

OncoSim

BREAST



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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-Breast

OncoSim-Breast is a mathematical simulation model of breast cancer; it models the natural history and progression of breast cancer and includes a detailed screening module. The model reflects disease progression and clinical treatment pathways consistent with current knowledge and evidence-based practice of breast cancer in Canada. OncoSim simulates large, representative samples of the Canadian population, one individual at a time, from birth to death. The model reports its projections, such as life-years and health care costs, at the provincial/territorial- and national-level. Examples of screening-related outcomes include number of individuals eligible for breast cancer screening, abnormal call rates, and number of biopsies.

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, screening program databases, 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.

Risk factors

OncoSim-Breast includes breast cancer risks factors such as hormone-replacement therapy (estrogen and progesterin), genetics (BRCA 1/2 and family history), and breast density.

Natural history and cancer detection

OncoSim-Breast simulates the natural history of tumour birth (invasive or ductal carcinoma in situ), growth, and spread. Tumour stage depends on tumour size, nodal involvement, and metastasis. To estimate the effect of screening, the model includes a screen-detectable preclinical cancer phase – the period before clinical diagnosis of breast cancer. The duration of the screen-detectable phase was estimated together with the sensitivity of screening to fit the breast cancer incidence and mortality in the Canadian Cancer Registry. Screening-related input was calibrated to match observed data in the Canadian Breast Cancer Screening Database. Users can specify the characteristics and cost of the breast screening program (e.g. age to start screening, frequency, type of screening) to evaluate its effectiveness and cost-effectiveness.

Disease progression and health-related quality of life

Disease progression (relapse and survival) depends on the stage at diagnosis, age, biology (estrogen and progesterone receptor, and HER2 status), and screening status. The model assumes that individuals with breast 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 breast cancer

The model includes health care costs associated with breast cancer from the perspective of the public payer: physician visits, laboratory services, hospitalization, chemotherapy, radiotherapy, drugs, home care, and long-term care. The default costs capture the publicly funded healthcare costs associated with breast cancer, estimated from a health care administrative database analysis. Users can modify costs to better reflect treatment patterns and costs in specific jurisdictions.

Questions the model answers

Using OncoSim-Breast, users can estimate the economic burden of breast cancer and the impact of interventions on breast cancer-related outcomes. For example, users can compare breast cancer screening strategies, varying age, screening intervals and follow-up protocols; users can also assess quality improvement initiatives related to breast cancer screening.

Validation

OncoSim-Breast has reproduced the predicted breast cancer screening effects from the Wisconsin Breast Cancer Epidemiology Simulation Model, another established breast cancer microsimulation model that is well validated.¹ Work is ongoing to compare OncoSim-Breast's projections with observed data in breast cancer screening trials and more recent data in the Canadian Cancer Registry and Canadian Breast Cancer Screening Database.

References

1. van den Broek JJ, van Ravesteijn NT, Mandelblatt JS, et al. Comparing CISNET Breast Cancer Incidence and Mortality Predictions to Observed Clinical Trial Results of Mammography Screening from Ages 40 to 49. *Med Decis Making* 2018; 38(1_suppl): 140S-50S.

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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