.66	16.43	13.15	10.28
55-59	31.41	22.02	15.05	25.00	18.80	13.91	15.39	12.92	10.66
60-64	28.83	21.35	15.39	22.29	17.65	13.79	12.89	11.29	9.86
65-69	27.82	21.71	16.47	20.81	17.29	14.15	11.24	10.21	9.25
70-74	30.70	25.22	20.33	22.06	19.18	16.40	10.99	10.30	9.64
75-79	32.04	27.53	23.38	21.99	19.87	17.83	9.97	9.58	9.27
80-84	27.88	24.94	22.19	18.12	16.92	15.81	7.35	7.20	7.14
85+	38.11	35.23	32.68	23.14	22.17	21.16	7.99	7.94	7.94
*	345.04	248.97	187.78	263.55	196.88	153.72	156.34	122.30	99.90
***	32.73	23.62	17.82	25.01	18.68	14.58	14.84	11.60	9.48

* total life years lost.

*** average life years lost per death

Table 5E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Calgary.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	79.97	42.07	23.46	211.67	111.37	62.10
35-44	378.33	209.76	121.01	1001.41	555.21	320.29
45-54	831.09	518.04	324.05	2199.81	1371.20	857.74
55-64	907.89	633.38	434.32	2403.10	1676.50	1149.60
65-74	922.39	716.37	546.28	2441.47	1896.16	1445.94
75-84	977.48	834.92	701.58	2587.30	2209.94	1857.00
85+	545.89	502.22	458.53	1444.93	1329.32	1213.68
*	4643.05	3456.76	2609.22	12289.68	9149.69	6906.35
***	33.18	24.70	18.64	33.18	24.70	18.64

* total life years lost.

*** average life years lost per death

Table 5F: QALYs Gained per Avoided Incidence of CB and AMI in city of Calgary.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.91	3.81	1.80	3.19	1.89	1.16
35-44	7.09	3.61	1.78	2.86	1.79	1.14
45-54	5.49	3.13	1.68	2.22	1.54	1.06
55-64	3.96	2.52	1.49	1.56	1.19	0.90
65-74	2.57	1.81	1.20	1.06	0.89	0.73
75-84	1.38	1.17	0.97	0.64	0.59	0.53
85+	0.77	0.71	0.64	0.38	0.37	0.36

Analyses for Montreal City

Table 6A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Montreal.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.24	0.29
5-9	0.02	0.02
10-14	0.02	0.02
15-19	0.03	0.04
20-24	0.05	0.06
25-29	0.08	0.10
30-34	0.10	0.12
35-39	0.17	0.21
40-44	0.32	0.40
45-49	0.59	0.73
50-54	0.93	1.15
55-59	1.37	1.69
60-64	1.73	2.14
65-69	2.34	2.89
70-74	3.51	4.34
75-79	5.10	6.30
80-84	6.47	7.99
85+	11.02	13.61
Total	34.08	42.09

Table 6B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Montreal.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	2.33	6.20
35-44	11.99	31.98
45-54	36.90	98.40
55-64	75.33	200.88
65-74	141.84	378.23
75-84	280.66	748.44
85+	267.21	712.55
Total	816.26	2176.69

Table 6C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Montreal.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	73.04	15.32
35-44	149.46	31.73
45-54	143.76	199.02
55-64	109.36	148.51
65-74	76.00	212.73
75-84	57.07	350.44
85+	19.59	115.24
Total	628.28	1073.01

Table 6D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Montreal assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	29.51	11.53	5.66	26.91	11.25	5.64	22.10	10.55	5.62
5-9	1.76	0.72	0.36	1.61	0.70	0.36	1.34	0.65	0.35
10-14	2.12	0.91	0.46	1.91	0.88	0.46	1.56	0.82	0.45
15-19	2.91	1.31	0.68	2.61	1.26	0.67	2.09	1.15	0.66
20-24	4.43	2.10	1.11	3.96	2.01	1.10	3.13	1.81	1.07
25-29	6.67	3.33	1.81	5.89	3.16	1.79	4.58	2.79	1.73
30-34	7.46	3.96	2.22	6.51	3.71	2.17	4.93	3.19	2.05
35-39	12.07	6.74	3.92	10.41	6.25	3.81	7.68	5.23	3.50
40-44	20.54	12.12	7.29	17.46	11.08	7.03	12.44	8.95	6.32
45-49	33.42	20.83	12.97	27.93	18.73	12.37	19.15	14.51	10.85
50-54	45.33	29.95	19.66	37.05	26.32	18.53	24.20	19.33	15.10
55-59	57.39	40.15	27.40	45.73	34.33	25.35	28.22	23.65	19.47
60-64	60.82	45.01	32.44	47.04	37.24	29.06	27.23	23.83	20.81
65-69	67.48	52.64	39.93	50.49	41.95	34.31	27.29	24.77	22.46

70-74	81.22	66.61	53.62	58.47	50.77	43.32	29.25	27.38	25.59
75-79	91.86	78.84	66.87	63.19	57.05	51.05	28.80	27.65	26.71
80-84	87.59	78.27	69.57	57.05	53.22	49.67	23.25	22.76	22.56
85+	109.51	101.16	93.78	66.65	63.82	60.87	23.15	22.97	22.97
*	722.08	556.18	439.75	530.88	423.74	347.57	290.40	241.99	208.29
***	27.22	20.96	16.56	20.01	15.97	13.10	10.94	9.12	7.85

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	23.39	9.14	4.48	21.33	8.91	4.47	17.52	8.36	4.45
5-9	1.40	0.57	0.28	1.27	0.55	0.28	1.06	0.52	0.28
10-14	1.68	0.72	0.37	1.52	0.70	0.36	1.24	0.65	0.36
15-19	2.30	1.04	0.54	2.07	1.00	0.53	1.66	0.91	0.52
20-24	3.51	1.67	0.88	3.14	1.59	0.87	2.48	1.43	0.84
25-29	5.28	2.64	1.44	4.67	2.51	1.42	3.63	2.21	1.37
30-34	5.91	3.13	1.76	5.16	2.94	1.72	3.91	2.53	1.62
35-39	9.56	5.34	3.10	8.25	4.96	3.02	6.08	4.15	2.77

40-44	16.28	9.60	5.78	13.84	8.78	5.57	9.86	7.09	5.01
45-49	26.49	16.51	10.28	22.13	14.84	9.81	15.17	11.50	8.60
50-54	35.92	23.73	15.58	29.37	20.86	14.68	19.18	15.32	11.97
55-59	45.48	31.82	21.71	36.24	27.21	20.09	22.37	18.75	15.43
60-64	48.20	35.67	25.71	37.28	29.51	23.03	21.58	18.89	16.49
65-69	53.48	41.72	31.65	40.01	33.24	27.19	21.63	19.63	17.80
70-74	64.37	52.79	42.49	46.33	40.23	34.33	23.18	21.70	20.28
75-79	72.80	62.48	53.00	50.08	45.21	40.45	22.82	21.91	21.17
80-84	69.41	62.03	55.13	45.21	42.17	39.37	18.43	18.04	17.88
85+	86.78	80.17	74.32	52.82	50.58	48.24	18.35	18.21	18.21
*	572.26	440.78	348.50	420.72	335.81	275.45	230.14	191.78	165.07
***	27.22	20.96	16.56	20.01	15.97	13.10	10.94	9.12	7.85

* total life years lost.
*** average life years lost per death

Table 6E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Montreal.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	114.71	61.22	34.57	305.89	163.24	92.20
35-44	539.12	302.42	176.69	1437.66	806.47	471.16
45-54	1313.44	823.36	515.98	3502.52	2195.62	1375.96
55-64	1989.28	1398.70	962.85	5304.76	3729.86	2567.60
65-74	2586.80	2024.26	1551.00	6898.13	5398.03	4136.01
75-84	3221.58	2766.31	2340.23	8590.89	7376.83	6240.62
85+	1722.15	1589.33	1474.39	4592.41	4238.20	3931.70
*	11487.09	8965.59	7055.71	30632.24	23908.25	18815.24
***	28.14	21.96	17.28	28.14	21.96	17.28

* total life years lost.
*** average life years lost per death

Table 6F: QALYs Gained per Avoided Incidence of CB and AMI in city of Montreal.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.81	3.78	1.81	3.19	1.89	1.16
35-44	6.97	3.58	1.78	2.85	1.79	1.14
45-54	5.38	3.09	1.66	2.21	1.54	1.05
55-64	3.85	2.47	1.46	1.55	1.18	0.89
65-74	2.46	1.75	1.16	1.04	0.88	0.72
75-84	1.32	1.13	0.95	0.63	0.57	0.51
85+	0.74	0.68	0.63	0.38	0.37	0.35

Analyses for Quebec City

Table 7A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Quebec.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.05	0.06
5-9	0.00	0.00
10-14	0.00	0.01
15-19	0.01	0.01
20-24	0.01	0.01
25-29	0.02	0.02
30-34	0.02	0.02
35-39	0.03	0.04
40-44	0.08	0.10
45-49	0.16	0.20
50-54	0.26	0.32
55-59	0.40	0.49
60-64	0.53	0.66
65-69	0.63	0.78
70-74	0.87	1.08
75-79	1.18	1.46
80-84	1.49	1.84
85+	2.54	3.14
Total	8.29	10.24

Table 7B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Quebec.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	0.55	1.47
35-44	3.25	8.68
45-54	12.38	33.07
55-64	27.43	73.24
65-74	44.28	118.23
75-84	78.39	209.33
85+	74.67	199.40
Total	240.94	643.41

Table 7C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Quebec.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	17.13	3.65
35-44	39.61	8.27
45-54	48.03	65.99
55-64	39.58	53.99
65-74	23.95	67.32
75-84	16.06	98.31
85+	5.55	32.02
Total	189.91	329.55

Table 7D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of Quebec assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	3.72	1.45	0.71	3.39	1.42	0.71	2.79	1.33	0.71
5-9	0.24	0.10	0.05	0.22	0.10	0.05	0.18	0.09	0.05
10-14	0.33	0.14	0.07	0.30	0.14	0.07	0.24	0.13	0.07
15-19	0.46	0.21	0.11	0.42	0.20	0.11	0.33	0.18	0.11
20-24	0.68	0.32	0.17	0.61	0.31	0.17	0.48	0.28	0.16
25-29	0.93	0.47	0.25	0.82	0.44	0.25	0.64	0.39	0.24
30-34	0.93	0.49	0.28	0.81	0.46	0.27	0.62	0.40	0.26
35-39	1.52	0.85	0.49	1.31	0.79	0.48	0.97	0.66	0.44
40-44	3.15	1.85	1.11	2.68	1.70	1.07	1.91	1.37	0.97
45-49	5.74	3.58	2.23	4.80	3.22	2.13	3.29	2.49	1.86
50-54	8.24	5.45	3.57	6.74	4.79	3.37	4.40	3.52	2.75
55-59	10.76	7.53	5.13	8.57	6.43	4.75	5.29	4.43	3.65
60-64	11.99	8.87	6.40	9.27	7.34	5.73	5.36	4.70	4.10
65-69	11.71	9.13	6.93	8.75	7.28	5.95	4.73	4.29	3.89

70-74	12.99	10.65	8.57	9.35	8.12	6.93	4.68	4.38	4.09
75-79	13.66	11.72	9.94	9.40	8.49	7.59	4.29	4.12	3.98
80-84	12.97	11.59	10.29	8.45	7.88	7.36	3.45	3.38	3.35
85+	16.39	15.12	14.01	10.00	9.57	9.12	3.50	3.47	3.47
*	116.41	89.53	70.33	85.90	68.66	56.10	47.16	39.60	34.14
***	28.17	21.65	16.99	20.79	16.61	13.57	11.41	9.58	8.26

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	4.60	1.80	0.88	4.19	1.75	0.88	3.44	1.64	0.88
5-9	0.30	0.12	0.06	0.27	0.12	0.06	0.23	0.11	0.06
10-14	0.41	0.18	0.09	0.37	0.17	0.09	0.30	0.16	0.09
15-19	0.57	0.26	0.13	0.51	0.25	0.13	0.41	0.23	0.13
20-24	0.84	0.40	0.21	0.75	0.38	0.21	0.59	0.34	0.20
25-29	1.15	0.58	0.31	1.02	0.55	0.31	0.79	0.48	0.30
30-34	1.15	0.61	0.34	1.00	0.57	0.34	0.76	0.49	0.32
35-39	1.88	1.05	0.61	1.62	0.97	0.59	1.19	0.81	0.54

40-44	3.89	2.29	1.38	3.30	2.10	1.33	2.36	1.69	1.19
45-49	7.09	4.42	2.75	5.93	3.97	2.62	4.07	3.08	2.30
50-54	10.18	6.73	4.41	8.33	5.91	4.16	5.44	4.34	3.39
55-59	13.28	9.29	6.34	10.58	7.95	5.87	6.53	5.47	4.51
60-64	14.81	10.96	7.90	11.45	9.07	7.08	6.62	5.80	5.07
65-69	14.46	11.28	8.56	10.81	8.99	7.35	5.84	5.30	4.81
70-74	16.04	13.15	10.59	11.55	10.03	8.56	5.78	5.41	5.06
75-79	16.87	14.47	12.27	11.61	10.48	9.37	5.30	5.09	4.91
80-84	16.02	14.31	12.71	10.44	9.74	9.08	4.26	4.17	4.14
85+	20.24	18.68	17.30	12.35	11.82	11.26	4.32	4.28	4.28
*	143.77	110.57	86.86	106.10	84.80	69.29	58.24	48.91	42.17
***	28.17	21.65	16.99	20.79	16.61	13.57	11.41	9.58	8.26

* total life years lost.
*** average life years lost per death

Table 7E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of Quebec.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	27.05	14.44	8.16	72.23	38.57	21.79
35-44	146.33	82.00	47.88	390.75	218.97	127.85
45-54	441.26	276.49	173.21	1178.34	738.34	462.53
55-64	723.92	509.10	350.52	1933.17	1359.49	936.04
65-74	807.15	631.69	484.06	2155.41	1686.87	1292.63
75-84	902.50	774.59	655.12	2410.05	2068.47	1749.44
85+	486.98	448.98	416.28	1300.43	1198.97	1111.64
*	3535.19	2737.29	2135.23	9440.39	7309.67	5701.92
***	29.39	22.76	17.74	29.39	22.76	17.74

* total life years lost.

*** average life years lost per death

Table 7F: QALYs Gained per Avoided Incidence of CB and AMI in city of Quebec.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	7.80	3.78	1.81	3.19	1.89	1.16
35-44	6.99	3.58	1.78	2.85	1.79	1.14
45-54	5.39	3.09	1.66	2.21	1.54	1.05
55-64	3.85	2.47	1.46	1.55	1.18	0.89
65-74	2.46	1.75	1.16	1.04	0.88	0.72
75-84	1.33	1.14	0.96	0.63	0.57	0.51
85+	0.75	0.69	0.64	0.38	0.37	0.35

Analyses for Greater Vancouver area

Table 8A: Estimated Reduction in incidence of O3-related all-cause premature mortality associated with elimination of anthropogenic ozone concentrations for the city of Greater Vancouver area.

Age Interval	Bell et al. (2004)	Levy et al. (2005)
0-4	0.18	0.22
5-9	0.01	0.02
10-14	0.01	0.01
15-19	0.03	0.03
20-24	0.04	0.05
25-29	0.05	0.07
30-34	0.08	0.10
35-39	0.15	0.18
40-44	0.31	0.38
45-49	0.51	0.63
50-54	0.78	0.96
55-59	1.10	1.36
60-64	1.23	1.51
65-69	1.54	1.90
70-74	2.02	2.49
75-79	2.97	3.67
80-84	3.74	4.62
85+	7.00	8.65
Total	21.75	26.86

Table 8B: Estimated Reduction in incidence of PM2.5-related all-cause premature mortality associated with elimination of anthropogenic PM2.5 concentrations for the city of Greater Vancouver area.

Age Interval	Pope et al. (2002)	Laden et al. (2006)
30-34	1.46	3.80
35-44	8.57	22.38
45-54	24.28	63.38
55-64	43.60	113.82
65-74	66.69	174.09
75-84	125.88	328.61
85+	131.37	342.95
Total	401.85	1049.04

Table 8C: Estimated Reduction in incidence of CB and AMI associated with elimination of anthropogenic PM2.5 concentrations for the city of Greater Vancouver area.

Age Interval	CB: Abbey et al. (1995)	AMI: Peters et al. (2001)
30-34	38.24	7.82
35-44	78.26	16.18
45-54	75.27	101.50
55-64	57.26	75.74
65-74	39.80	108.49
75-84	29.88	178.72
85+	10.26	58.77
Total	328.97	547.21

Table 8D: Estimated Discounted O3-Related total life years gained associated with elimination of anthropogenic ozone concentrations for the city of greater Vancouver area assuming life expectancies of the general population, COPD of average severity, and severe COPD.

Age Interval	Total Life Years Gained based on Bell et al 2004								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	14.11	5.50	2.70	12.87	5.37	2.69	10.58	5.04	2.68
5-9	0.95	0.39	0.19	0.87	0.38	0.19	0.72	0.35	0.19
10-14	0.81	0.35	0.18	0.73	0.34	0.17	0.60	0.31	0.17
15-19	1.74	0.79	0.41	1.57	0.76	0.40	1.26	0.69	0.40
20-24	2.50	1.19	0.63	2.23	1.14	0.62	1.76	1.02	0.60
25-29	2.94	1.47	0.80	2.60	1.40	0.79	2.02	1.23	0.76
30-34	3.91	2.06	1.16	3.42	1.94	1.13	2.59	1.67	1.07
35-39	6.72	3.75	2.18	5.80	3.48	2.12	4.28	2.91	1.95
40-44	12.55	7.41	4.46	10.67	6.78	4.30	7.60	5.47	3.87
45-49	18.51	11.55	7.19	15.46	10.38	6.86	10.59	8.03	6.01
50-54	24.34	16.12	10.61	19.87	14.15	9.98	12.94	10.36	8.10
55-59	29.32	20.56	14.06	23.32	17.55	12.99	14.35	12.05	9.95
60-64	27.43	20.33	14.67	21.18	16.80	13.14	12.23	10.72	9.37
65-69	28.43	22.20	16.85	21.25	17.67	14.47	11.47	10.41	9.45

70-74	29.81	24.47	19.71	21.44	18.63	15.91	10.70	10.02	9.38
75-79	34.08	29.28	24.86	23.39	21.14	18.96	10.61	10.20	9.86
80-84	32.45	29.00	25.78	21.13	19.71	18.40	8.61	8.42	8.35
85+	44.87	41.43	38.40	27.34	26.17	24.95	9.52	9.45	9.45
*	315.48	237.85	184.84	235.14	183.77	148.09	132.42	108.36	91.62
***	29.07	21.91	17.02	21.67	16.93	13.64	12.20	9.98	8.44

Age Interval	Total Life Years Gained based on Levy et al 2005								
	General Population			Average COPD			Severe COPD		
	ex	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**	**ex**	**3% Disc**	**7% Disc**
0-4	17.42	6.80	3.33	15.90	6.63	3.32	13.07	6.22	3.31
5-9	1.17	0.48	0.24	1.07	0.46	0.24	0.89	0.44	0.23
10-14	1.00	0.43	0.22	0.91	0.41	0.22	0.74	0.38	0.21
15-19	2.15	0.97	0.51	1.94	0.94	0.50	1.55	0.85	0.49
20-24	3.09	1.47	0.78	2.76	1.41	0.77	2.18	1.26	0.75
25-29	3.64	1.82	0.99	3.21	1.73	0.98	2.49	1.52	0.94
30-34	4.82	2.55	1.43	4.22	2.39	1.40	3.20	2.06	1.32
35-39	8.30	4.63	2.69	7.16	4.30	2.62	5.28	3.60	2.41

40-44	15.50	9.15	5.51	13.17	8.37	5.31	9.38	6.76	4.78
45-49	22.86	14.26	8.88	19.10	12.82	8.47	13.08	9.92	7.42
50-54	30.06	19.91	13.10	24.54	17.47	12.33	15.98	12.79	10.01
55-59	36.21	25.39	17.36	28.81	21.68	16.04	17.72	14.88	12.29
60-64	33.88	25.11	18.12	26.16	20.75	16.23	15.10	13.23	11.58
65-69	35.11	27.41	20.81	26.25	21.82	17.87	14.16	12.86	11.67
70-74	36.82	30.22	24.35	26.48	23.01	19.65	13.22	12.38	11.58
75-79	42.09	36.16	30.70	28.89	26.11	23.42	13.11	12.59	12.18
80-84	40.07	35.81	31.84	26.09	24.34	22.73	10.63	10.40	10.32
85+	55.41	51.17	47.42	33.76	32.32	30.81	11.76	11.67	11.67
*	389.62	293.75	228.28	290.40	226.96	182.90	163.54	133.82	113.15
***	29.07	21.91	17.02	21.67	16.93	13.64	12.20	9.98	8.44

* total life years lost.
*** average life years lost per death

Table 8E: Estimated Discounted PM2.5-Related total life years gained associated with elimination of anthropogenic PM2.5 concentrations for the city of greater Vancouver area.

Age Interval	Total Life Years Gained based on:					
	Pope et al 2002			Laden et al 2006		
	ex	3% Disc	7% Disc	ex	3% Disc	7% Disc
30-34	74.41	38.93	21.66	194.24	101.63	56.54
35-44	396.50	219.16	126.34	1035.07	572.13	329.80
45-54	893.67	552.29	341.03	2332.94	1441.75	890.25
55-64	1203.25	833.89	568.26	3141.09	2176.89	1483.44
65-74	1288.82	995.02	743.56	3364.48	2597.52	1941.06
75-84	1534.90	1305.91	1084.94	4006.87	3409.08	2832.24
85+	900.26	826.35	747.81	2350.13	2157.20	1952.17
*	6291.81	4771.56	3633.59	16424.83	12456.19	9485.52
***	31.39	23.80	18.11	31.39	23.80	18.11

* total life years lost.

*** average life years lost per death

Table 8F: QALYs Gained per Avoided Incidence of CB and AMI in city of Greater Vancouver area.

Age Interval	CB			AMI		
	QALYs	3% Discounting	7% Discounting	QALYs	3% Discounting	7% Discounting
30-34	8.02	3.83	1.81	1.67	1.91	1.16
35-44	7.19	3.64	1.78	1.59	1.80	1.14
45-54	5.60	3.16	1.67	1.37	1.56	1.06
55-64	4.06	2.57	1.51	0.61	1.22	0.90
65-74	2.64	1.86	1.19	0.50	0.91	0.73
75-84	1.40	1.19	0.98	0.43	0.60	0.54
85+	0.78	0.72	0.65	0.40	0.37	0.36