Adding years to life and life to years: Life and health expectancy in Ontario

Research Atlas

ICES — Institute for Clinical Evaluative Sciences

Adding Years to Life and Life to Years: Life and Health Expectancy in Ontario

Douglas G. Manuel [1,2]
Susan E. Schultz [1]

[1] Institute for Clinical Evaluative Sciences

[2] Assistant Professor, Department of Public Health Sciences,
University of Toronto

KEY TERMS & CONCEPTS

- life and health expectancy
- health-related quality of life
- compression of morbidity
- life span

KEY MESSAGES

✔ The health of Ontarians is among the best in Canada and the world. Most Ontarians not only live a long life but also remain in good health.

✔ The health of Ontarians continued to improve between 1990 and 1996/97, during a period of health care restructuring.

✔ Health status varies considerably between local areas. There was an increased disparity in health status between District Health Councils from 1990 to 1996/97.

✔ Increasing longevity continues to change health care needs. To improve health in the future, we should focus not only on reducing mortality but also on improving health-related quality of life for those who live with chronic conditions.

Background

The desire for the best possible health is common to all Ontarians. With the dramatic increase in life expectancy that occurred during the 20th century we can be more optimistic than ever that good health is both achievable and sustainable. However, the increased length of life has brought about another realization—longevity is an empty prize without improvements in the quality of life.[1] In other words, improving health is not only about reducing death from disease but also maintaining a high health-related quality of life (HRQOL) that acts as a resource for an active and fulfilling life.[2,3]

Is HRQOL improving in Ontario? We don't know the answer to this question. However, the recent rapid decline in death rates has raised concern that longer life expectancy may also mean a greater part of our lives will be spent living with chronic, highly disabling conditions. In the 1980s, Fries coined the phrase, "expansion and contraction of morbidity" to describe this changing pattern of disease.[4,5] He argued that an improvement in lifestyle would not only reduce death rates but would also slow the development of chronic diseases. This delayed onset, in turn, would lead to an increase in the proportion of life lived in a healthy state, or what he called "a compression of morbidity." Other authors have not been convinced by Fries' arguments, instead taking the view that increased medical care would lead to an "expansion of morbidity," due to an increase in survival without a change in the progression towards disability among the survivors.[6-8] If these authors are correct, this expansion of morbidity will also result in increases in health care utilization.[9-12] It is therefore important that this report, the first of its kind in Ontario, address the question of whether, in addition to "years to life," we are also adding "life to years."[13] We do this by estimating the change in *health-adjusted life expectancy* since those reported in the previous ICES Practice Atlas, *Patterns of Health Care in Ontario: An ICES Practice Atlas*.[14] We further build on traditional measures of disease and death by describing different concepts of health status and the impact of the changing pattern of disease on health care utilization.

Is health improving equally across Ontario? In 1987, the *Report of the Panel on Health Goals for Ontario* proposed that equitable health opportunities should be an important goal for the health care system.[15] This concept has also been endorsed by other provincial,[16] national[17] and international health organizations.[18] We report the progress in achieving equity by estimating health status for the 16 District Health Councils (DHCs).

Methods

Measuring Years of Life

Ontario's mortality experience is presented from three perspectives in this report. The first of these, life expectancy, captures the overall impact of death on a population. Second, the probability of dying before age 65 years is an indicator of our success at avoiding deaths at younger ages. Finally, we look at the impact of individual diseases. Because the rising average age at death makes it increasingly difficult to interpret simple "death rates from the leading causes of death" as a measure of impact, we expand on methods in previous Practice Atlases[14,19] by reporting the change in life expectancy that might be expected if selected causes were eliminated. This method is particularly attractive since it can be combined with measures of HRQOL to estimate the overall health impact of specific conditions. All mortality information comes from death certificates that are collected by the Office of the Registrar General and Statistics Canada (see Technical Supplement).

Measuring Health-related Quality of Life

Health-related quality of life comprises a broader concept of health than one based solely on traditional measures of disease and death. In this report we utilize a framework that is under development by the World Health Organization (WHO ICIDH-2—see Exhibit 1).[20] Previously, HRQOL was defined in terms of impairment, disability and handicap; a more current concept divides the HRQOL into layers of health that begin at the level of the body's physiological or psychological functioning and extend to an individual's participation in real life situations.

While one might expect to see a progression from one level to the next (eg. functional limitations leading to activity restrictions resulting in reduced societal participation), this is not always the case. Societal circumstances may hinder a person's participation, even when the individual has no impairment—such as someone living with HIV or a genetic predisposition. Conversely, with sufficient support, a person with severe impairments may have a high level of participation in society—think of physicist Stephen Hawking and actor Christopher Reeve.

In this report *body function* is measured by the Health Utilities Index (HUI) (see Glossary). The HUI combines six health attributes: sensation (vision, hearing and speech), mobility, dexterity, emotion, cognition and pain, into a single summary measure between 0 (death) and 1 (perfect health).

Measuring limitations in *activities* is useful because it describes the impact of functional limitations on day-to-day living. The National Population Health Survey (NPHS)/Ontario Health Survey (OHS) measured this by asking whether the respondent had a need for assistance with basic activities of daily living such as eating, bathing, dressing and getting about the house. The need for assistance with basic activities of daily living (ADL) indicates a higher level of need than the need for assistance with instrumental activities such as shopping, meal preparation and housework (IADL).

Whether people with disabilities or impairments affecting their activities of daily living are able to *participate* in society or maintain social function depends not only on the availability of hospital care and physician services but also on a wide range of formal and informal community services such as home care, special needs transportation, assistive devices, accessible buildings, family and community interaction,etc. Estimates of the degree to which individuals must restrict their activities at work, school or at leisure due to a long-term health problem provide a measure of the impact that reductions in HRQOL are having on people's social participation. These measures give us some estimate of the need for broader community-based services, but there are few measures available that evaluate how well these needs are being met.[15] More attention needs to be paid to this question in future surveys.

Many of the HRQOL indicators included in this study relate to more than one domain of health. For instance, a restriction in a person's ability to work outside the home is a combination of both limitations in *activities* and the ability to *participate* in society. We report a self-response question on long-term disability and handicap since this was often included in previous health surveys. This broad question is open to interpretation from respondents and therefore captures different perspectives of health. For example, although the majority of people with a long-term disability experience some activity restriction, it is not true in all cases. Similarly, almost everyone with a long-term disability also has a reduction in physical functioning. Another measure that may be widely interpreted is self-rated health status where people are asked to rate their health from "excellent" to "poor." Self-rated health is useful because it allows people to gauge their health from their own perspective. Studies have shown that functional status is one of the main criteria used by individuals to rate their health, but that self-rated health is also influenced by a person's judgment about the severity of current illness, personal resources to maintain well-being, health behaviour, and family health history.[21] An additional benefit of self-rated health is the degree to which it is predictive of mortality and health care utilization.[22]

In Exhibit 2 we show two hypothetical responses to the HRQOL indicators with a focus on how the HUI was calculated. In the first example, a woman in her 60s has disability from arthritis. Her body function is limited by pain, which contributes to a low HUI score of 0.34. Despite this low score she is able to perform most activities of daily living and rates her own health as "poor." The example of the man in his 40s with heart disease illustrates how a person with a perfect functional (HUI) score of 1.0, may still rate his health as only "fair," possibly because he knows his future health is at risk from this potentially fatal disease.

Data for HRQOL measures come from the Ontario Health Survey (OHS, 1990 and 1996/97) and the National Population Health Survey (NPHS) 1996/97.

Measuring Life to Years

Health expectancy measures were used to estimate the length of life lived in good health. Diseases were grouped according to ICD-9 chapter headings, with the exception of cancer, heart disease and diabetes which were included separately (see Technical Supplement for exact classification). Using an adapted Sullivan method (see Technical Supplement), we combined mortality from life tables with morbidity from HRQOL measures into either health-adjusted life expectancy (HALE) or disability-free life expectancy (DFLE). The impact of eliminating individual conditions on the HRQOL was estimated by recalculating HUI after specific conditions were eliminated from the total Ontario population.[23] We did not adjust for comorbidity (see Interpretive Cautions and Technical Supplement); this approach was used by most researchers.[23-26] If HALE increases faster than life expectancy, there will be a compression of morbidity with a larger proportion of life lived in a healthy state. By examining the effect of eliminating leading causes of death and disability on both life expectancy and HALE we were able to gauge the potential impact of individual diseases on the compression of morbidity.

We should acknowledge the WHO *Global Burden of Disease Initiative* that uses *disability-adjusted life years (DALYs)* to combine death and disability into a single summary measure.[27] DALYs are well suited to measure disease differences between nations, many of which lack population health surveys such as the OHS and NPHS. In addition, DALYs, cannot be used to assess the compression or expansion of morbidity (see Technical Supplement).

Estimating the Impact of Eliminating Causes of Morbidity and Mortality on Hospitalization

Using the same life-table approach, we estimated the potential change in hospitalization if leading causes of death and disability were eliminated. This approach assumes that if a disease is eliminated, the age- and sex-specific hospitalization rates of the remaining conditions will apply to the entire population.[12,28]

Interpretive Cautions

Measures of mortality are estimated from death certificates that are completed by physicians and coroners and transferred to electronic records by the Office of the Registrar General and Statistics Canada. Although this process ensures that virtually every death is recorded, there are limitations in the accuracy of some types of information. Mortality measures assume that people die from one primary underlying condition. Physicians may have difficulty identifying the most important condition if there are several contributing diseases or if a person died in a manner that could be attributed to more than one cause. This problem is becoming more apparent as a greater proportion of people die in their elderly years, when a person typically suffers from a variety of chronic conditions. The presence of multiple chronic conditions also affects estimates of the impact on life expectancy if specific diseases are eliminated. These calculations assume that if a person does not die from a specific disease they have the same likelihood of dying as the remaining population. In reality, some diseases (ischemic heart disease, stroke) may be associated with more underlying conditions than others (unintentional injuries).[29]

Other errors in death certificates arise from a decrease in the quality of vital statistics data since 1991. The 1996/97 mortality data does not include deaths that occurred outside of Ontario, whereas 1989/91 data included deaths where Ontario residents died in other provinces or the United States (0.3% of all deaths). This has a small effect on estimates for all areas except the Northwestern DHC, where up to five per cent of deaths occur in Manitoba.

Other measures used in this report were estimated from the Ontario Health Surveys (OHS 1990 and 1996/97) and the National Population Health Survey (NPHS 1996/97). The surveys used in this report excluded people living in long-term care facilities, remote communities and on reserves; therefore, estimates from these surveys do not represent the entire population. This may be a particularly important consideration for measures such as long-term disability, since a large proportion of the disabled elderly population live in nursing homes. Comparisons of community health status over the period of the study are further complicated by the fact that the proportion of elderly Ontarians living in long-term care facilities has decreased. This suggests that the disabled elderly were more likely to be living in a private home in 1996/97 than in 1990 and so, were more likely to be included in the latest health survey.

The OHS 1990 and 1996/97 were self-report surveys and therefore all questions are subject to interpretation by each respondent. This includes measures used to estimate disability from chronic conditions. Similar to death certificates, a respondent may have difficulty identifying the most important chronic condition when there is disability from many conditions. This may result in underreporting of chronic conditions such as musculoskeletal disorders or acute conditions such as muscle strains or respiratory infections. There is evidence to suggest that respondents' reports for conditions such as diabetes and arthritis differ from a physician's diagnosis.[30-33] Finally, caution is required when comparing the 1990 and 1996/97 OHS since these surveys had different modes of administration (for more details on the two surveys and how they differ, please refer to the Technical Supplement).

Findings

Adding Years to Life

Between 1990 and 1996/97, Ontarians' life expectancy at birth continued to increase at a steady pace, reaching 78.8 years in 1996/97 (Exhibit 3). The only province with a higher life expectancy was British Columbia (Exhibit 4). Ontario's provincial life expectancy also compared favorably to other Organization for Economic Cooperation and Development (OECD) nations (Exhibit 5). Within Ontario, the northern DHCs not only have a lower life expectancy than Toronto and surrounding regions, but the gap from highest to lowest has widened from 3.6 years in 1990 to 3.9 years in 1996/97 (Exhibit 6 and Technical Supplement). For women the difference in life expectancy between highest and lowest DHC increased from 2.4 to 3.3 years.

Exhibit 7 shows that the total number of deaths continued to increase as a result of both a larger and an aging population. Although a reduction in mortality among older people is the main contributor to increased life expectancy, there have also been important reductions in mortality before age 65 years (Exhibit 8). In the north there continued to be high rates of premature mortality; although

Algoma, which had the highest rate of premature mortality in 1990, had a 14.1 per cent reduction from 1990 to 1996/97.

Health-related Quality of Life

Life expectancy describes the impact of mortality, but what about the health of those who are living? Exhibit 9 shows that 70.4 per cent of all Ontarians report that they are in nearly perfect functional health (HUI≥ 0.95), an increase from 1990. This was a surprising finding, given the fact that a greater proportion of elderly Ontarians were living in the community in 1996/97 compared with 1990. As well, nearly 90 per cent of all Ontarians rated their health as good, very good or excellent and just over 90 per cent reported themselves as free of any long-term disability or handicap.

Exhibit 9 also illustrates that 780,000 (8.9%) non-institutionalized Ontarians required help with instrumental activities of daily living (IADL) in 1996/97, while 190,000 (2.2%) required help for basic activities of daily living (ADL). As well, 11.6 per cent reported that they found it necessary to restrict their activities at home, school, work or leisure due to a long-term health problem or handicap. Of all HRQOL measures used in this report, IADL and ADL likely have the greatest association with the need for home care services.[34]

Although there are various factors associated with reductions in HRQOL, the most important predictor is the almost linear decline in maximal function of all vital organs over the life span.[5] While this decline begins in early life, it is not until later years that it becomes evident, emerging as either a long-term disability or chronic condition (or both). This effect is shown in Exhibit 10 and 11. By age 75 years, one in four Ontarians report a long-term disability and half live with three or more chronic conditions. Although men and women did not report large differences in the prevalence of long-term disability and activity restrictions, women were almost twice as likely to require assistance with activities of daily living. As with measures of mortality and disease, the northern regions had the highest proportion of people reporting deficits for all HRQOL measures.

Adding Life to Years

Health expectancy combines HRQOL with life expectancy to estimate the length of life lived in good health (Exhibits 6 and 12). In 1996/97, Ontario's health-adjusted life expectancy (HALE) for men and disability-free life expectancy (DFLE) for both men and women were the highest in the country (Exhibit 4). In total, non-institutionalized Ontarians could expect to live 91.8 per cent of their lives

in good health (Exhibit 6). Although women live longer than men they live a smaller proportion of it in good health as a result of higher prevalence of conditions such as arthritis and mental disorders (92.6% of life expectancy in good health for men and 90.9% for women), especially in later life.

Exhibit 6 and 13 show that both HALE and DFLE have a greater variation across DHCs than life expectancy. As with life expectancy, males tend to be lower in the north and higher in Ottawa/Carlaton and the south central regions. In Exhibit 12, the difference between the survival curve for life expectancy and HALE represents the amount of time that is lived in poor health. Since 1990, HALE has increased at a slightly faster pace than life expectancy (1.0 years for life expectancy; 1.1 years for HALE) indicating that there may be a small compression in morbidity or, in other words, we are adding life to years.

The Impact of Leading Causes of Death and Disability

Exhibit 14 shows why measuring death is frequently viewed as capturing only the "tip of the iceberg" when it comes to the overall burden of a disease;[35] while there were 79,000 deaths per year in 1996/97, this compares with 5.4 million non-institutionalized people who report living with at least one chronic condition. Furthermore, the wide range between the ratios of the prevalence of disease to annual death from diseases (7,000:1 ratio for musculoskeletal conditions, 4:1 for cancer) indicates that mortality is a poor estimate of the burden of diseases on health.

Measuring the impact of eliminating or reducing individual diseases on HALE overcomes the limitations of measuring mortality and/or morbidity separately. Life expectancy will increase following a reduction in disease prevalence if it is a common cause of death or death occurs at younger years; HALE will increase for the same reasons or if the disease is common and/or debilitating. Exhibits 15 and 16 show the impact that eliminating certain causes of death and disability would have on mortality, HRQOL, and the combined impact on HALE.

Eliminating cancer has the largest impact on life expectancy, with both men and women gaining an additional 3.5 years of life. Ischemic heart disease is second with gains of 3.2 and 2.8 years for men and women respectively while other circulatory conditions come in third with 0.9 and 1.2 years of life gained. Unintentional injuries were the 6th most common cause of death for men but the 4th leading cause of life expectancy lost (0.8 years). The larger impact on life expectancy from injuries was a result of the relatively young age of death and the corresponding greater potential life lost for each individual. Conditions such

as mental disorders and musculoskeletal conditions, which are much more likely to result in a limitation in HRQOL than in death, have a larger impact on HALE than on life expectancy. For instance, eliminating musculoskeletal conditions in women will result in only a 0.1 year gain in life expectancy but a ten times greater impact (1.0 years) on HALE—the third largest impact on HALE.

Because many of the leading causes of death have a larger impact on mortality than HRQOL, reducing the prevalence of these conditions may result in an expansion of morbidity, or a trend towards people living longer but in a lower health state. This effect is most noticeable for ischemic heart disease and cancer, with the elimination of either resulting in a 0.5 per cent reduction in the proportion of life lived in a healthy state. Conversely, there will be a compression of morbidity if musculoskeletal conditions are eliminated (0.5% point reduction for men and 1.3% point increase for women) since this condition mainly affects HRQOL, rather than mortality.

Exhibit 17 uses this concept of changing morbidity to demonstrate the potential impact on hospitalization if leading conditions are eliminated. A reduction in ischemic heart disease and cancer will result in an increase in hospitalization because people will live longer but will require hospitalization for other conditions. Reducing mental disorders will result in decreased hospital utilization since this condition is a frequent cause of hospitalization, but a less common cause of death.

Discussion

Living Longer and Healthier

Ontarians experienced a long and lengthening life expectancy between 1991 and 1996, despite entering a period of economic change and health care reform. The over 20-year increase in life expectancy throughout the last century raises questions regarding the limits of human longevity. Inevitably, life expectancy will be subject to the law of diminishing returns where over time the same per cent reduction in mortality will result in a smaller increase in life expectancy.[6,9,36] Regardless, many researchers argue that biologic processes will limit the human life span to between 85 and 90 years,[5,6] unless discoveries in genetics and biology fundamentally change our understanding of cellular aging.[37]

By examining the change in HALE since 1990 we estimate that along with the gain in life expectancy there has also been a small compression of morbidity—

overall, not only are Ontarians living a longer life but we are also living longer in a healthier state. To maintain this trend in the future we need to focus our efforts on preventing and reducing impairment from non-fatal diseases that impact HRQOL such as musculoskeletal and mental disorders. The decreasing mortality rate for the leading fatal conditions such as ischemic heart disease and cancer will likely continue as a result of both improvements in lifestyle factors over the last 20 years and improving medical care. For these conditions, Fries may be correct when he postulated that improved lifestyles would result in a delay in the development of chronic disease. Alternatively, health care should continue to focus on improving HRQOL in the survivors of these conditions to ensure that the proportion of life lived in a healthy state increases. If this is achieved, not only will there be improvements in health but also in the utilization of health care services.

In any event, the continued reduction in mortality continues to change the landscape of health care delivery.[38] With more people surviving to older ages, our health care system is potentially faced with the additional challenge of providing supportive care to maintain a high HRQOL for those living with chronic conditions that often require ongoing care physician and hospital services. For instance, an elderly woman with osteoarthritis may benefit from medications to control pain and inflammation or joint replacement surgery if there is severe disease of large joints (typically knees or hips).[39] Despite the availability of such services, she may still become one of the many Ontarians whose arthritis has forced them to restrict their day-to-day activities. For these people, maintaining health requires additional health care and community services such as adequate housing, accessible public facilities, and assistance from an occupational therapist, home care, family and friends. In Canada it is estimated that half the people with limitations in activities of daily living have unmet needs for health-related personal assistance.[40]

Regional Inequality in Health

While the results of our analyses suggest that, overall, we have been adding both "life to years" as well as "years to life" here in Ontario, there is also evidence that this has not occurred equally across the province. First, there continue to be wide regional differences, not only in mortality, but also in all the HRQOL measures studied in this report. The North and Central South Regions, in particular, have life expectancies, health-adjusted life expectancies and disability-free life expectancies that are significantly lower than the provincial average. In addition, the geographic differences in HALE are larger than those identified using

mortality-based measures alone. This suggests that using mortality indicators alone[41] may underestimate the health care needs of these regions, especially with respect to services directed at supporting HRQOL.

Second, for the most part, the already wide variations in health across DHCs increased between 1990 and 1996/97 (most notably a 0.4 year increase in the life expectancy difference from highest to lowest and a 0.2 year difference in HALE), despite previous recommendations to reduce inequities in health opportunities in Ontario.[15] On an encouraging note, DHC differences for premature mortality and the probability of death prior to age 65 years narrowed, a finding not always seen in other provinces for which data are available.[42] It is difficult to determine whether widening disparities in health are new or part of a sustained trend since there is a lack of long-term health surveillance information. However, we do know that the range in life expectancy across DHCs narrowed during the 1980s (data not shown), before widening again in the early 1990s. There is also evidence that the gap in life expectancy across provinces began to diverge in the early 1990s, for the first time since 1926 (Exhibit 3).[35] Many factors may contribute to a widening in overall health status including health care, social and working conditions and health behaviour[43-45]—all of which will be examined in future ICES *Atlas Reports.*

Conclusions

Using both traditional and newer measures, our evidence suggests that as a whole, health status of Ontario continues to improve, with both life and health expectancy reaching unprecedented levels. However, there are serious concerns that this good health is not shared equitably. Furthermore, the already wide disparity in regional health has widened since 1990. The source of this gap likely lies not only in the health care system but also in other prerequisites for good health.[43-45]

As we continue to approach the limits of the human life span we must focus our efforts not only on reducing mortality but also on improving HRQOL and well-being for those who live with chronic conditions. This presents a challenge not only for the traditionally funded health care sectors such as hospitals and physicians, but for all Ontarians, whether they work in supporting community agencies or have family and community members with health needs.
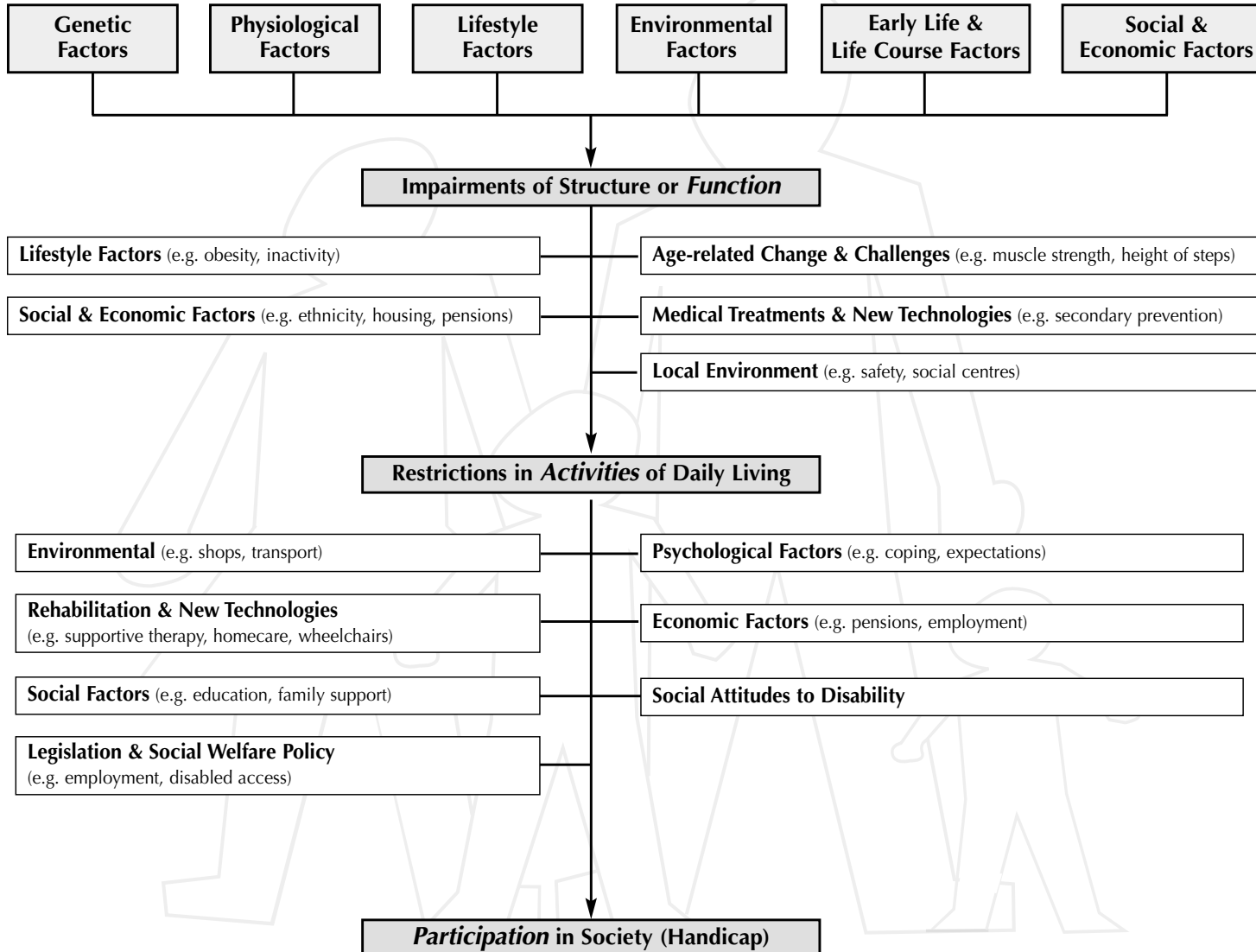
Acknowledgements

Exhibit 1: Domains of Health-related Quality of Life

| Genetic Factors | Physiological Factors | Lifestyle Factors | Environmental Factors | Early Life & Life Course Factors | Social & Economic Factors |

Impairments of Structure or *Function*

Lifestyle Factors (e.g. obesity, inactivity)

Age-related Change & Challenges (e.g. muscle strength, height of steps)

Social & Economic Factors (e.g. ethnicity, housing, pensions)

Medical Treatments & New Technologies (e.g. secondary prevention)

Local Environment (e.g. safety, social centres)

Restrictions in *Activities* of Daily Living

Environmental (e.g. shops, transport)

Psychological Factors (e.g. coping, expectations)

Rehabilitation & New Technologies
(e.g. supportive therapy, homecare, wheelchairs)

Economic Factors (e.g. pensions, employment)

Social Factors (e.g. education, family support)

Social Attitudes to Disability

Legislation & Social Welfare Policy
(e.g. employment, disabled access)

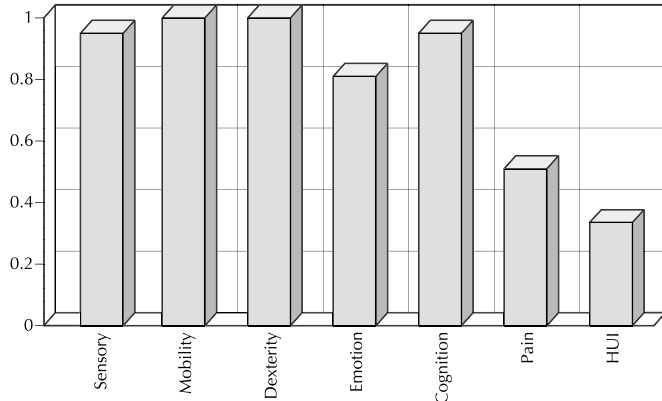***Participation* in Society (Handicap)**

Exhibit Highlights

✔ Health-related quality of life (HRQOL) is composed of different layers or domains.

✔ There are many factors that influence each layer.

Adapted From: Ebrahim[46]

Exhibit 2: Self-rated Health Status and the Difference of Respondents' Perspectives

Example 1

A 62-year-old woman reports that she needs to restrict her activities at home and at leisure because of her arthritis. Although she has no difficulty with general mobility or dexterity, she reports that the pain from her arthritis is severe and prevents her from participating in many activities. In addition, she requires glasses for reading, finds herself somewhat forgetful and describes herself as feeling somewhat unhappy. Her HUI score is 0.34 and she rates her health as "poor".
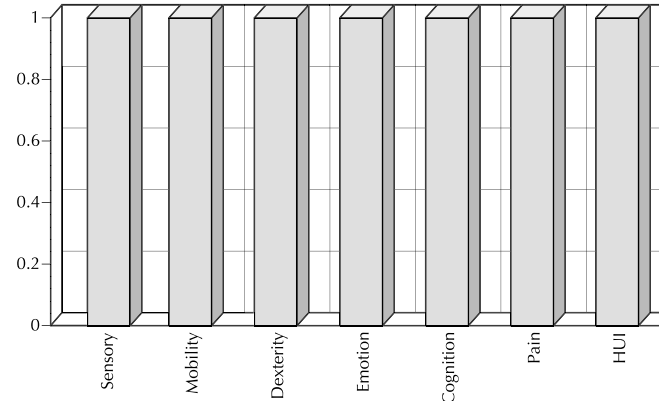
Example 2

A 48-year-old man reports that he has heart disease which restricts his activities at home. He has no problems with vision, hearing, speech, mobility, or dexterity. He says he is happy, has no thinking or memory problems and does not experience pain. His HUI is 1.00, or perfect. However, he rates his health as only "fair".

Exhibit Highlights

✔ **Self-rated health is a reflection of an individual's perception of his/her health, which includes factors beyond functional status.**

Health Status Profile

Example 1

	Response		Response
Activity restriction	Yes	Long-term disability	No
Health Utility Index score	0.34	Self-rated health status	**Poor**
Needs assistance with IADL	Yes	Needs assistance with ADL	No

Health Status Profile

Example 2

	Response		Response
Activity restriction	Yes	Long-term disability	No
Health Utility Index score	1.00	Self-rated health status	**Fair**
Needs assistance with IADL	No	Needs assistance with ADL	No

Note: The above examples are hypothetical, fictitious composites. Resemblance to any person alive or dead is purely coincidental.

Exhibit 3: The Range of Life Expectancy at Birth for Both Sexes in the Provinces, Compared to Ontario, 1921 to 1997
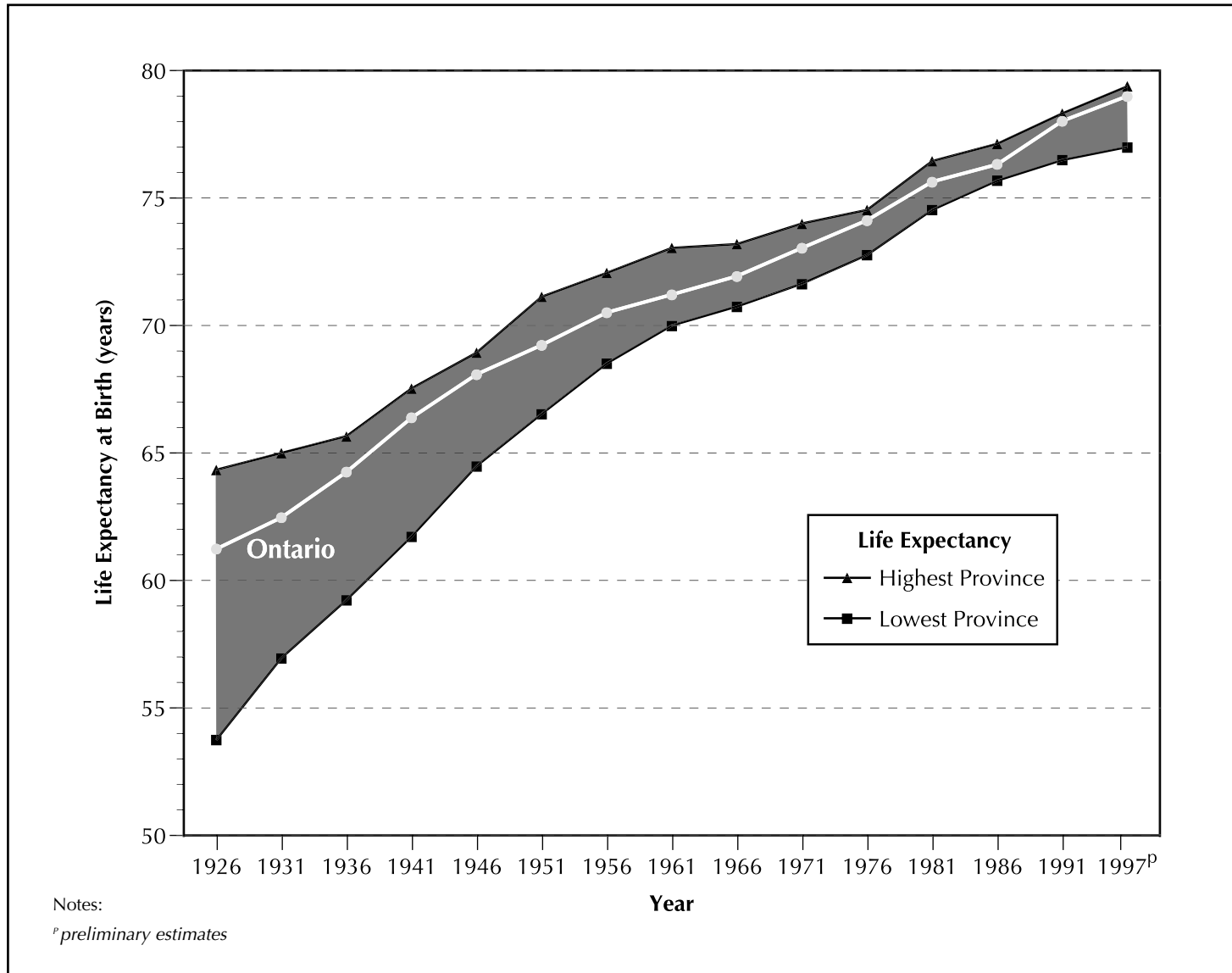
Exhibit Highlights

✔ Over the past decade Ontario life expectancy has increased to one of the highest provinces in Canada.

✔ The gap between the highest and lowest provincial life expectancies has widened since 1986.

Notes:

ᵖ preliminary estimates

Data Source: Statistics Canada

Exhibit 4: Measures of Health Status, Canada and Provinces, 1996/97

Province	Health-adjusted Life Expectancy at Birth (years)		Disability-free Life Expectancy at Birth (years)		Life Expectancy at Birth (years)		Self-rated Health Status (% ≥ Good)*	
	Women	Men	Women	Men	Women	Men	Women	Men
Ontario	74.2	70.5	72.5	69.4	81.4	76.2	90	92
Alberta	73.6	70.1	69.2	65.7	81.3	76.1	90	91
Saskatchewan	73.5	69.9	67.8	65.6	81.5	75.5	90	94
British Columbia	74.0	69.8	67.8	67.7	81.9	76.2	91	93
Newfoundland	73.6	69.7	69.7	65.7	80.0	74.6	92	93
Manitoba	73.1	69.5	69.8	65.9	80.6	75.5	90	92
Quebec	73.9	69.4	71.3	65.2	81.2	75.0	92	94
Prince Edward Island	74.3	68.9	69.3	65.5	81.3	74.9	91	91
New Brunswick	73.4	68.8	69.6	64.9	81.1	75.1	89	91
Nova Scotia	72.7	68.2	65.4	60.2	80.4	74.9	91	88
Canada**	**73.9**	**69.8**	**70.6**	**66.5**	**81.3**	**75.7**	**91**	**92**

Notes:

age-sex standardized to 1996 Ontario population
** provinces only, does not include territories

Exhibit Highlights

✔ In 1996/97 Ontario men ranked number one in health-adjusted life expectancy, disability-free life expectancy and life expectancy at birth.

✔ Ontario women ranked number one in disability-free life expectancy, number two in health-adjusted life expectancy and number three in life expectancy at birth.

✔ Despite their high rankings on most measures, Ontario men and women tended to rate their health lower than men and women in a number of other provinces.

Data Sources: Health Indicators 1999, Statistics Canada Cat. No. 82-221-XCB; 1996/97 National Population Health Survey

Exhibit 5: Sex-specific Life Expectancy at Birth and Age 65 in Canada and Other Selected Countries Belonging to the Organization for Economic Cooperation and Development (OECD)

| | Life Expectancy at Birth | | | | Life Expectancy at Age 65 | | | |
| | Years, 1995 | | Rank, 1995 | | Years, 1995 | | Rank, 1995 | |
Country	Women	Men	Women	Men	Women	Men	Women	Men
Japan	82.9	76.4	1	2	20.9	16.5	1	1
France	81.9	73.9	2	11	20.6	16.1	2	3
Switzerland	81.7	75.3	3	4	20.2	16.1	3	3
Canada	81.3	75.3	4	4	20.1	16.2	4	2
Sweden	81.3	75.9	4	3	19.7	16.0	5	4
Spain	81.2	73.2	5	14	19.7	15.8	5	5
Australia	80.9	75.0	6	5	19.7	15.7	5	6
Italy	80.8	74.4	7	8	19.4	15.6	7	7
Norway	80.8	74.8	7	6	19.1	15.5	8	8
Belgium	80.7	73.9	8	11	19.6	15.1	6	11
Iceland	80.6	76.5	9	1	19.4	16.5	7	1
Netherlands	80.4	74.6	10	7	18.7	14.4	12	14
Greece	80.2	75.0	11	5	18.4	16.1	15	3
Finland	80.2	72.8	11	16	18.6	14.5	13	13
Austria	80.1	73.5	12	12	18.7	15.2	12	10
Germany	79.8	73.3	13	13	18.5	14.7	14	12
United Kingdom	79.7	74.3	14	9	18.4	14.7	15	12
New Zealand	79.5	74.2	15	10	19.0	15.4	9	9
Luxembourg	79.4	72.9	16	15	---	---	---	---
United States	79.2	72.5	17	18	18.9	15.6	10	7
Ireland	78.5	72.9	18	15	---	---	---	---
Portugal	78.2	71.0	19	19	17.8	14.4	16	14
Denmark	77.8	72.6	20	17	17.6	14.2	17	15
Korea	77.4	69.5	21	22	16.9	13.2	18	16
Czech Republic	76.9	70.0	22	20	16.4	12.8	20	18
Poland	76.4	67.6	23	23	16.6	12.9	19	17
Mexico	76.2	69.8	24	21	18.7	15.5	12	8
Hungary	74.5	65.3	25	25	15.8	12.1	21	19
Turkey	70.3	65.7	26	24	---	---	---	---

Exhibit Highlights

✔ In life expectancy at birth, Canada ranks 4th among OECD nations for both men and women.

✔ In life expectancy at age 65, Canadian women once again are 4th among OECD countries, but Canadian men are second only to Japan.

Data Source: Organization for Economic Cooperation and Development Health Data 1998

Exhibit 6: Measures of Health Expectancy by Health Planning Region and District Health Council in Ontario, 1996/97

District Health Council	Life Expectancy (years)		Health-adjusted Life Expectancy (years)		Life in Good Health (%)*	Change from 1990 in Expected Proportion of Life in Good Health (%)	Disability-free Life Expectancy (years)
	1996/97	Change from 1990 (years)	1996/97	Change from 1990 (years)			1996/97
South West Planning Region							
• Essex, Kent and Lambton	77.8	0.7	71.2	0.3	91.5	-0.48	68.2
• Grey, Bruce, Huron, Perth	78.1	0.6	72.2	1.1	92.4	0.90	68.8
• Thames Valley	78.2	0.8	71.8	0.9	91.8	0.23	69.3
Region	**78.0**	**0.7**	**71.7**	**0.8**	**91.9**	**0.22**	**68.8**
Central South Planning Region							
• Grand River	77.7	0.7	71.3	0.5	91.8	-0.20	67.5
• Hamilton-Wentworth	78.2	1.0	71.6	1.2	91.6	0.40	68.8
• Niagara Region	78.5	0.8	71.8	1.1	91.5	0.52	68.4
Region	**78.2**	**0.9**	**71.6**	**1.0**	**91.6**	**0.25**	**68.4**
Central West Planning Region							
• Halton-Peel	80.3	1.1	73.8	0.7	91.9	-0.43	72.4
• Waterloo Region-Wellington-Dufferin	79.0	0.9	72.9	2.1	92.3	1.79	70.8
Region	**79.8**	**1.0**	**73.4**	**1.2**	**92.0**	**0.39**	**71.9**
Toronto Planning Region							
• Toronto	79.5	1.2	72.9	0.9	91.7	-0.28	71.9
Region	**79.5**	**1.2**	**72.9**	**0.9**	**91.7**	**-0.28**	**71.9**
Central East Planning Region							
• Durham, Haliburton, Kawartha and Pine Ridge	78.7	0.9	72.2	1.0	91.7	0.24	69.2
• Simcoe-York	79.7	1.5	73.6	1.6	92.3	0.43	71.2
Region	**79.2**	**1.2**	**73.0**	**1.4**	**92.2**	**0.54**	**70.3**
East Planning Region							
• Champlain	79.3	1.5	72.9	1.3	91.9	-0.11	70.7
• Quinte, Kingston, Rideau Valley	77.4	0.7	71.0	1.0	91.7	0.51	67.7
Region	**78.6**	**1.2**	**72.2**	**1.5**	**91.9**	**0.56**	**69.7**
North Planning Region							
• Algoma, Cochrane, Manitoulin, Sudbury	76.7	1.0	69.4	-0.1	90.5	-1.58	66.4
• Muskoka, Nipissing, Parry Sound and Timiskaming	76.8	0.3	70.1	1.3	91.3	1.49	66.7
• Northwestern Ontario	76.3	0.6	69.0	0.5	90.4	-0.06	67.8
Region	**76.6**	**0.7**	**69.5**	**0.9**	**90.7**	**0.39**	**66.8**
Ontario							
• Women	81.4	0.7	74.0	0.7	90.9	0.11	71.8
• Men	76.1	1.3	70.5	1.5	92.6	0.43	68.4
Overall	**78.8**	**1.0**	**72.3**	**1.1**	**91.8**	**0.22**	**70.1**

* Age (sex-specific estimates) or age-sex (overall, regional and DHC estimates) standardized to Ontario 1996 population

Data Source: Office of the Registrar General; Statistics Canada; 1996/97 Ontario Health Survey; 1990 Ontario Health Survey

Exhibit Highlights

✔ Health expectancies tend to be highest in the central regions (Central East, Central West, Toronto), lowest in the North.

✔ Health-adjusted Life Expectancy is increasing at the same rate or slightly faster than Life Expectancy, resulting in a compression of morbidity.

✔ There is evidence of greater compression of morbidity for men than for women.

Exhibit 7: Measures of Mortality by Health Planning Region and District Health Council in Ontario, 1996/97

District Health Council	Population		Total Deaths		Crude Death Rate**		Age Standardized MortalityRate*,** (all cause, all ages)	
	Average Population 1996/97	Change from 1990 (%)	Average no. of deaths 1996/97	Change from 1990 (%)	Rate 1996/97	Change from 1990 (%)	Rate 1996/97	Change from 1990 (%)
South West Planning Region								
• Essex, Kent and Lambton	610,025	4.4	5,048	8.1	828	3.6	760	-3.8
• Grey, Bruce, Huron, Perth	293,975	3.7	2,806	9.7	954	5.8	729	-2.7
• Thames Valley	587,140	6.1	4,591	9.0	782	2.7	736	-4.9
Region	1,491,140	4.9	12,444	8.8	835	3.7	743	-4.0
Central South Planning Region								
• Grand River	230,415	5.1	2,019	11.6	876	6.2	775	-1.7
• Hamilton-Wentworth	484,105	3.9	3,964	7.1	819	3.0	737	-5.7
• Niagara Region	416,455	3.2	3,722	11.7	894	8.2	724	-4.3
Region	1,130,975	3.9	9,705	9.7	858	5.6	740	-4.4
Central West Planning Region								
• Halton-Peel	1,253,305	18.4	5,463	25.1	436	5.7	623	-8.8
• Waterloo Region-Wellington-Dufferin	648,400	10.1	4,201	14.4	648	3.8	702	-4.3
Region	1,901,705	15.4	9,664	20.2	508	4.1	655	-7.0
Toronto Planning Region								
• Toronto	2,477,490	4.1	17,351	4.2	700	0.1	651	-8.8
Region	2,477,490	4.1	17,351	4.2	700	0.1	651	-8.8
Central East Planning Region								
• Durham, Haliburton, Kawartha and Pine Ridge	775,825	12.3	5,422	19.0	699	6.0	712	-4.9
• Simcoe-York	968,140	22.3	5,232	21.9	540	-0.3	652	-10.3
Region	1,743,965	17.6	10,653	20.4	611	2.4	681	-7.6
East Planning Region								
• Champlain	1,038,840	7.9	6,884	7.4	663	-0.4	673	-9.8
• Quinte, Kingston, Rideau Valley	491,020	6.7	4,607	14.0	938	6.8	783	-2.1
Region	1,529,860	7.5	11,491	10.0	751	2.3	713	-6.8
North Planning Region								
• Algoma, Cochrane, Manitoulin, Sudbury	434,040	-0.4	3,404	10.6	784	11.0	818	-5.8
• Muskoka, Nipissing, Parry Sound and Timiskaming	218,645	2.1	2,120	12.2	970	9.9	807	-1.5
• Northwestern Ontario	254,115	1.7	2,023	7.8	796	6.0	814	-3.3
Region	906,800	0.8	7,546	10.3	832	9.4	814	-3.9
Ontario								
• Women	5,671,715	8.4	38,491	14.2	679	5.3	674	-3.8
• Men	5,510,220	7.8	40,362	7.9	733	0.1	727	-9.0
Overall	11,181,935	8.1	78,853	10.9	705	2.6	701	-6.5

* Age (sex-specific estimates) or age-sex (overall, regional and DHC estimates) standardized to Ontario 1996 population   ** rate per 100,000 population

Data Source: Office of the Registrar General; Statistics Canada

Exhibit Highlights

✔ The total number of deaths in Ontario has increased since 1990 due to a larger population.

✔ The crude death rate has increased since 1990 as a result of the aging of the population.

✔ The falling age-standardized mortality rates indicate an improvement in the health status of the population.

Exhibit 8: Measures of Premature Mortality by Health Planning Region and District Health Council in Ontario, 1996/97

District Health Council	Age Standardized Mortality Rate* per 100,000 (all cause, aged 0 to 64 years)		Per cent Survival to Age 65 Years	
	Rate 1996/97	Change from 1990 (%)	(%) 1996/97	Change from 1990 (Percentage Points)
South West Planning Region				
• Essex, Kent and Lambton	195	-9.5	85.3	1.5
• Grey, Bruce, Huron, Perth	187	-11.7	85.4	1.2
• Thames Valley	191	-9.3	85.7	1.5
Region	**191**	**-10.3**	**85.5**	**1.5**
Central South Planning Region				
• Grand River	195	-11.8	85.2	1.9
• Hamilton-Wentworth	194	-11.4	85.3	1.8
• Niagara Region	185	-10.2	86.0	1.4
Region	**191**	**-11.0**	**85.6**	**1.7**
Central West Planning Region				
• Halton-Peel	141	-11.6	88.9	1.4
• Waterloo Region-Wellington-Dufferin	162	-13.1	87.6	1.8
Region	**148**	**-12.5**	**88.5**	**1.6**
Toronto Planning Region				
• Toronto	175	-14.4	87.0	2.2
Region	**175**	**-14.4**	**87.0**	**2.2**
Central East Planning Region				
• Durham, Haliburton, Kawartha and Pine Ridge	169	-14.4	86.9	1.9
• Simcoe-York	147	-17.0	88.6	2.3
Region	**157**	**-16.0**	**87.8**	**2.2**
East Planning Region				
• Champlain	167	-19.8	87.2	3.0
• Quinte, Kingston, Rideau Valley	201	-16.0	84.9	2.6
Region	**178**	**-18.4**	**86.4**	**2.8**
North Planning Region				
• Algoma, Cochrane, Manitoulin, Sudbury	225	-14.1	83.1	2.5
• Muskoka, Nipissing, Parry Sound and Timiskaming	223	-5.3	83.4	1.2
• Northwestern Ontario	239	-7.4	82.5	1.4
Region	**229**	**-10.2**	**83.0**	**1.9**
Ontario				
• Women	133	-11.5	89.8	1.8
• Men	219	-15.4	83.4	3.7
Overall	**176**	**-14.0**	**86.6**	**2.8**

* Age (sex-specific estimates) or age-sex (overall, regional and DHC estimates) standardized to Ontario 1996 population

Data Source: Office of the Registrar General; Statistics Canada

Exhibit Highlights

✔ Overall survival to age 65 increased 2.8 percentage points from 1990 to 1996/97, with the male-female gap also narrowing during the period.

✔ All areas of Ontario showed reductions in premature mortality from 1990 to 1996/97.

✔ While the North continues to have the highest premature mortality rates in the province, some areas, such as Algoma, Cochrane, Manitoulin and Sudbury, did show important reductions.

Exhibit 9: Measures of Health-related Quality of Life by Health Planning Region and District Health Council in Ontario, 1996/97

| District Health Council	Mean Health Utility Index ≥ .95*		Self-rated Health ≥ "Good"* 1996/97 (%)	Need Assistance with Instrumental (IADL) and Basic (ADL) Activities of Daily Living 1996/97		Prevalence of Long-term Disability 1996/97 (%)*	Prevalence of Activity Restriction 1996/97 (%)*
	1996/97 (%)	Change from 1990 (%)		ADL (%)	IADL (%)*		
South West Planning Region							
• Essex, Kent and Lambton	69.1	-1.4	87.9	3.0	10.2	12.0	13.4
• Grey, Bruce, Huron, Perth	72.2	4.0	90.7	2.5	9.7	10.9	12.8
• Thames Valley	69.2	3.5	90.8	2.2	9.4	10.4	11.8
Region	**69.9**	**1.8**	**89.6**	**2.6**	**9.8**	**11.1**	**12.6**
Central South Planning Region							
• Grand River	70.0	5.2	88.9	2.5	11.1	12.6	14.0
• Hamilton-Wentworth	68.8	0.4	89.6	1.6	8.0	10.8	12.1
• Niagara Region	68.9	5.2	89.2	2.6	11.1	12.0	13.3
Region	**68.9**	**2.8**	**89.4**	**2.2**	**10.0**	**11.7**	**13.1**
Central West Planning Region							
• Halton-Peel	73.4	2.6	91.2	2.3	7.3	7.9	10.2
• Waterloo Region-Wellington-Dufferin	71.7	14.4	91.2	2.1	8.9	9.2	11.7
Region	**72.7**	**6.6**	**91.2**	**2.2**	**7.9**	**8.3**	**10.8**
Toronto Planning Region							
• Toronto	70.5	0.5	89.5	1.9	7.3	7.3	9.2
Region	**70.5**	**0.5**	**89.5**	**1.9**	**7.3**	**7.3**	**9.2**
Central East Planning Region							
• Durham, Haliburton, Kawartha and Pine Ridge	70.1	4.9	90.0	2.5	10.8	11.5	13.1
• Simcoe-York	73.3	4.5	91.2	2.1	8.4	9.4	11.0
Region	**71.9**	**4.9**	**90.7**	**2.3**	**9.5**	**10.2**	**11.9**
East Planning Region							
• Champlain	70.3	-0.1	90.3	2.1	9.2	9.4	11.9
• Quinte, Kingston, Rideau Valley	69.6	6.0	88.7	1.7	9.6	12.2	14.2
Region	**70.1**	**5.9**	**89.9**	**1.9**	**9.3**	**10.2**	**12.7**
North Planning Region							
• Algoma, Cochrane, Manitoulin, Sudbury	65.7	-2.5	86.1	2.3	11.8	12.7	14.6
• Muskoka, Nipissing, Parry Sound and Timiskaming	66.5	8.3	88.3	3.1	10.9	12.9	14.1
• Northwestern Ontario	64.9	1.3	87.6	2.4	9.6	11.2	13.2
Region	**65.7**	**5.7**	**87.2**	**2.6**	**11.0**	**12.3**	**14.1**
Ontario							
• Women	68.6	3.0	89.1	2.6	11.2	10.2	12.8
• Men	72.3	4.6	90.6	1.8	6.6	9.2	10.4
Overall	**70.4**	**3.8**	**89.8**	**2.2**	**8.9**	**9.7**	**11.6**

* Age (sex-specific estimates) or age-sex (overall, regional and DHC estimates) standardized to Ontario 1996 population
Note: See glossary for definitions of ADL, IADL, long term disability and activity restriction

Data Sources: 1990 Ontario Health Survey; 1996/97 Ontario Health Survey

Exhibit Highlights

✔ The data show relatively small male-female differences in the prevalence of long-term disability and activity restriction, but much larger differences in the need for assistance with activities of daily living, particularly with instrumental activities such as heavy housework, shopping and meal preparation.

✔ Health-related quality of life (HRQOL) is generally lower in the North, with higher prevalence of activity restriction and a smaller proportion reporting their health as good or better.

**Exhibit 10: Age/Sex-specific Per Cent Prevalence of Long Term Disability in Ontario, 1996/97**
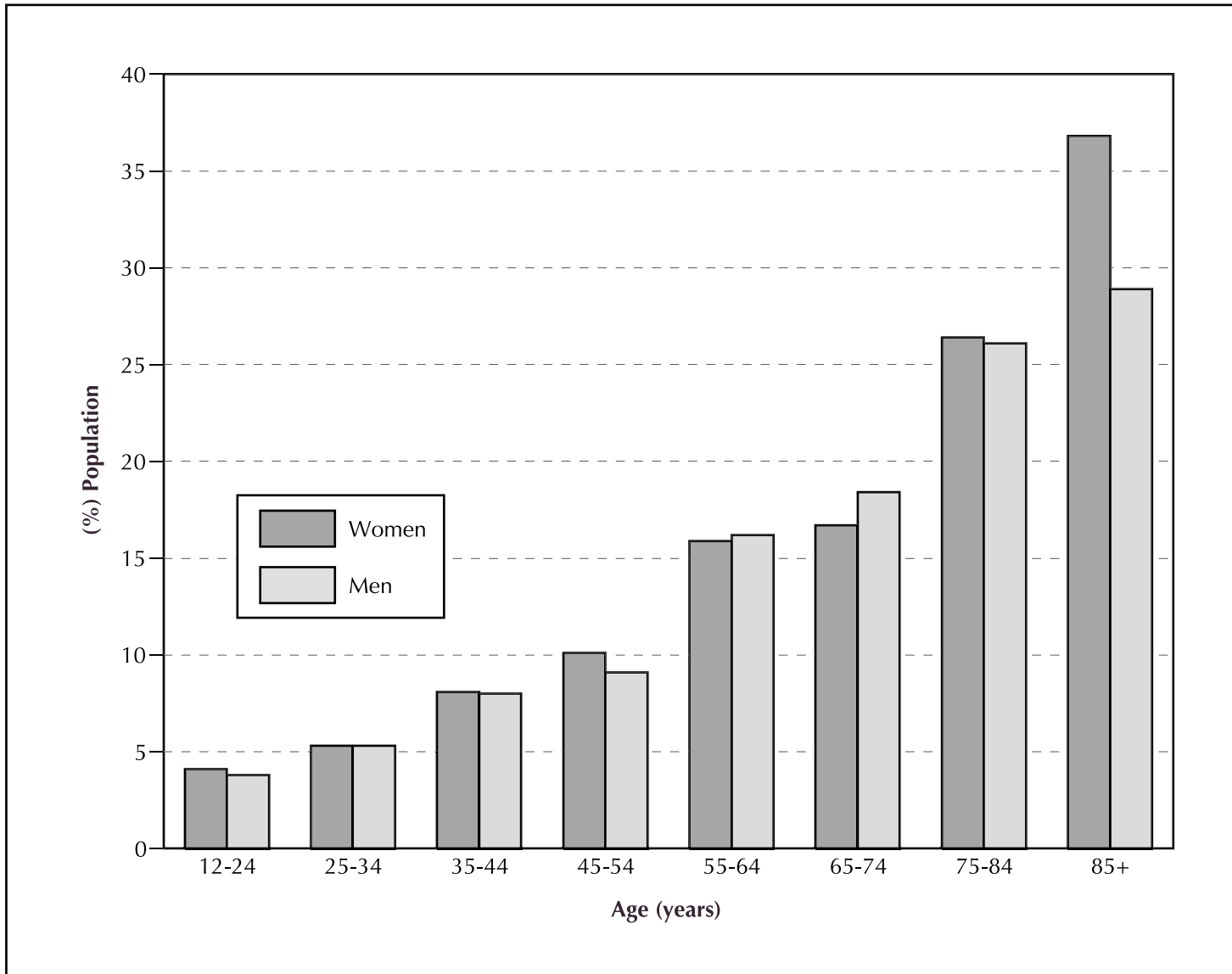
Exhibit Highlights

✔ **Long-term disability increases with age.**

✔ **Prevalence of long-term disability is similar for men and women until very old age.**

Data Source: 1996/97 Ontario Health Survey

Exhibit 11: Age/Sex-specific Per Cent of the Population Reporting One, Two and Three or More Chronic Conditions in Ontario, 1996/97
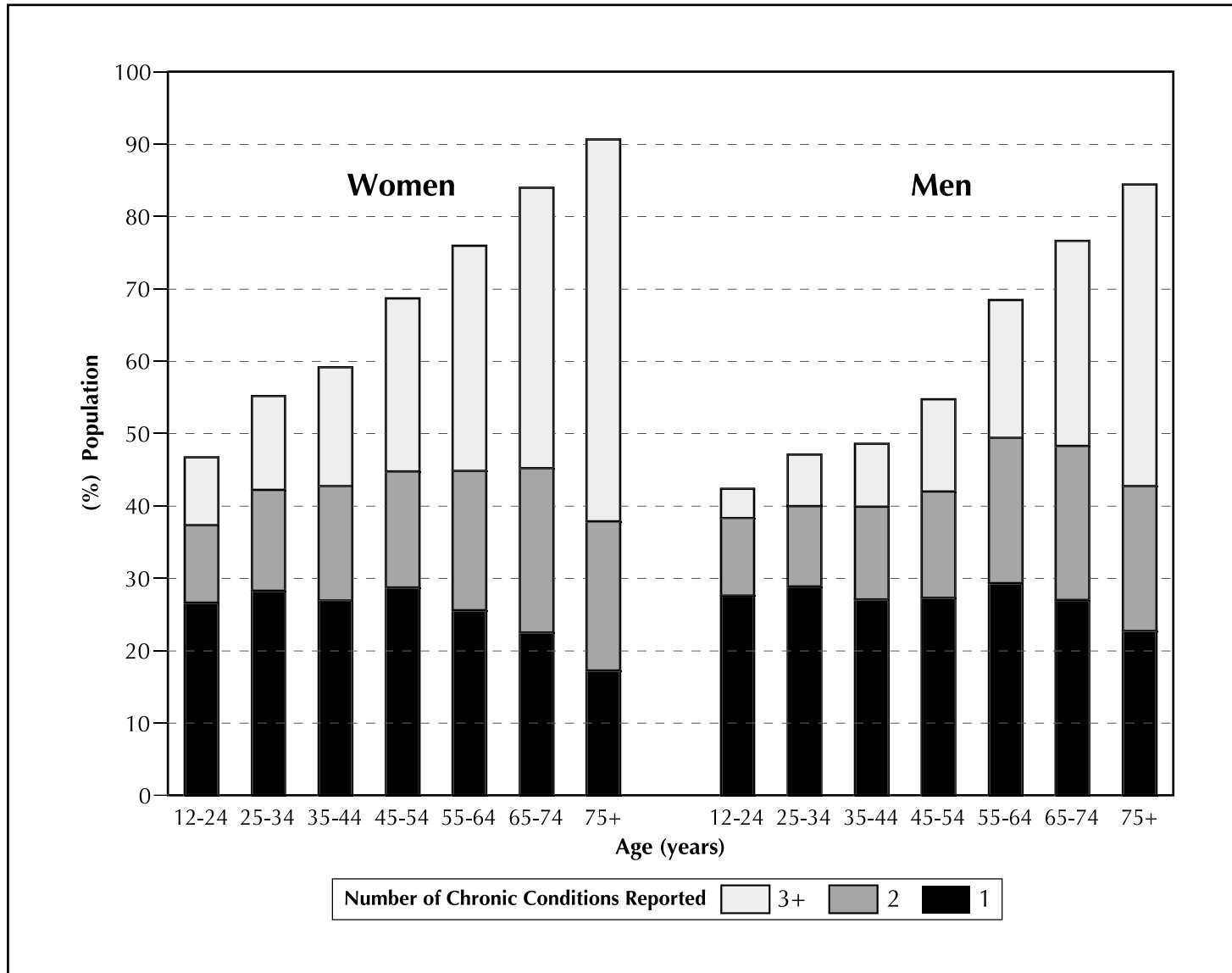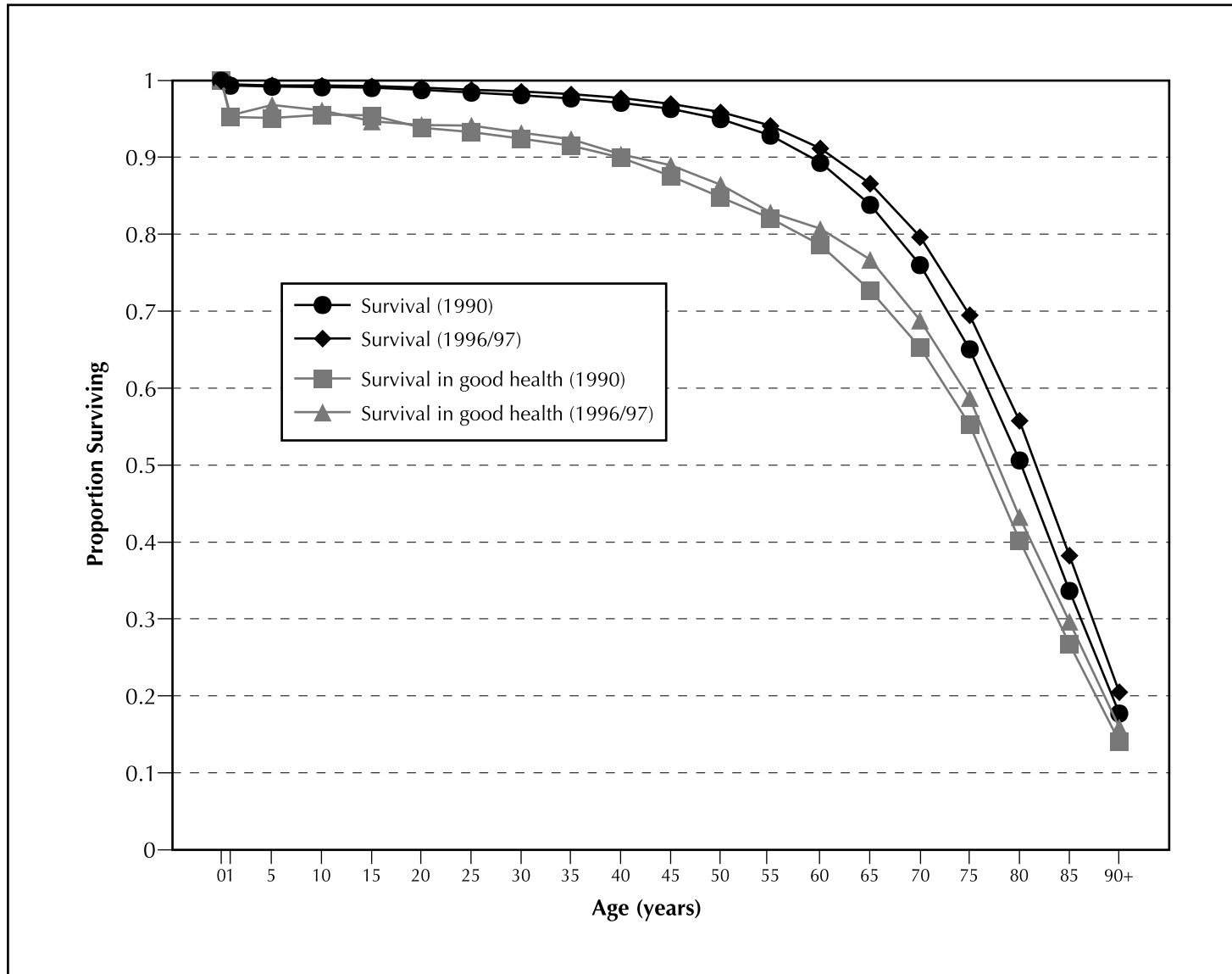

Exhibit Highlights

✔ As people age, they are both more likely to have a chronic condition and more likely to have more than one.

Data Source: 1996/97 Ontario Health Survey

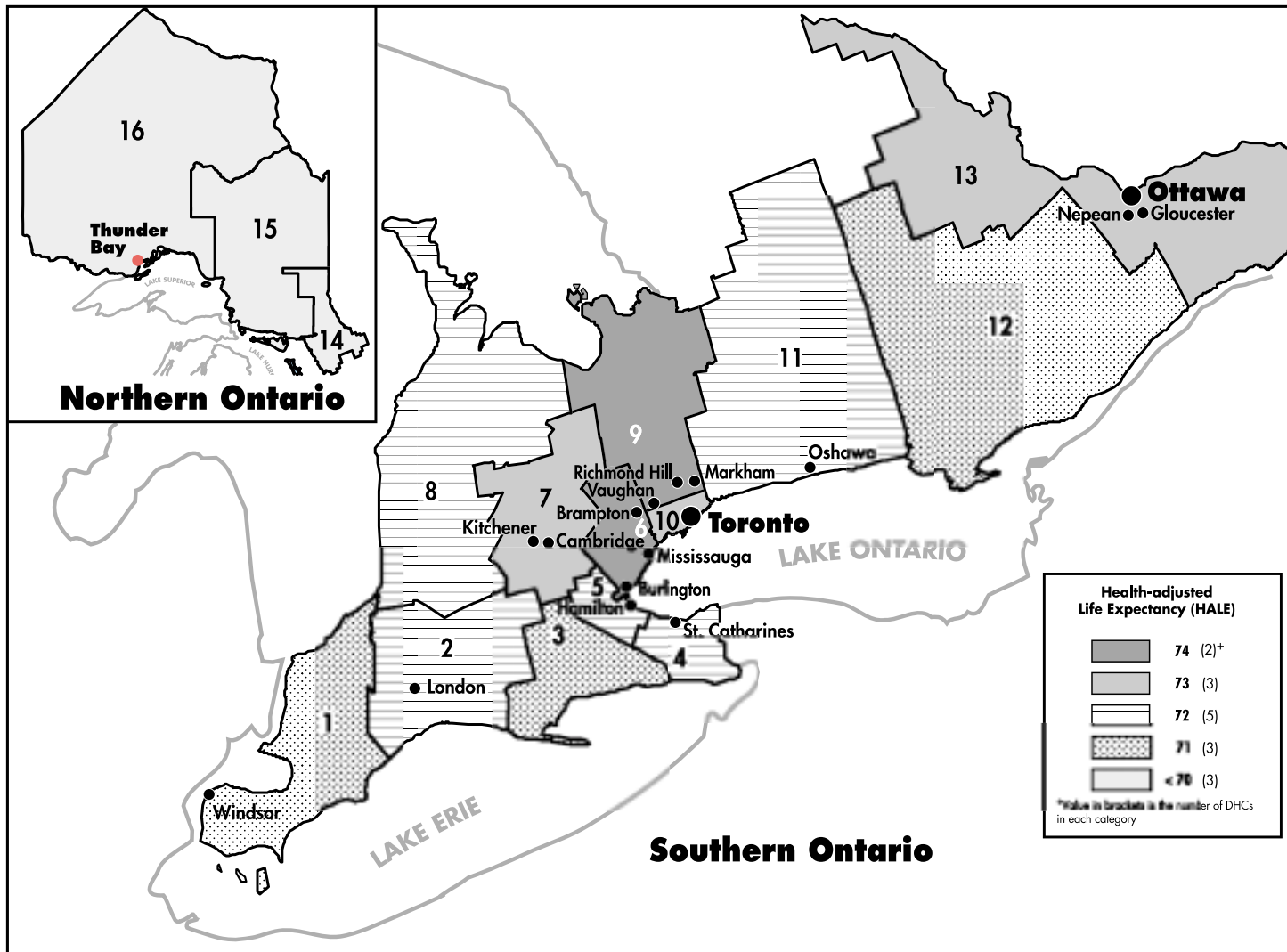**Exhibit 12: Overall Survival and Survival in Good Health in Ontario, 1990 and 1996/97**

Exhibit Highlights

✔ The survival curve is becoming increasing "rectangular" over time, indicating life expectancy continues to approach the maximum life span of 85 to 90 years.

✔ The area on the exhibit between the overall survival and survival in good health represents the amount of ill health. This area has decreased slightly between 1990 and 1996/97, indicating that there has been a compression of morbidity over this time.

Data Source: Registrar General; Statistics Canada; 1996/97 Ontario Health Survey

Exhibit 13: Health-adjusted Life Expectancy (HALE) for Men and Women Combined by District Health Council in Ontario, 1996/97

Northern Ontario

16

15

Thunder Bay

14

LAKE SUPERIOR

LAKE HURON

13

Ottawa
Nepean • Gloucester

12

11

9

Oshawa

8

7

Richmond Hill • Markham
Vaughan
Brampton • 10 **Toronto**
Kitchener • 6
Cambridge • Mississauga

LAKE ONTARIO

5 • Burlington
Hamilton

St. Catharines

2

3

4

London •

1

Windsor •

LAKE ERIE

Southern Ontario

Health-adjusted Life Expectancy (HALE)

74	(2)+
73	(3)
72	(5)
71	(3)
<70	(3)

*Value in brackets is the number of DHCs in each category
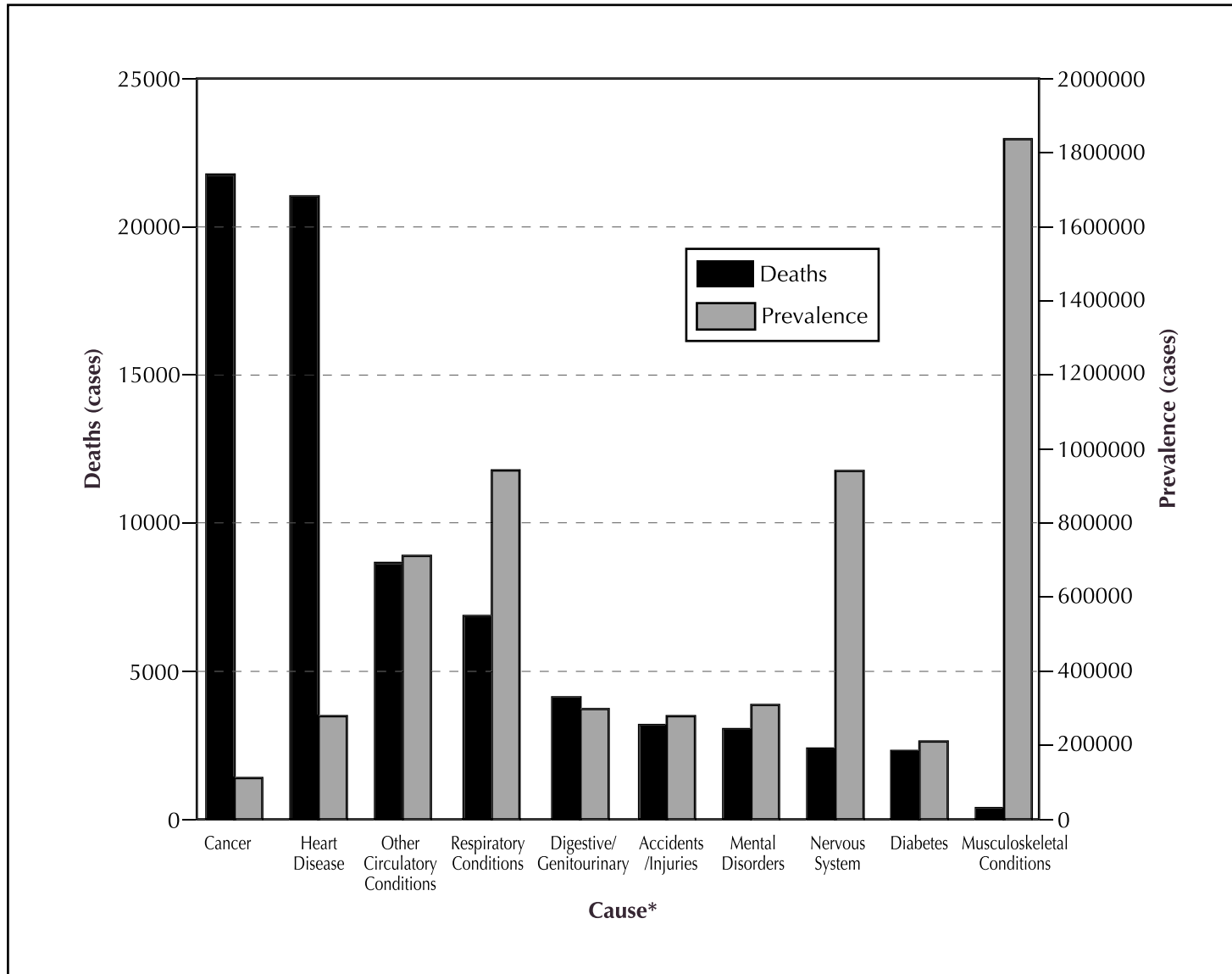
Exhibit Highlights

✔ Health-adjusted Life Expectancy (HALE) tends to be lower in the north and higher in the Ottawa/ Carleton and the south central regions.

Ontario District Health Councils:

1. Essex, Kent and Lambton
2. Thames Valley
3. Grand River
4. Niagara Region
5. Hamilton-Wentworth
6. Halton-Peel
7. Waterloo Region-Wellington-Dufferin
8. Grey, Bruce, Huron, Perth
9. Simcoe-York
10. Toronto
11. Durham, Haliburton, Kawartha and Pine Ridge
12. Quinte, Kingston, Rideau
13. Champlain
14. Muskoka, Nipissing, Parry Sound and Timiskaming
15. Algoma, Cochrane, Manitoulin and Sudbury
16. Northwestern Ontario

Data Source: Ontario Health Survey, Office of The Register General, Statistics Canada

Exhibit 14: Number of Deaths and Prevalence for Leading Causes of Mortality and Morbidity in Ontario, 1996/97*

Exhibit Highlights

✔ Diseases such as heart disease and cancer are the leading causes of death but are less common causes of disability than musculoskeletal conditions (such as arthritis).

* See Technical Supplement for disease group classifications.

Data Source: Health Indicators 1999, Statistics Canada; 1996/97 Ontario Health Survey

Exhibit 15: Impact of Eliminating Leading Causes of Death and Disability in Men in Ontario, 1996/97

Cause*	Cause-deleted Life Expectancy (years)	Cause-deleted Health-adjusted Life Expectancy (HALE) (years)	Cause-deleted Life Expectancy in a Healthy State (%)	Impact on Life Expectancy (years)	Impact on Health-related Quality of Life (HRQOL) (years)**	Impact on Health-adjusted Life Expectancy (years)***
Cancer (excluding benign neoplasms)	79.7	73.4	92.1	3.5	**-0.6**	2.9
Ischemic and Other Heart Disease	79.3	73.1	92.1	3.2	**-0.6**	2.6
Injuries (excluding suicide)	76.9	71.5	92.9	0.8	0.2	0.9
Other Circulatory Conditions	77.1	71.2	92.4	0.9	**-0.2**	0.7
Diseases of the Respiratory System	77.0	71.2	92.4	0.8	**-0.2**	0.6
Mental Disorders (includes suicide)	76.7	71.0	92.6	0.5	0.0	0.5
Diseases of the Digestive and Genitourinary Systems	76.7	70.9	92.5	0.5	**-0.1**	0.4
Diseases of the Musculoskeletal System	76.2	70.9	93.1	0.0	0.4	0.4
Diseases of the Nervous System and Sense Organs	76.4	70.8	92.7	0.3	0.0	0.3
Diabetes Mellitus	76.4	70.7	92.5	0.3	**-0.1**	0.2
All Other Causes	77.4	72.2	93.2	1.3	0.4	1.6
Overall Measures (no cause deleted)	**76.2**	**70.5**	**92.6**			

* See Technical Supplement for disease group classifications.

** "Impact on HRQOL" denotes the impact that eliminating a particular disease would have on the number of years lived in good health. Because some diseases cause more death than disability, eliminating them would result in an increase in life expectancy, but some of the extra years of life would be lived with other, more disabling conditions. Heart disease and cancer are examples of diseases whose elimination would likely result in an increase in overall life expectancy, but also an increase in the number of years spent in ill health. Eliminating musculoskeletal conditions, on the other hand, would not add to life expectancy, but would reduce the number of years spent in ill-health.

*** Impact on Health-adjusted Life Expectancy (HALE) is equal to the impact on life expectancy plus the impact on Health-related Quality of Life (HRQOL). Some totals may not match due to rounding.

Exhibit Highlights

✔ Among men, heart disease and cancer have the greatest impact on life expectancy. However, while eliminating them would result in an increase in life expectancy, there would also be an increase in the number of years spent in ill health from other disabling conditions.

✔ Elimination of injuries among men would result in an increase in both life expectancy and the number of years lived in good health.

Data Sources: Office of the Registrar General; Statistics Canada; 1996/97 Ontario Health Survey; 1990 Ontario Health Survey

Exhibit 16: Impact of Eliminating Leading Causes of Death and Disability in Women in Ontario, 1996/97

Cause*	Cause-deleted Life Expectancy (years)	Cause-deleted Health-adjusted Life Expectancy (HALE) (years)	Cause-deleted Life Expectancy in a Healthy State (%)	Impact on Life Expectancy (years)	Impact on Health-related Quality of Life (HRQOL) (years)**	Impact on Health-adjusted Life Expectancy (years)***
Cancer (excluding benign neoplasms)	84.9	76.9	90.5	3.5	**-0.8**	2.8
Ischemic and Other Heart Disease	84.2	76.1	90.4	2.8	**-0.8**	2.0
Injuries (excluding suicide)	81.9	74.8	91.4	0.4	0.2	0.7
Other Circulatory Conditions	82.6	75.0	90.7	1.2	**-0.4**	0.8
Diseases of the Respiratory System	82.2	74.7	90.8	0.8	**-0.2**	0.5
Mental Disorders (includes suicide)	81.8	74.4	91.0	0.3	0.0	0.3
Diseases of the Digestive and Genitourinary Systems	81.9	74.5	90.9	0.5	**-0.2**	0.4
Diseases of the Musculoskeletal System	81.5	75.2	92.3	0.1	0.9	1.1
Diseases of the Nervous System and Sense Organs	81.8	74.6	91.2	0.3	0.1	0.4
Diabetes Mellitus	81.7	74.3	90.9	0.3	**-0.1**	0.2
All Other Causes	82.4	75.6	91.8	1.0	0.5	1.5
Overall Measures (no cause deleted)	**81.4**	**74.1**	**91.0**			

Exhibit Highlights

✔ Cancer and heart disease are the leading causes of life years lost among women. Eliminating them would result in an increase in life expectancy, but also an increase in years spent in ill health.

✔ Musculoskeletal conditions have the third largest impact on health-adjusted life expectancy, due almost entirely to its large impact on disability/ill-health.

Notes:

* See Technical Supplement for disease group classifications.

** For an explanation of "Impact on Health-related Quality of Life (HRQOL)", please see Exhibit 15.

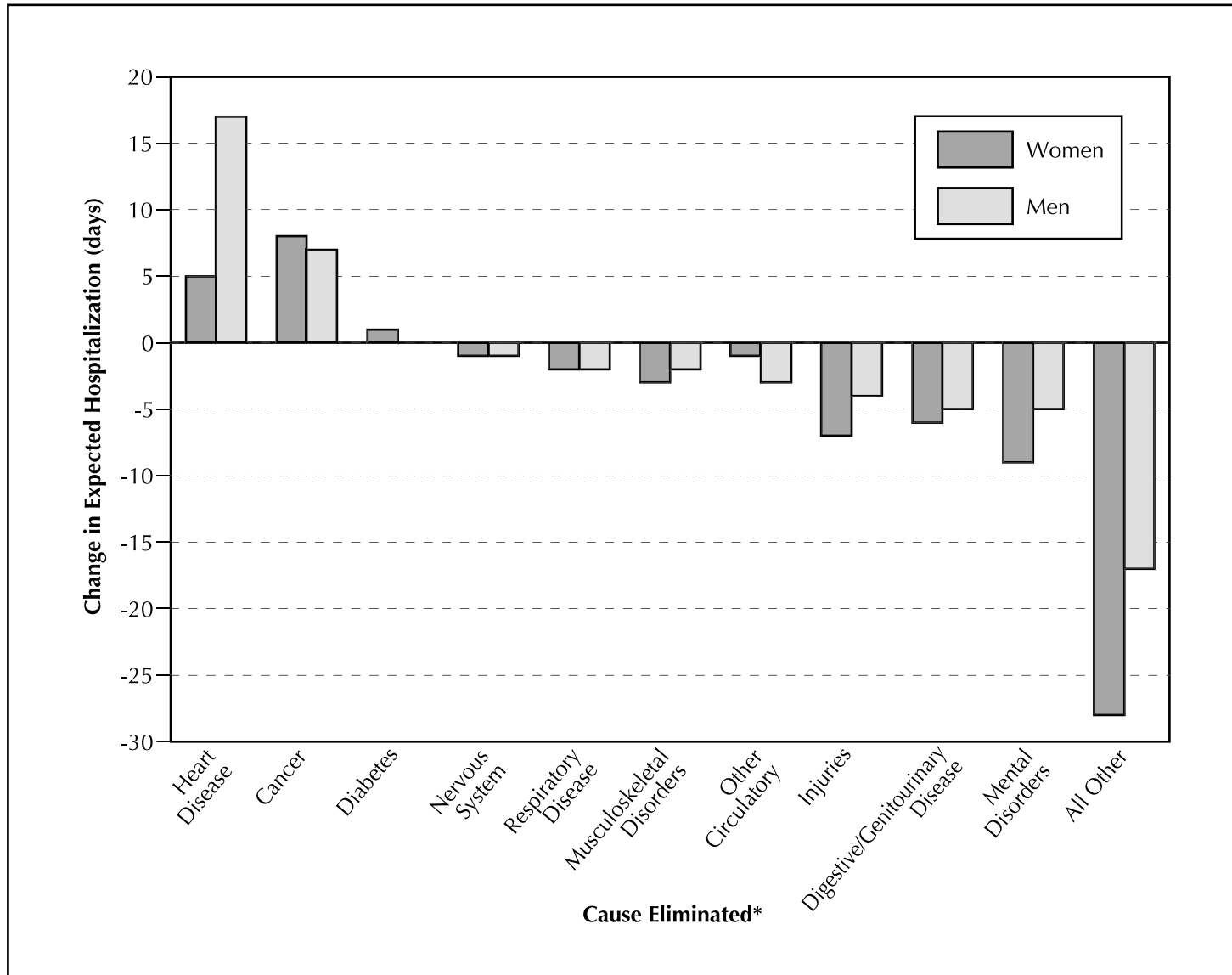*** For explanation of "Impact on Health-adjusted Life Expectancy (HALE)", please see Exhibit 15.

Data Sources: Office of the Registrar General; Statistics Canada; 1996/97 Ontario Health Survey; 1990 Ontario Health Survey

Exhibit 17: Impact of Eliminating Leading Causes of Death and Disability on Hospitalization in Ontario, 1996/97

Exhibit Highlights

✔ Eliminating the leading causes of mortality—heart disease and cancer—will result in an increase in the prevalences of less fatal but more disabling conditions, leading to an increase in hospitalization.

* See Technical Supplement for disease group classifications.

Data Source: Statistics Canada, Canadian Institute for Health Information

Glossary

compression of morbidity

a compression of morbidity means a reduction in the proportion of life spent in ill health. It occurs when life in good health increases more rapidly than life expectancy. The age distribution of a population will affect the total burden of morbidity in a society, which is different from the compression of morbidity. The increasing proportion of older people in Ontario will result in an increased number of morbid conditions. If HALE increases faster than life expectancy there will be a compression of morbidity.

health expectancy

health expectancy is a generic term for the expectation of life lived in a defined state of health, whether that is a state of good health (eg. disability-free) or poor health (eg. disabled, dependent). The international organization REVES (Réseau sur l'espérance de Vie en Santé)[47] has created a taxonomy to describe these measures. Specific health expectancy measures are used to describe the adjustment using different HRQOL indicators. These are broadly classified into two groups of measures: dichotomous measures such as *disability-free life expectancy* (DFLE) combine life expectancy with the proportion of disabled people; *health-adjusted life expectancy* (HALE) is a polychotomous measure that incorporates a utility-based HRQOL measure to combine discrete health states into a single indicator, indicating the expectation of equivalent years of good health. HALE is particularly attractive to health economists since it can be equitably valued against other health status measures such as life expectancy or disease-specific utility measures. Also, since HALE uses polychotomous weights it is sensitive to changes in the severity of disability within a population.

other related types of summary population health measure of morbidity and mortality such as disability-adjusted life years (DALYs)[27] or healthy-life years (HeaLYs)[48] measure the *health gap* between a specified health goal (ie. life expectancy without disability of 82.5 years for women and 80 years for men).

health-related quality of life (HRQOL) indicators

health-related quality of life, quality of life, health status, and functional status are concepts that are often used interchangeably as measures of health.[49, 50] *Quality of life* is generally considered a generic term that refers to aspects of life that may include concepts outside the usually defined boundaries of health, although we should recognize that factors such as income, education and the physical environment have important influences on health. *Health status* is usually defined as any measure of health, including negatively valued aspects such as death or disease. In this report, we separate measures of mortality and disease from HRQOL measures. Functional status is analogous to HRQOL in that they both refer to functioning at the body, individual and society levels,[20] regardless of whether a person is disabled.[51]

health utilities index

developed by McMaster University's Centre for Health Economics and Policy Analysis (CHEPA), the Health Utilities Index (HUI) is a summary measure of an individual's health.[52] It comprises six attributes: sensation (vision, hearing and speech), mobility, dexterity, emotion, cognition and pain, each of which has a number of levels. The six attributes are then combined into a single index which falls somewhere between 0 (death) and 1 (perfect health). The HUI are based on concepts of functional capacity rather than activities or participation. This "within the skin approach" was not adopted by other commonly used summary HRQOL life measures such as the MOS SF-36 (Medical Outcome Study 36-item Short-form Health Survey).[53] In this study we use separate measures such as restriction in activities of daily living to measures to assess activities or participation.

life expectancy

life expectancy is the average length of life that a person would be expected to live, given the mortality rate for a specific population and time period. Life expectancy should not generally be used as a predictive measure since mortality changes over time. For instance, it is correct to say that, based on the 1996/97 mortality rate, the Ontario life expectancy at birth for men is 76 years. It is incorrect to say that on average an infant born in 1996/97 will live 76 years.

life span

in the context of this report, life span is the average longevity that would be expected in society without disease, injury or other health risk factors. Life expectancy can rise towards but not exceed life span. The human life span is likely 85 to 90 years, with a broad distribution of natural longevity between 70 and 100 years. The oldest age achieved by an individual—122 years—is the "maximum life potential."[54] Cases of extreme longevity will increase in the coming decades as a larger cohort of people survive to their elderly years.

self-rated health status

self-rated health status is a simple, global measure of an individual's health status used on many population-based health surveys. It is based on the question, "In general, how would you rate your health?" or "In general, compared with others your age, how would you rate your health?" On US and Canadian surveys, the response choices are usually: "excellent, very good, good, fair or poor." European surveys use slightly different categories, either: "very good, good, fair, bad or very bad" or "very good, fairly good, average, fairly poor or poor." Self-rated health status is predictive of future mortality and health care utilization.

References

1.   World Health Organization. *World Health Report 1998.* Geneva: World Health Organinzation; 1998.

2.   World Health Organization. Constitution of the World Health Organization. Basic documentation: Geneva, Switzerland: World Health Organization; 1948.

3.   World Health Organization. Ottawa Charter for Health Promotion. *Ottawa, Canada* 1986.

4.   Fries J. Aging, natural death, and the compression of morbidity. *NEJM* 1980;303(3):130-135.

5.   Fries J. The compression of morbidity. *Milbank Memorial Fund Quarterly/ Health and Society* 1983;61(3):397-419.

6.   Olshansky S, Carnes B, Cassel C. In search of methuselah: Estimating the upper limits of human longevity. *Science* 1990;250:634-640.

7.   Ludwig FC. *Life span extension-consequences and open questions.* New York: Springer Pub. Co.; 1991.

8.   Robine J-M. *Longevity: To the limits and beyond.* Berlin ; New York: Springer; 1997.

9.   Olshansky S, Rudberg M, Carnes B, Cassel C, Brody J. Trading off longer life for worsening health. *Journal of Aging and Health* 1991;3(2):194-216.

10. Vaupel JW, Gowan AE. Passage to Methuselah: Some demographic consequences of continued progress against mortality. *Am J Public Health* 1986;76(4):430-433.

11. Gruenberg E. The failures of success. *Milbank Memorial Fund Quarterly* 1977;55:3-24.

12. Millar W, Hill G. The elimination of disease: A mixed blessing. *Health Reports* 1995;7(3):7-13.

13. World Health Organization. Development of indicators for monitoring progress toward health for all by the year 2000. WHO Health Series No. 4. Geneva: World Health Organization; 1981.

14. Goel V, Iron K, Williams J. *Chapter 2: Indicators of Health Determinants and Health Status.* In: Goel V, Williams J, Anderson G, Blackstein-Hirsch P, Fooks C, Naylor CD, editors. Patterns of Health Care in Ontario. 2nd ed. Ottawa: Canadian Medical Association; 1996.

15. Spasoff R. *Health for All Ontario: Report of the Panel on Health Goals for Ontario.* Toronto: Ontario Ministry of Health; 1987.

16. Premier's Council on Health Strategy. A Vision of Health. Health Goals for Ontario. Toronto: Premier's Council on Health Strategy; 1989.

17. Epp J. Achieving health for all: A framework for health promotion. Ottawa: Health and Welfare Canada, Ministry of Supply and Services Canada; 1986. Report No.: H39-102/1986E.

18. World Health Organization. Targets for Health for All. Copenhagen: WHO Regional Office for Europe; 1985.

19. Iron K, Goel V. *Chapter 2: Overview of Health Status of Ontario Residents.* In: Naylor CD, Anderson G, Goel V, editors. Patterns of Health Care in Ontario. 1st ed. Ottawa: Canadian Medical Association; 1994.

20. World Health Organization. ICIDH-2: International Classification of Functioning and Disability. Beta-2 draft, Full Version. Geneva: World Health Organization; 1999.

21. Farmer MM, Ferraro KF. Distress and perceived health: Mechanisms of health decline. *J Health Soc Behav* 1997;38(3):298-311.

22. Idler EL, Benyamini Y. Self-rated health and mortality: A review of twenty-seven community studies. *J Health Soc Behav* 1997;38(1):21-37.

23. Mathers CD. Gains in health expectancy from the elimination of diseases among older people. *Disabil Rehabil* 1999;21(5-6):211-221.

24. Mathers C. Estimating the gains in health expectancy due to the elimination of specific diseases. In: Paper presented at the fifth meeting of the International Network on Health Expectancy (REVES-5); 1992 February 19-21; Ottawa, Canada; 1992.

25. Manton KG, Stallard E. Cross-sectional estimates of active life expectancy for the U.S. elderly and oldest-old populations. *J Gerontol* 1991;46(3):S170-182.

26. Nusselder WJ, van der Velden K, van Sonsbeek JL, Lenior ME, van den Bos GA. The elimination of selected chronic diseases in a population: the compression and expansion of morbidity. *Am J Public Health* 1996;86(2):187-194.

27. Murray C, Lopez AD, editors. *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020.* Cambridge, Mass.: Published by the Harvard School of Public Health on behalf of the World Health Organization and the World Bank; Distributed by Harvard University Press; 1996.

28. Newman SC. The analysis of hospital morbidity data using life table methods. *Can J Public Health* 1988;79(1):45-48.

29. Wilkins K, Parsons GF, Gentleman JF, Forbes WF. Deaths due to dementia: An analysis of multiple-cause-of-death data. *Chronic Dis Can* 1999; 20(1):26-35.

30. Heliovaara M, Aromaa A, Klaukka T, Knekt P, Joukamaa M, Impivaara O. Reliability and validity of interview data on chronic diseases. The Mini-Finland health survey. *J Clin Epidemiol* 1993;46(2):181-191.

31. Jabine TB. Reporting chronic conditions in the National Health Interview Survey. A review of findings from evaluation studies and methodological test. *Vital Health Stat 2* 1987(105):1-45.

32. Gross R, Bentur N, Elhayany A, Sherf M, Epstein L. The validity of self-reports on chronic disease: characteristics of underreporters and implications for the planning of services. *Public Health Rev* 1996;24(2):167-182.

33. Beckett M, Weinstein M, Goldman N, Yu-Hsuan L. Do health interview surveys yield reliable data on chronic illness among older respondents? *Am J Epidemiol* 2000;151(3):315-323.

34. Wilkins K, Park E. Home care in Canada. *Health Reports* 1998; 10(1):29-37.

35. Manuel DG, Hockin J. Recent trends in provincial life expectancy. *Can J Public Health* 2000.

36. Martel L, Bélanger A. An analysis in the change in dependence-free life expectancy in Canada between 1986 and 1996. Ottawa: Statistics Canada; 2000. Report No.: 91-209-XPE.

37. Manton K, Stallard E, Tolley H. Limits to human life expectancy: Evidence, prospects and implications. *Population and Development Review* 1991;17(4):603-637.

38. van de Water H, van Vliet H, Boshuizen H. *The impact of "Substitute Morbidity and Mortality" on Public Health Policy*. The Netherlands: TNO Prevention and Health; 1994.

39. Badley E, Rothman L, Stephens M, Wong M. *Chapter 4: Availability of Services for People with Arthritis*. In: Badley E, Williams J, editors. Patterns of Health Care in Ontario: Arthritis and Related Conditions. Toronto: Institute for Clinical Evaluative Sciences; 1998. p. 35-62.

40. Chen J, Wilkins R. Seniors' needs for health-related personal assistance. *Health Reports* 1998;10(1):39-50.

41. Eyles J, Birch S. A population needs-based approach to health-care resource allocation and planning in Ontario: A link between policy goals and practice? *Can J Public Health* 1993;84(2):112-117.

42. Mustard CA, Derksen S, Black C. Widening regional inequality in premature mortality rates in Manitoba. *Can J Public Health* 1999;90(6):372-376.

43. Advisory Committee on Population Health. Toward a Health Future: Second Report on the Health of Canadians. Ottawa: Health Canada; 1999. Report No.: Cat H39-468/199E.

44. Advisory Committee on Population Health. Report on the Health of Canadians. Toronto; 1996 Sept. 10-11, 1996.

45. Health Canada. Population Health Approach. In: http://www.hc-sc.gc.ca/hppb/phdd/index.html, last accessed May 10, 2000.

46. Ebrahim S. Disability in older people: a mass problem requiring mass solutions. *Lancet* 1999;353(9169):1990-1992.

47. REVES (Réseau sur l'espérance de vie en santé). In: http://sauvy.ined.fr/reves/, last accessed August, 2000.

48. Hyder AA, Rotllant G, Morrow RH. Measuring the burden of disease: Healthy life-years. *Am J Public Health* 1998;88(2):196-202.

49. Patrick D, Bergner M. Measurement of health status in the 1990s. *Annu Rev Public Health* 1990;11:165-183.

50. Guyatt GH. A taxonomy of health status instruments. *J Rheumatol* 1995;22(6):1188-1190.

51. Bickenbach JE, Chatterji S, Badley EM, Ustun TB. Models of disablement, universalism and the international classification of impairments, disabilities and handicaps. *Soc Sci Med* 1999;48(9):1173-1187.

52. Torrance GW, Feeny DH, Furlong WJ, Barr RD, Zhang Y, Wang Q. Multi-attribute Utility Function for a Comprehensive Health Status Classification System: Health Utilities Index Mark 2. *Med Care* 1996; 34(7):702-722.

53. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992;30(6):473-483.

54. Shulman P. Design for living. *Scientific American Presents* 2000;11(2): 19-21.

Institute for Clinical Evaluative Sciences (ICES)

ICES is an independent, non-profit organization that conducts research on a broad range of topical issues to enhance the effectiveness of health care for Ontarians. Internationally recognized for its innovative use of population-based health information, ICES research provides evidence to support health policy development and changes to the organization and delivery of health care services.