OncoSim

LUNG

CANADIAN **PARTNERSHIP** AGAINST **CANCER** **PARTENARIAT** CANADIEN CONTRE LE **CANCER**

Overview

OncoSim is a tool built using Canadian data, collaboratively by a team of clinicians, epidemiologists, statisticians, mathematical modellers, and health economists, all experts in their respective fields. Its projections have also been compared to real-world data. The tool helps researchers, policy advisors, and decision-makers project the impact of policy change and support resource allocation decisions related to cancer control. It helps fill information gaps when data is lacking or where clinical trials or practice experiments are not feasible.

Why OncoSim is a game changer

OncoSim is a free, web-based simulation tool that evaluates cancer control strategies. Combining data from the real world, expert opinion, and the published literature, OncoSim projects health and economic outcomes and attributes them to 27 risk factors, such as smoking and inadequate physical activity. It currently models four cancer sites (breast, colorectal, lung, and cervical) and related screening programs in detail, and it provides high-level projections for 28 other cancer sites. This unique and sophisticated tool is used by decision-makers across Canada to better understand the impact and value of cancer control investments.

Working for you

OncoSim has helped policy analysts, clinicians, researchers, and program managers assess and report on a variety of cancer control issues. Built for public sector use, OncoSim is available free on an online platform with 24/7 access. Users can export OncoSim's projections to a computer for reference, analysis, and presentation.

OncoSim-Lung

OncoSim-Lung is a mathematical simulation model of lung cancer; it reflects disease progression and clinical treatment pathways consistent with current knowledge and evidence-based practice of lung cancer in Canada. OncoSim simulates large, representative samples of the Canadian population, one individual at a time, from birth to death. In addition to lung cancer incidence and progression, OncoSim-Lung has smoking cessation and lung cancer screening modules. The model aggregates the projected outcomes at the provincial/ territorial- and national-level. Examples of outcomes include smoking rates, number of individuals eligible for lung cancer screening, number of computed tomography scans, lung cancer incidence by stage, life-expectancy, quality-adjusted life-years, and health care costs.

Model input

The model was built using Canadian data, whenever available, from a wide range of sources including Canadian vital statistics, community health surveys, cancer registries, healthcare administrative databases, and peer-reviewed literature. The input was supplemented with expert opinion when necessary. Users can change the model input to answer specific policy questions.

Smoking and radon

The model captures the impact of smoking and radon exposure on lung cancer. Users can modify population smoking behavior by specifying the prevalence of smoking and level of exposure (non-smoker, number of cigarettes smoked, and years since quit smoking). The baseline smoking behavior is simulated to match Canadian survey data over time, by age, sex, and jurisdiction. To evaluate interventions related to radon exposure, the model has included input such as the mean radon exposure by jurisdiction and costs associated with interventions to reduce radon levels.

Screening

The screening module was developed based on the National Lung Screening Trial, including eligibility criteria, diagnostic procedures to follow-up positive screens, stage shift associated with screening, sensitivity and specificity of low-dose CT, etc.[1] For evaluating lung cancer screening programs, the model includes a screen-detectable preclinical cancer phase – the period before diagnosis of lung cancer. The duration of the screen-detectable phase was estimated together with the sensitivity of screening to fit the number of lung cancer cases in the National Lung Screening Trial.[2] Users can specify the characteristics and cost of the lung screening program to evaluate its effectiveness and cost-effectiveness.

Disease progression and quality of life

Lung cancer incidence and stage at the time of diagnosis are based on data from the Canadian Cancer Registry.[2] Stage-specific survival was estimated using health care administrative data in Ontario and the Canadian Cancer Registry. Lung cancer mortality was calibrated to the Canadian Mortality Database. The model assumes that individuals with lung cancer have a lower health-related quality of life than the general population; health-related quality of life varies by stage and declines further during treatment.

Costs associated with lung cancer

The model includes health care costs associated with lung cancer from the perspective of the public payer: physician visits, laboratory services, hospitalizations, chemotherapy, radiotherapy, and drugs.

The default costs were estimated by following a cohort of lung cancer patients in Ontario and extracting the associated administrative data to capture the publicly funded healthcare costs incurred throughout their lung cancer treatment. Users can modify costs to better reflect treatment patterns and costs in specific jurisdictions.

Questions the model answers

Using OncoSim-Lung, users can estimate the economic burden of lung cancer and the impact of interventions on lung cancer-related outcomes. The model has been applied to assess the impact of smoking cessation programs, lung cancer screening strategies, and new lung cancer treatment options.[3-9] Using this model, users can also assess interventions to reduce radon exposure.
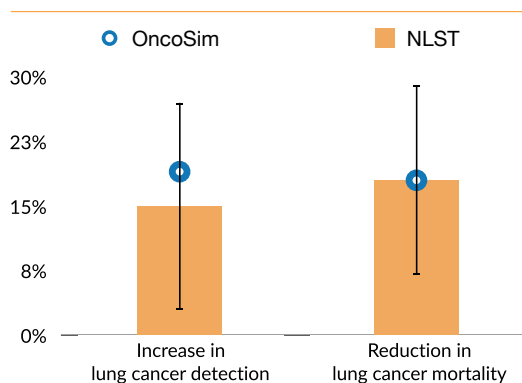
Validation

The model has reproduced the effects of lung cancer screening observed in the National Lung Screening Trial (NLST), a randomized clinical trial that led to a recommendation of computed tomography screening in people at high risk of getting lung cancer.[10]

OncoSim vs. Observed data

Impact of lung cancer screening
OncoSim's projected impact of lung cancer screening on lung cancer incidence and mortality were well within the observed confidence intervals of the National Lung Screening Trial (NLST).[2]

○ OncoSim   ▮ NLST

30%
23%
15%
8%
0%

Increase in lung cancer detection   Reduction in lung cancer mortality

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About the Canadian Partnership Against Cancer

The Canadian Partnership Against Cancer was created by the federal government in 2006 with funding through Health Canada to work with Canada's cancer community to implement the Canadian Strategy for Cancer Control to reduce the incidence of cancer, lessen the likelihood of Canadians dying from cancer, and enhance the quality of life of those affected by cancer.

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