EXSPANSE

A REPORT FROM THE CANCER SURVIVAL & PREVALENCE ANALYTIC NETWORK

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The increasing number of people surviving cancer will impact follow-up care and support services in the future.

Surviving cancer

A diagnosis of cancer is overwhelming. The news can turn worlds upside down and it affects people physically, emotionally, socially and spiritually. Not only do patients and their families turn to cancer survival statistics to understand what to expect in terms of lifespan, longevity and quality of life, but physicians and health care professionals as well as policy makers rely on this information too.

As defined by SEER, the Surveillance Epidemiology and End Results branch of the National Cancer Institute, conditional survival is the likelihood of an individual - having already survived for a certain duration or number of intervals after a diagnosis of cancer - continuing to survive for a specified timeframe after that point. For example, conditional survival can be used to estimate the probability of surviving to the 5-year mark given that someone has survived the first year after diagnosis.

In the case of regular survival statistics a patient's prognosis is estimated only at the time of diagnosis. However, survival probability changes over time and estimates made at diagnosis are no longer applicable after a patient has survived for a period of time after diagnosis and treatment, making conditional survival a more accurate estimate because it accounts for continuously changing hazard rates over time.[1] This makes conditional survival unique because it offers a message of hope for cancer survivors and provides a look at what the future could hold.

Survivorship is a significant topic in cancer control and conditional survival is an important statistic for patients living with a cancer diagnosis.

In a 1999 paper in CHEST, *The Definition of Survival*, Dr. Robert Thurer touched on the idea that statistical description may represent an attempt to gain a sense of control over illness, but does it really do this?

He reasoned that concern over negative statistics may serve to mask the positive interventions that can prolong life and ease pain. He stated, "A preoccupation with data may dehumanize rather than help patients and their loved ones. When using numbers, we must be careful to relate them to a patient's particular situation in an understandable fashion."

As noted in our cover story, conditional survival is a statistic that offers hope. During C-SPAN's sessions with patient advocates, we often heard how people wanted to "see themselves" in cancer survival reports as well as wanting to know what the picture looks like today and how have things improved.
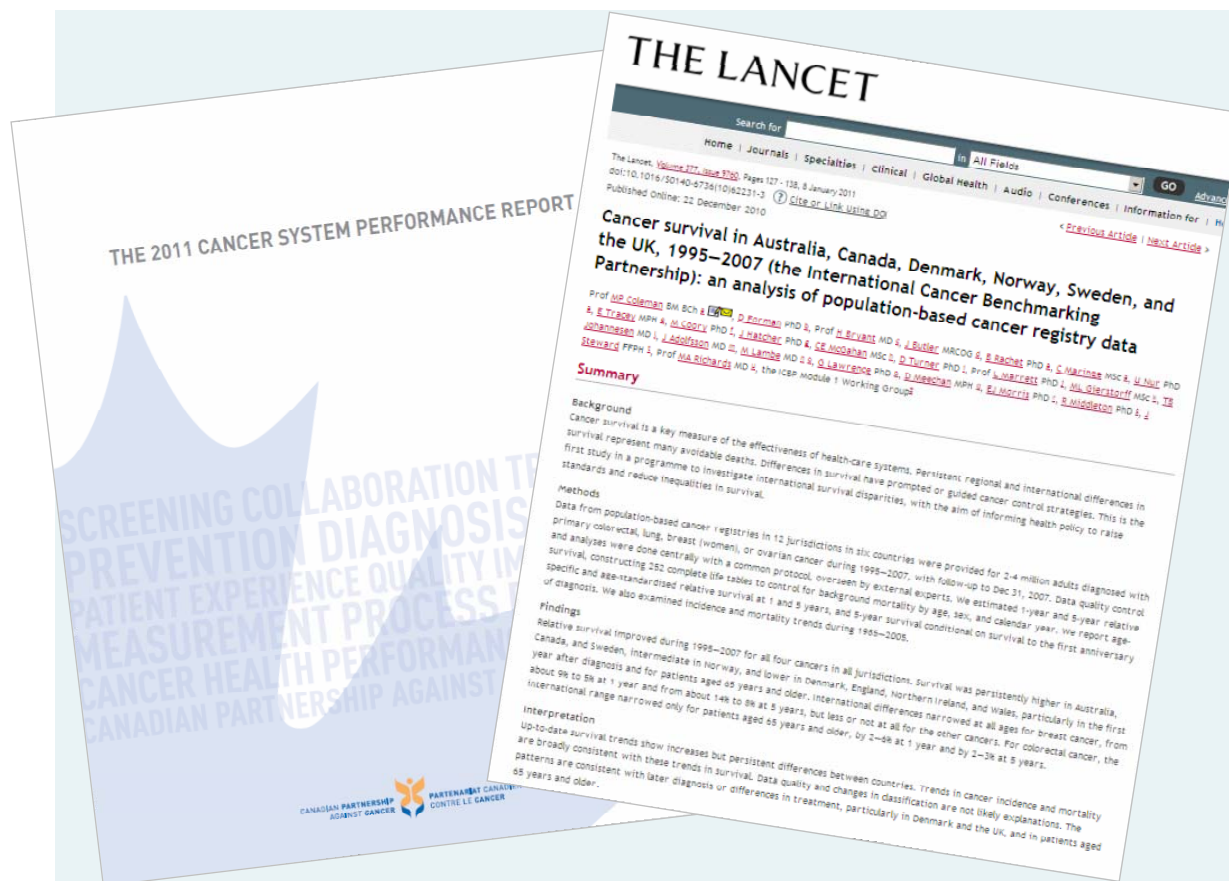
Conditional survival helps us to further understand the cancer journey, and it is an important way of viewing survivorship. In many cases conditional survival demonstrates that patients who survive the first year are more likely to live to five years. This inspires those of us working in the health care system to find cancer earlier and employ treatment when cancers are small and interventions more effective.

I'm very pleased the Canadian Partnership Against Cancer is featuring conditional survival in its recent system performance reports in addition to "regular" relative survival; by combining these statistics the story becomes much clearer and richer in detail.

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THE 2011 CANCER SYSTEM PERFORMANCE REPORT

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Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995–2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data

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Summary

Background
Cancer survival is a key measure of the effectiveness of health-care systems. Persistent regional and international differences in survival represent many avoidable deaths. Differences in survival have prompted or guided cancer control strategies. This is the first study in a programme to investigate international survival disparities, with the aim of informing health policy to raise standards and reduce inequalities in survival.

Methods
Data from population-based cancer registries in 12 jurisdictions in six countries were provided for 2·4 million adults diagnosed with primary colorectal, lung, breast (women), or ovarian cancer during 1995–2007, with follow-up to Dec 31, 2007. Data quality control and analyses were done centrally with a common protocol, overseen by external experts. We estimated 1-year and 5-year relative survival, constructing 252 complete life tables to control for background mortality by age, sex, and calendar year. We report age-specific and age-standardised relative survival at 1 and 5 years, and 5-year survival conditional on survival to the first anniversary of diagnosis. We also examined incidence and mortality trends during 1985–2005.

Findings
Relative survival improved during 1995–2007 for all four cancers in all jurisdictions. Survival was persistently higher in Australia, Canada, and Sweden, intermediate in Norway, and lower in Denmark, England, Northern Ireland, and Wales, particularly in the first year after diagnosis and for patients aged 65 years and older. International differences narrowed at all ages for breast cancer, from about 9% to 5% at 1 year and from about 14% to 8% at 5 years, but less or not at all for the other cancers. For colorectal cancer, the international range narrowed only for patients aged 65 years and older, by 2–6% at 1 year and by 2–3% at 5 years.

Interpretation
Up-to-date survival trends show increases but persistent differences between countries. Trends in cancer incidence and mortality are broadly consistent with these trends in survival. Data quality and changes in classification are not likely explanations. The patterns are consistent with later diagnosis or differences in treatment, particularly in Denmark and the UK, and in patients aged 65 years and older.

This section is designed to engage, educate and learn from the end-users of cancer surveillance information so that we can create products that work for you.

What conditional survival can tell you

The first year of survival after a cancer diagnosis is a critical time for patients and families and it also is a time when acute care resources are most required. In this first year, the risk of death is a lot higher. Therefore it's essential to encourage investment in things that are likely to improve survival in that first year. The key here is finding cancer at an early stage and initiating effective treatment.

Previous studies have shown that UK nations often have poorer cancer survival outcomes than comparable countries. To understand how and why survival rates vary, the International Cancer Benchmarking Partnership (ICBP) was established in 2009. Made up of representatives from six countries including Canada, the ICBP is comparing cancer services, processes and the public's interaction with the healthcare system across the participating jurisdictions to identify reasons for the observed differences in survival. By understanding critical differences and similarities between UK nations and those countries with better survival rates, all members will be able to build a picture of where improvements could be made.

The ICBP released it first paper last year. Results from *Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995-2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data* found substantial variations in 5-year relative survival, but these variations were diminished for conditional survival (that is, for those who survived the first year). This suggests that the UK's poorer survival at 5 years was largely due to poorer survival in the first year following diagnosis.

This spring, a Canadian publication - *Conditional survival analyses across cancer sites* by Larry F. Ellison, Heather Bryant, Gina Lockwood and Lorraine Shack – showed that conditional survival data provides more accurate prognostic information about how the risk of death changes over time. The data were also featured in the Canadian Partnership Against Cancer's 2011 System Performance Report (http://www.cancerview.ca/idc/groups/public/documents/webcontent/2011_system_performance_rep.pdf). Co-author Lorraine Shack provides more detailed insight based on her experiences on the back page of this edition of exSPANse.

These reports demonstrate that conditional survival statistics can be used to help focus attention on the importance of early detection and successful treatment soon after cancer is diagnosed, in order to effect change in longer-term survival statistics.

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Area of interest
Most of Mengzhe's current work focuses on cancer surveillance methodology including survival and prevalence analysis, cancer projection methodology and cancer risk factor surveillance. She is currently involved in three national networks: Cancer Survival and Prevalence Analytic Network, Cancer Projection networks, and the Colorectal Cancer Networks.

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Conditional survival estimates can be helpful for patients and providers to help guide health-related decisions [2-4] which may in turn drive patients and clinicians to make more appropriate decisions regarding follow-up, surveillance testing and future treatment. [5]

The good news is that once someone has survived that all important first year after diagnosis, the longer their survival is likely to be.

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Taking the fall line to   conditional survival
Ski enthusiast Lorraine Shack moguls   *through this important statistic*

Traditional cancer survival is usually assessed from the time of diagnosis to one, five or ten years after diagnosis. As mortality is highest soon after diagnosis, the probability of surviving a subsequent year(s) will improve over time. Conditional survival estimates the likelihood of surviving an additional number of years (e.g., four years into the future) given that a patient has already survived a certain number of years (e.g., one year since diagnosis).

Conditional survival can be assessed at anytime since diagnosis. It is normally estimated as the likelihood of surviving four subsequent years conditional on already having survived the first year (i.e., five years in total from start time) or the likelihood of surviving five years conditional on already surviving the first year (i.e., six years in total from start time). Estimates for conditional survival provide a more positive estimate for patients who have already survived one or more years since diagnosis. It can also focus on time periods since diagnosis that may be clinically relevant due to the late effects of treatment.

The rate of improvement in conditional survival over time, and the specific time interval since diagnosis where the greatest improvement in survival occurs, will vary depending on the cancer type and associated prognosis. The improvement in conditional survival with time since diagnosis is generally rapid for cancers in which there is a particularly high mortality soon after diagnosis, such as lung cancer.

Conversely, for cancers with a good prognosis, conditional survival is high and improves marginally with time since diagnosis. For example the prognosis for breast cancer is generally good and conditional survival generally improves with time since diagnosis, but this improvement is small compared to lung cancer.

Conducting conditional survival is not in itself a complicated analysis, but the stratification of follow-up periods can result in issues with sample size. Most commonly it is conducted using relative survival but it can be conducted for observed survival (e.g., all cause mortality) or other measures of net survival (e.g., cause-specific survival).

Excluding the period where the most deaths occur results in a substantial proportion of deaths and cases that are excluded thus decreasing the sample size. The sample size required for conditional survival is not a set number but rather it requires the same sample size as required for a standard survival calculation but because individuals who die during the first period are excluded the sample size is smaller than traditional survival. This issue must be managed as it would for any survival analysis by a careful selection of the cohorts to be analyzed. This may limit conditional survival to the main cancers, require grouping of years and limit age-specific analysis, particularly in sub-national analysis.

When there is a change in mortality over follow-up periods, survival should be assessed separately or take these changes taken into account. Assessing survival at different time periods since diagnosis can identify the key areas of improvement.

For some cancers, like testis or thyroid, conditional relative survival improves to 100% after a few years. When relative survival reaches 100%, the cohort of cancer patients has similar mortality to that of the general population.

For cancers that continue to have mortality long after diagnosis, conditional relative survival may not reach that of the population for decades if at all. When compared by demographic, prognostic or geographic variations, these trends can assist in identifying areas were outcomes are less than optimal for targeting.

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