Catalogue no. 82-005-XIE

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Statistics Canada Statistique Canada

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Statistics Canada

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Published by authority of the Minister responsible for Statistics Canada

March 2006

Catalogue no. 82-005-XIE
ISSN 1703-2180

Frequency: Irregular

Ottawa

Cette publication est disponible en français sur demande (nº 82-005-XIF au catalogue).

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

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Newsletter of the Health Analysis and Measurement Group, Statistics Canada *Spring 2006*

In this issue...

Population health impact of cancer in Canada, 2001

Cameron N. McIntosh

Cancer reduces both quantity and quality of life

Cancer takes a considerable toll on the Canadian population in terms of both number of deaths and potential years of life lost due to premature mortality.

However, the impact of cancer goes beyond the deaths it causes: another important outcome of cancer and its treatment is morbidity or reductions in health-related quality of life. Persons living with cancer may experience mental, physical, and social limitations that affect their health-related quality of life.

Time spent with the disease could be described as "not fully lived." In other words, a year lived with cancer could be considered as a portion of a year spent in full health. The amount of time "lost" depends on the severity of the limitations.

Estimates of the population health impact of cancer place mortality and morbidity on a common scale, namely lost time, and then combine them into a single numerical index. These years lost to cancer can be attributed to various cancer risk factors such as alcohol consumption, smoking, lack of fruit and vegetable consumption, obesity, and physical inactivity.

One-quarter of the impact of cancer is due to lung cancer

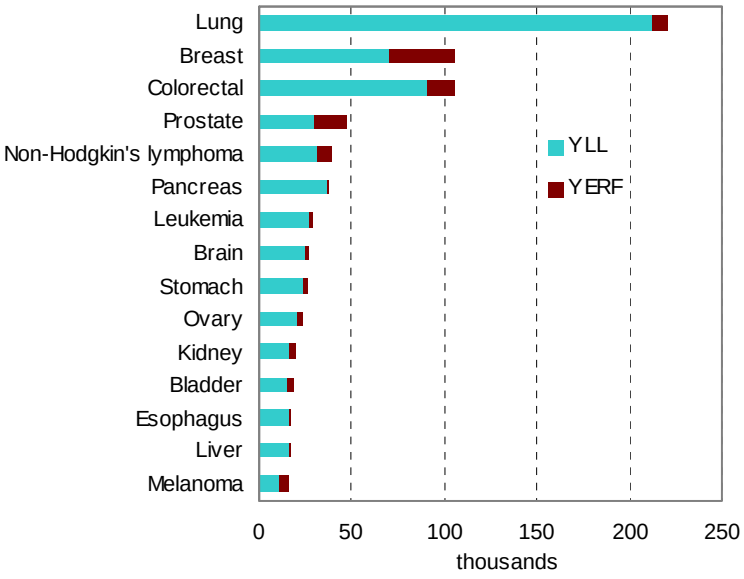
For the year 2001, we measured the population health impact of 25 different cancers using the health-adjusted life year (HALY) as a global index of mortality and morbidity.

HALYs summarize two distinct aspects of cancer impact: total years of life lost due to premature mortality (YLLs), and total year-equivalents lost due to reduced functioning (YERFs). YERFs are calculated by weighting the time spent in each cancer-related health state according to severity of functional limitations.

Across all 25 cancer types examined, the total number of HALYs was estimated to be 905,000; YLLs and YERFs comprised 85% (771,000) and 15% (134,000) of this total, respectively (Figure 1).

Lung cancer ranked highest, accounting for 221,000 years or almost one-quarter of the total HALYs, followed by breast and colorectal cancer.

Figure 1
Cancers with highest impact, Canada, 2001



Note: Estimates discounted at 3%.

HAMG conducts policy-relevant research and quantitative analysis of health and social issues

Statistics Canada Statistique Canada

Catalogue no. 82-005-XIE
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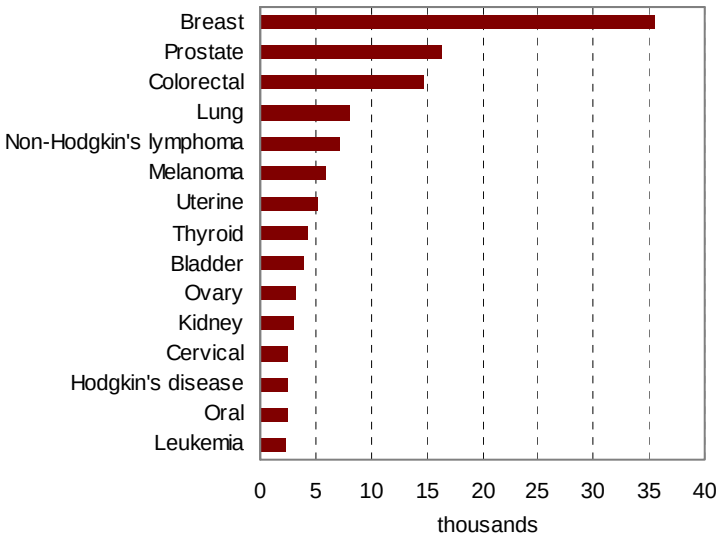
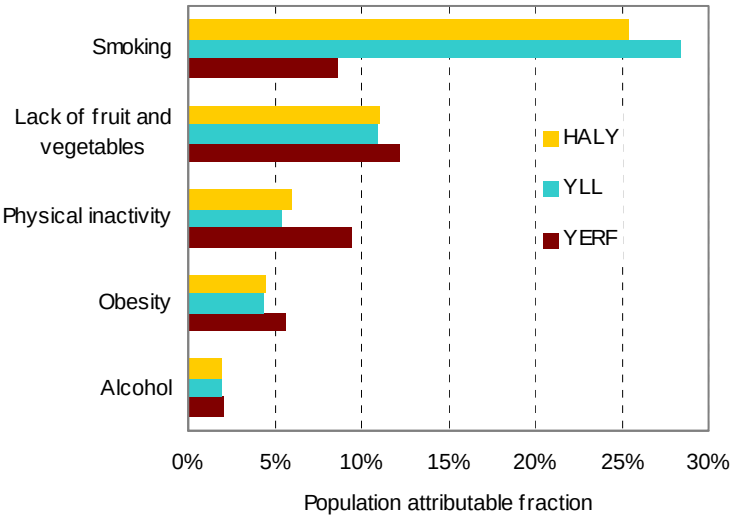
Figure 2
Cancers with highest morbidity, Canada, 2001



Note: Estimates discounted at 3%.

Figure 3
Cancer mortality and morbidity attributable to five risk factors, Canada, 2001



Our new look!

The new look of *...au courant* has been created by Francine Simoneau and Shannon McPhail of Publications Services, Analytical Studies Branch.

We are moving our listing of recent publications and presentations to electronic format only so we can dedicate these four pages to our feature article.

We hope you enjoy this new format!

To see our publications by subject or year, please visit http://www.statcan.ca/bsolc/english/bsolc?catno=82-005-XWE or email us at hamg@statcan.ca for a copy on CD.

Morbidity for breast cancer is four times that for lung cancer

While the mortality due to premature deaths (measured by YLLs) associated with breast and colorectal cancers combined is less than for lung cancer, a different picture emerges regarding morbidity.

Morbidity related to reduced functioning (measured by YERFs) for breast cancer alone is more than four times that of lung cancer. For colorectal cancer, it is about twice that of lung cancer (Figure 2).

This is largely due to the earlier detection and longer survival duration associated with both breast and colorectal cancers. Reduced functioning during many years after the cancers are in remission results in substantial losses in health-related quality of life within the population.

Much of the impact of cancer is attributable to modifiable risk factors

Estimates of mortality and morbidity were attributed to five major risk factors for cancer using standard methods for estimating population attributable fractions (PAFs). PAFs represent the proportion of cancer-related HALYs, YLLs, or YERFs that are attributable to a particular risk factor.

One-quarter of the impact of cancer (measured by HALYs) was attributable to smoking (Figure 3). But other factors were also important: lack of fruit and vegetable consumption (11%), physical inactivity (6%), obesity (5%), and alcohol consumption (2%).

These five risk factors are all potentially modifiable by individuals, so lifestyle changes could prevent considerable losses in both quantity and quality of life.

Quantifying morbidity is complex and challenging

Estimating the population health impact of cancer requires integration of data from many sources. Quantifying the effects of cancer on health-related quality of life is a particularly complex and challenging endeavour. As described below, it involves several steps: (1) developing descriptions for the various health states across the course of cancer and its treatment; (2) classifying this information on a series of standardized attributes; and (3) transforming the classification into a preference score that indicates the relative preference for these health states compared with full health. Preference scores are combined with epidemiologic and clinical measures such as incidence and duration to calculate YERFs, a measure of the impact of morbidity.

(1) Health state descriptions

The foundation for assessing cancer-related morbidity was a set of health state descriptions that capture the primary mental, physical, and social limitations associated with the disease and its treatment. Through an iterative process of literature review and expert medical consultation, the progression and treatment of cancer were partitioned into separate phases.

We identified a set of 21 distinct health states that could be used to represent the effect of cancer and its treatment as experienced by Canadians. These health states represent the "average case" at diagnosis, during treatment, and during remission and palliative/terminal care, since the objective was to measure cancer impact at the population level.

(2) Classification of health states

The health states were then classified using the Classification and Measurement System of Functional Health (CLAMES), a generic instrument consisting of 11 attributes relevant to daily living. Each attribute has four or five levels ranging from normal to severely limited functioning (Table 1).

For example, Figure 4 shows the health state for Remission after surgery, describing the long-term effects of having surgery for cancer.

This health state was classified as follows.

Pain or discomfort (PD) is level 2, mild pain or discomfort; Physical functioning (PF) is level 2, mild limitations in physical functioning, and so on. Level 1 indicates no limitations in that attribute.

These standardized and comprehensive health state descriptions allowed us to synthesize numerous different symptoms and functional limitations into a more compact and manageable form that can be transformed into a preference score.

More complete information about CLAMES and these health state descriptions for cancers is available at http://www.statcan.ca/bsolc/english/bsolc?catno=82-619-MWE2005001

(3) Preference scores

Preference scores express the classification across the 11 attributes as a single number between 0 (death) and 1 (full health) that reflects health-related quality of life.

A preference score was calculated for each of the 21 health states using a scoring function derived from preference measurement exercises among lay Canadians (Table 2). The most dramatic decreases in functional health as measured by preference scores are experienced for cancers diagnosed as metastatic disease and for palliative and terminal care.

The scoring function for CLAMES is available free of charge, and in a practical and user-friendly format, to health professionals and researchers for use in population health measurement and economic evaluation of health care programs or intervention strategies. For more information see http://www.phac-aspc.gc.ca/phi-isp/index.html

Figure 4
Health state description and classification for one health state related to cancer

Remission after surgery

Description

This description includes the long-term effects of having had surgery only, not in combination with any other therapy. Fatigue, insufficient sleep and insomnia are reported following surgery. Patients requiring radical surgery frequently report severely restricted social and sexual activities. Breast cancer patients experience numbness, pain and swelling in the affected arm; lung cancer patients complain of dyspnea; those having surgery for colorectal or prostate cancer can experience persistent bowel and/or bladder problems. Anxiety and psychological distress can result from follow-up visits.

Classification

PD	PF	ES	FA	MT	SR	AN	SP	HE	VI	HF
2	2	2	2	1	3	2	1	1	1	1

Table 1
CLAMES attributes

Attributes	Number of levels
Pain or Discomfort (PD)	4
Physical Functioning (PF)	4
Emotional State (ES)	5
Fatigue (FA)	4
Memory and Thinking (MT)	5
Social Relationships (SR)	5
Anxiety (AN)	4
Speech (SP)	4
Hearing (HE)	4
Vision (VI)	4
Use of Hands and Fingers (HF)	5

Table 2
Preference scores for cancer health states

At diagnosis	
Very good prognosis	0.891
Fairly good prognosis	0.853
Poor prognosis	0.809
Metastatic disease	0.439
Childhood acute lymphoblastic leukemia	0.732
Chronic lymphocytic leukemia	0.940
Treatment	
Surgery in-patient	0.732
Surgery out-patient	0.853
Radiotherapy curative	0.781
Radiotherapy palliative	0.507
Chemotherapy mild toxicity	0.750
Chemotherapy moderate toxicity	0.742
Chemotherapy severe toxicity	0.706
Hormonal therapy	0.896
Bone marrow transplantation	0.864
Remission	
After surgery	0.894
After radiotherapy	0.891
After chemotherapy	0.926
After hormonal therapy	0.912
Palliative care	0.484
Terminal care	0.179

Integrating the data: structured workbooks

Structured workbooks with linked databases were developed to manage preference scores and other epidemiologic and clinical data used to calculate HALYs and PAFs by age group and sex.

Currently, these tools provide overall Canadian estimates, and the linked databases are focused on cancer. However, the system provides a structured framework for organizing the various pieces of information needed for calculating different summary measures of population health, and is readily adaptable for use with other diseases and populations.

The workbooks, a user guide, and a peer-reviewed article that describes the calculations are available free of charge at http://www.pophealthmetrics.com/content/3/1/5.

A versatile framework to inform policy

The present findings and methods are informative from both a research and policy perspective. First, the HALY estimates provided here illuminate the impact of cancer on the health of the Canadian population for the year 2001. This includes the premature mortality related to cancer deaths in 2001 and the morbidity related to cancers diagnosed in 2001. The years lost to morbidity, while small in relation to those for mortality, are considerable. Up to half of the impact of cancer overall can be attributed to potentially modifiable risk factors; intervention strategies geared toward producing lifestyle changes could yield improvements in population health.

Second, the methods described here provide a versatile framework for measuring and comparing the relative impact of numerous other major diseases and risk factors that affect Canadians. This approach has the potential to inform health policy making and priority-setting. It will contribute to the evidence base necessary for public health priority setting and the allocation of limited societal resources to different treatment and intervention programs.

The data gathered for these estimates also provide a foundation for a microsimulation model for cancer, which is now being developed as part of the Population Health Impact of Disease in Canada (PHI) research program.

Microsimulation provides a dynamic approach that considers previous and subsequent disease events and changes in risk factors over time and incorporates co-morbidity of multiple health conditions. This approach will allow us to evaluate, much more realistically and directly, various "what-if" scenarios regarding potential interventions. For example, "How would an increase in physical activity affect cancer in Canada over the next 10 years?"

The next phase of the PHI will examine the population health impact of four major disease categories–diabetes, musculoskeletal conditions, mental health, and cardiovascular disease–all of which have been previously linked to a growing health problem in Canada and other countries: obesity.

Visit our website for more information

This work contributes to the Population Health Impact of Disease in Canada research program, a collaboration of Statistics Canada, the Public Health Agency of Canada, and researchers from McGill University, the University of Ottawa, the University of Manitoba, the Institute for Clinical Evaluative Sciences (ICES) and l'Agence de développement de réseaux locaux de services de santé et de services sociaux de la Montérégie.

More details are available as follows:

Methods and preliminary results for cancers: http://www.phac-aspc.gc.ca/phi-isp/index.html

Health state descriptions: http://www.statcan.ca/bsolc/english/bsolc?catno=82-619-MWE2005001

Workbooks: http://www.pophealthmetrics.com/content/3/1/5

Cameron N. McIntosh *has been an analyst with HAMG since 2002. He obtained his MA in psychology in 2000 from the University of Saskatchewan. His current research interests include the measurement of health status, and both basic and applied issues in statistics.*

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. . . au courant is published three times a year by the Health Analysis and Measurement Group, Statistics Canada.

Aussi disponible en français.

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