OncoSim

Formerly the Cancer Risk Management Model

Informing decisions in cancer control

CANADIAN PARTNERSHIP AGAINST CANCER | PARTENARIAT CANADIEN CONTRE LE CANCER

The comparative impacts of cervical cancer screening guidelines on the overdiagnosis of precancerous lesions in Canada

Preventing Overdiagnosis Conference
August 17-19, 2017 Quebec City, QC

Cindy Gauvreau PhD[1], Natalie Fitzgerald MA[1], Joy Pader MPH[1], Saima Memon MPH[1], William Flanagan BM[2], Claude Nadeau PhD[2], Catherine Popadiuk MD[3], Andrew Coldman PhD[4], Anthony Miller MD[5]

[1]Canadian Partnership Against Cancer, Toronto, ON, [2]Statistics Canada, Ottawa, ON, [3]Memorial University, St. John's, NL, [4]BC Cancer Research Centre, Vancouver, BC, [5]University of Toronto, Toronto, ON

Background and Objectives

- **While beneficial, cervical cancer screening could also result in physical and psychological deleterious effects from overtreatment of self-limiting and reversible precancerous cervical lesions**
- **Canadian jurisdictions implement screening following different local guidelines, leading to different resource use and outcomes, including those related to overdiagnosis/overtreatment**
- **Using the OncoSim microsimulation model* we projected potential over-treatment 2017-2037 associated with three different guidelines scenarios:**
  - **Status quo practice in most Canadian programs (SQ)**
  - **American Society of Clinical Oncology guidelines, for maximal resource settings (ASCO-Max)**
  - **Canadian Task Force on Preventive Health Care guidelines (CTFPHC)**

*Version 2.3

OncoSim Model Overview

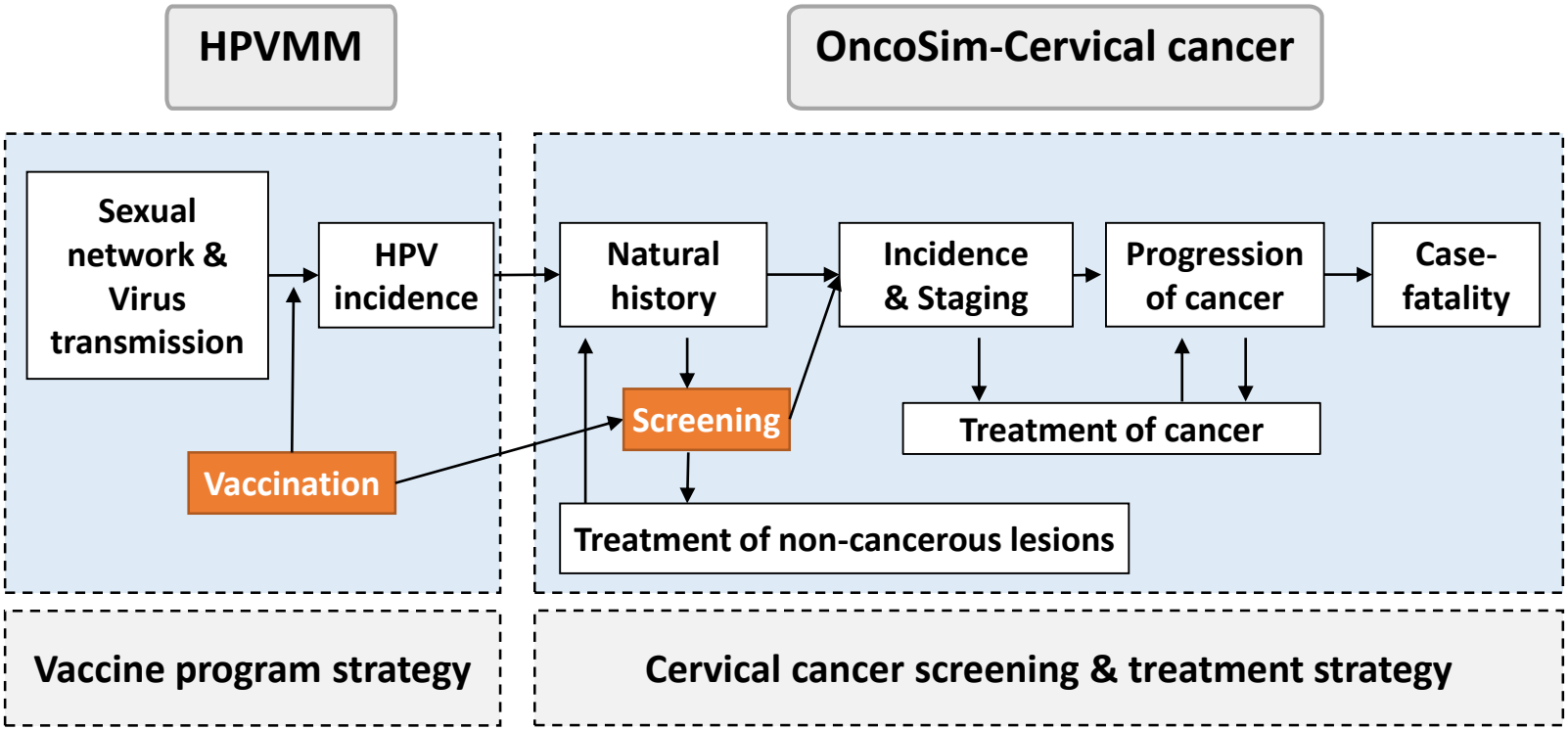
- **OncoSim can evaluate cancer control strategies for prevention, screening and treatment of common cancers by comparing projections of incidence, mortality, resource needs, direct healthcare costs and cost-effectiveness**

- **OncoSim comprises a suite of models: Lung, Colorectal, HPV-Cervical (Breast and All-Cancers in development)**

- **Users can customize inputs and outputs but a number of standard analyses are available**

- **Available online free of cost for public sector use via a secure login at: www.oncosim.ca**

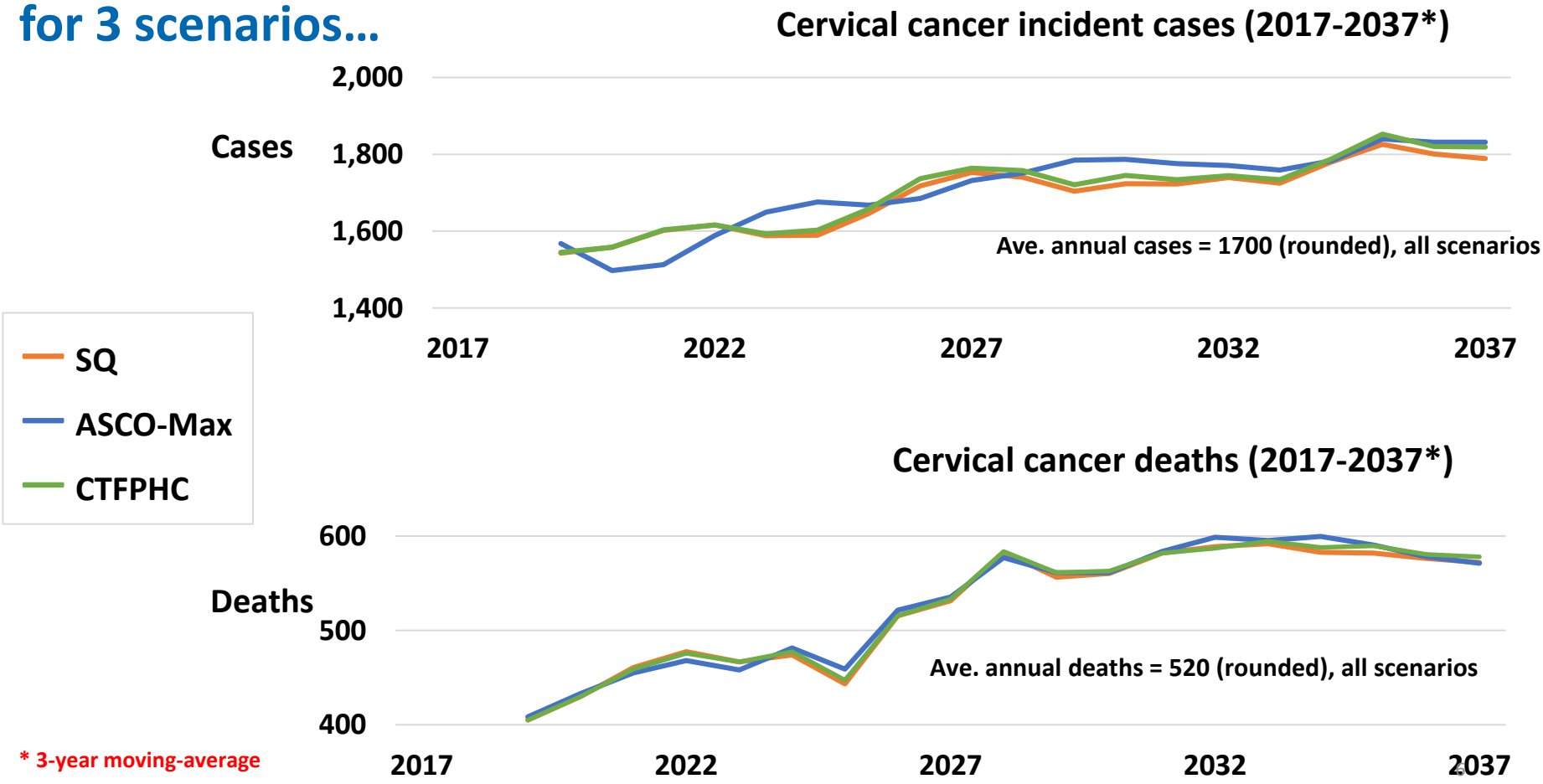
HPV/Cervical Cancer Model: Conceptual Framework



Scenario Assumptions

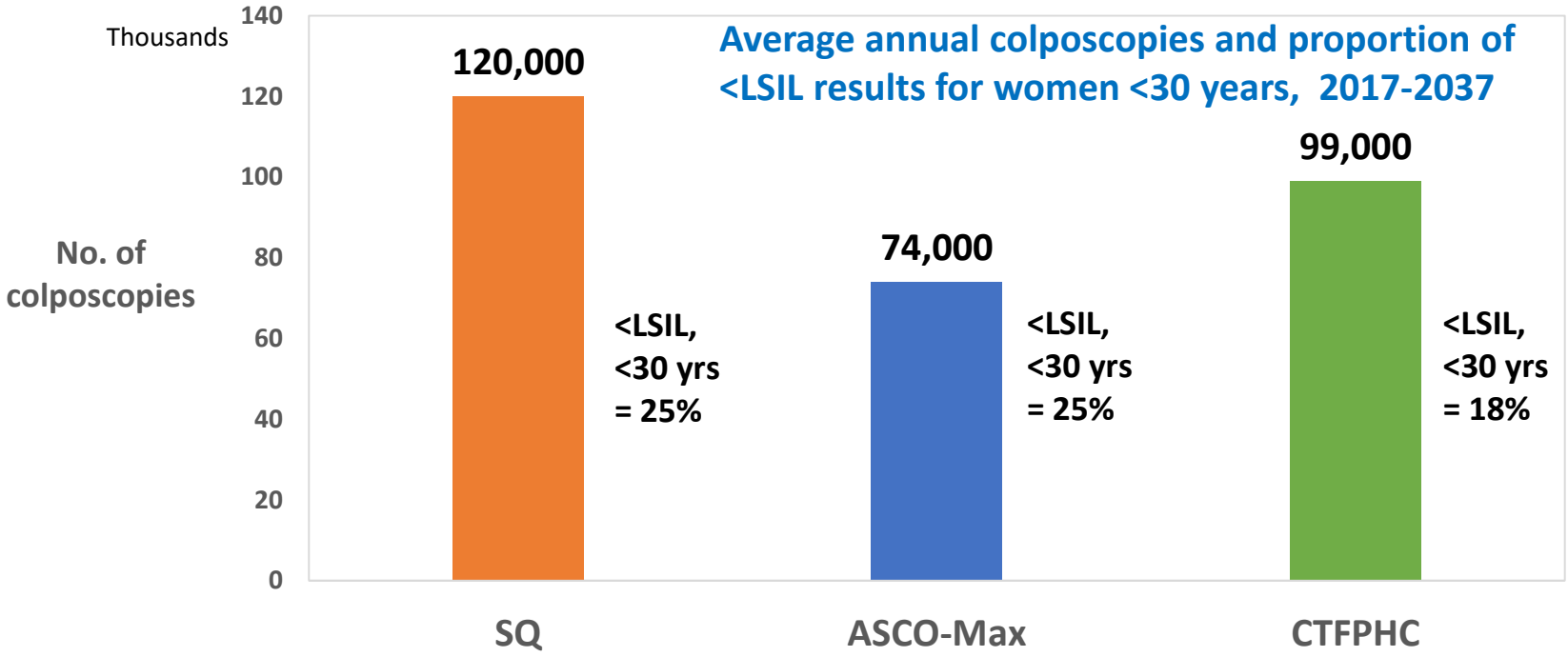
	SQ	ASCO-Max	CTFPHC
Screening Method	Cytology	HPV DNA Testing	Cytology
Age range	21 to 69	25 to 65	25 to 69
Frequency	Every 3 years	Every 5 years	Every 3 years
Recruitment period	2017 onward (historical screening behaviour simulated assuming SQ)		
Screening participation	90%		
Rescreen rate	80%		
Costs (2008 Canadian dollars)			
Colposcopy	$955.71		
Cytology screen	$59.49	n/a	$59.49
HPV DNA test	n/a	$87.79	n/a
Vaccination Program			
Age	12		
Sex	Female		
Deployment Year	2008		
Vaccine Type (cost)	Quadrivalent ($500 per 3-dose schedule)		
Vaccination Coverage	60%		
Proportion Protected	100%		
Degree of Protection	100% efficacy, no waning		

Long-term outcomes similar for 3 scenarios…



* 3-year moving-average

…but, impact on colposcopy utilization and resulting <LSIL findings differ



* Rounded numbers

Number of <LSIL results in <30 yr old women suggests 18-25% of colposcopies lead to over-treatment

Scenario	Colposcopies cumulative count 2017-2037	Of colposcopy results, <LSIL counts in women under 30	Proportion of <LSIL results in under 30 yr-olds of all results	Proportion of <LSIL results in under 30 yr-olds of <LSIL results in all ages
SQ (Pap 21-69, 3yrs)	2,500,000	630,000	25%	34%
ASCO-Max (HPV 25-65, 5yrs)	1,500,000	390,000	25%	35%
CTFPHC (Pap 25-69, 3yrs)	2,100,000	380,000	18%	25%

* Values may not be consistent due to rounding

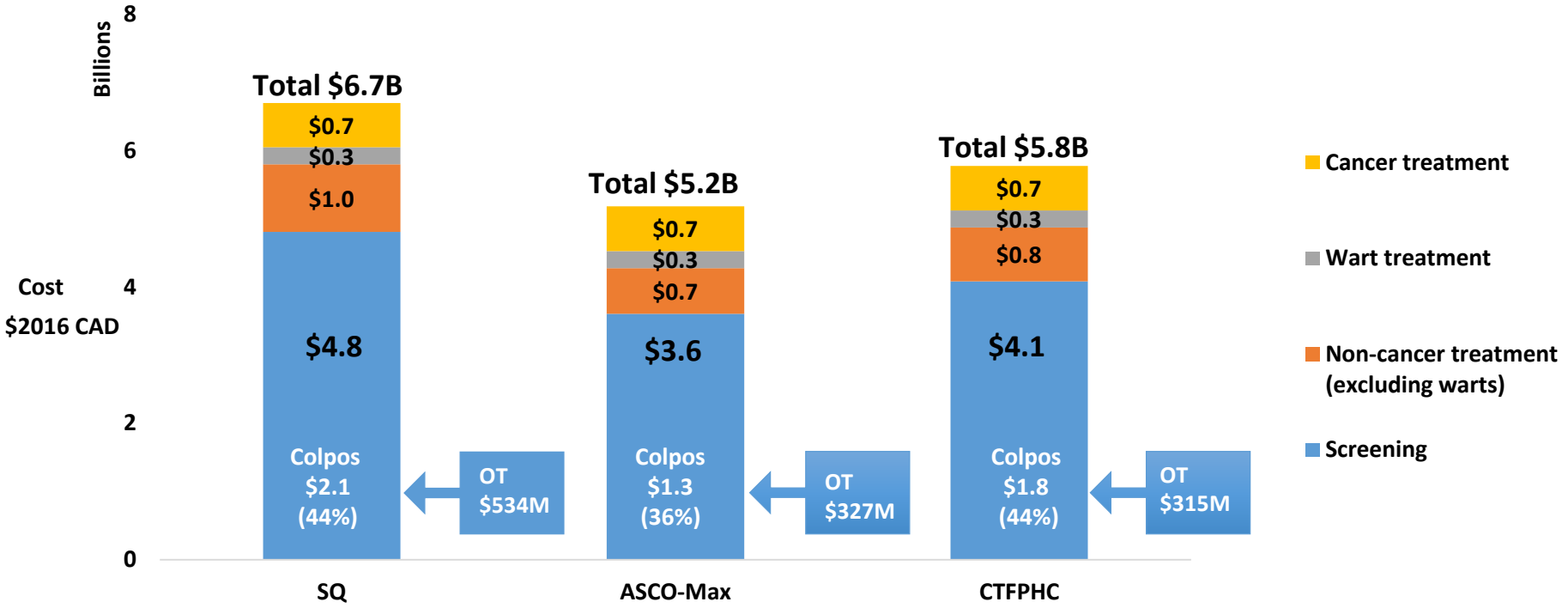
Furthermore, cascading invasive treatments differ considerably among scenarios

Average annual counts for pre-cancer invasive procedures, 2017-2037

* Rounded numbers

And, there are cost implications for unnecessary colposcopies and non-cancer treatments

Cost components of screening scenarios (cumulative 2017-2037, billions $CAD)



Notes: Rounded numbers; undiscounted dollars; OT= Over Treatment; M = Millions

Summary and Conclusions

- **Potential benefits/harms and resource implications of practice and practice changes in Canada can be weighed through scenario modelling**

- **SQ (Pap), ASCO-Max (HPV) and CTFPHC (Pap) guidelines are projected to have similar benefits for cervical cancer incidence and mortality over the next 20 years, in a 60% HPV vaccination setting**

- **A projected 18-25% of colposcopies could result in overtreatment, implying $10 million/yr of colposcopy costs could be better spent elsewhere**

- **ASCO-Max guidelines could result in the least numbers of invasive pre-cancerous lesion treatments, with up to $15 million/yr difference in costs compared to other scenarios**

- **However, even moving from the Status Quo to comply with CTFPHC guidelines by all provinces/territories could result in significant reduction of overtreatment and related costs**

Limitations

- **Costs of downstream effects from colposcopies are not included**
- **The Ontario follow-up protocol for HPV DNA test as the primary screening modality was used which may impact screening outcomes (i.e. number of colposcopies)**
- **HPV DNA testing comes with some uncertainty related to performance and cost in the Canadian context as it has not yet been implemented**
- **There is considerable uncertainty for the parameters describing sexual behaviour, long-term vaccine efficacy and the development and progression of lesions and HPV related cancers**
- **Input costs are predominantly from Ontario**

Acknowledgements

The OncoSim model is led and supported by the Canadian Partnership Against Cancer, with model development by Statistics Canada, and is made possible through funding by Health Canada. Many individuals have contributed to the conceptualization, development and dissemination of the model; see

www. oncosim.ca/podc2017

Contact us at: oncosim@partnershipagainstcancer.ca

CANADIAN PARTNERSHIP AGAINST CANCER

PARTENARIAT CANADIEN CONTRE LE CANCER