A Microsimulation Model for High-Risk Stage II and Stage III Colon Cancer Survivors Following the Current Guidelines

Sumeyye Samur[1], Emir Gursel[1], Ning Yan Gu[2], Melanie Palomares[2], Mert Sahinkoc[1,3], Oya Hoban[1], Gebra Cuyun Carter[2], Turgay Ayer[4,5], Jagpreet Chhatwal[3], Aparna Parikh[6], Alfred I Neugut[7]

[1]Value Analytics Labs, Boston, Massachusetts, USA
[2]Exact Sciences Corporation, Madison Wisconsin, USA
[3]Massachusetts General Hospital Institute for Technology Assessment, Harvard Medical School, Boston, MA, USA
[4]Georgia Institute of Technology, Atlanta, Georgia, USA
[5]Emory Medical School, Atlanta, Georgia, USA
[6]Massachusetts General Hospital Cancer Center, Harvard Medical School, Boston, MA, USA
[7]Herbert Irving Comprehensive Cancer Center, Columbia University, New York, USA

EXACT SCIENCES

ISPOR US 2024

Value Analytics | Labs

DISCLOSURE

This study is supported by Exact Sciences

BACKGROUND

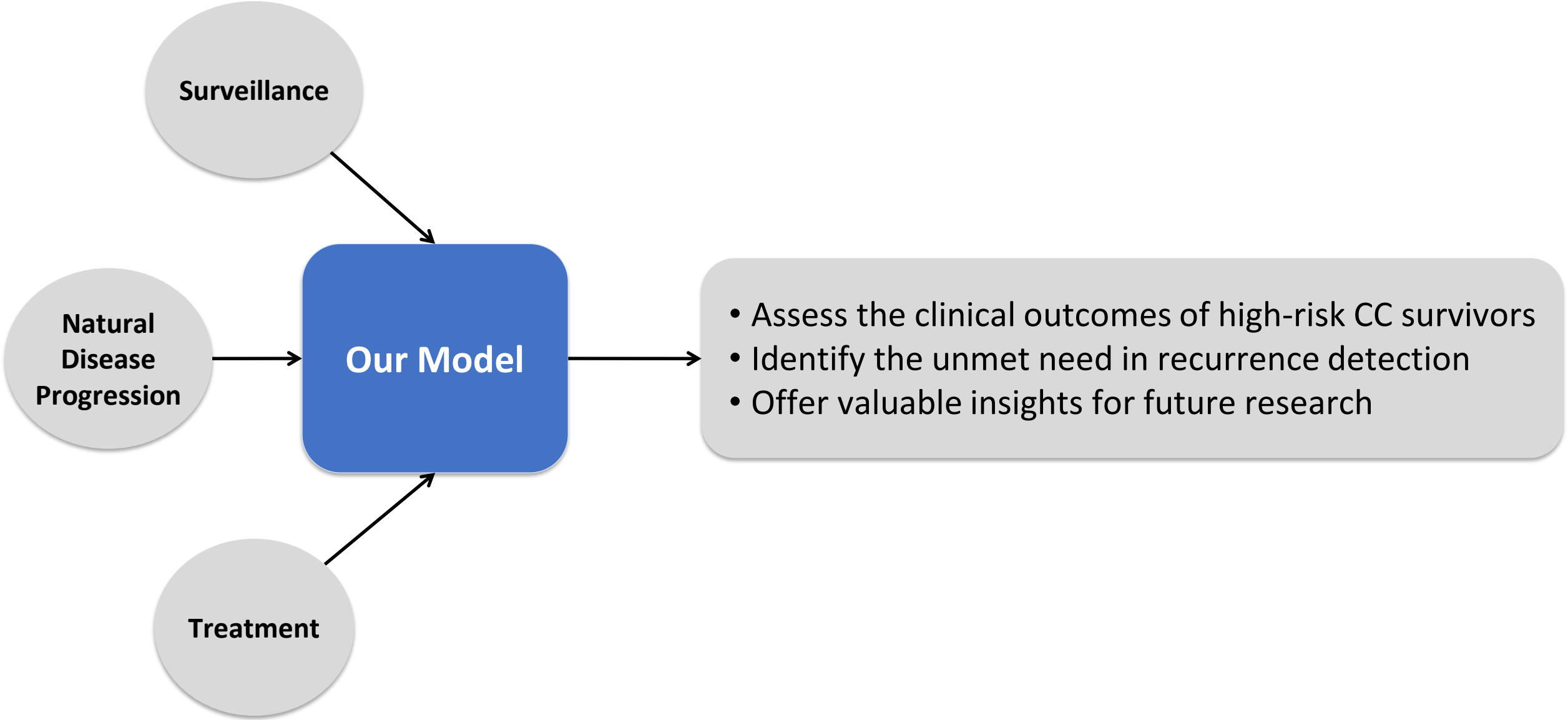
- Colon cancer (CC) constitutes approximately 6% of global cancer incidences, being one of the leading causes of cancer-related deaths [1]
- High-risk Stage II and Stage III CC survivors continue to face the ongoing risk of recurrence, due to the presence of circulating tumor DNA (ctDNA)
- Current guidelines recommend surveillance for high-risk Stage II and Stage III CC survivors for possible recurrences
- The effectiveness of the recommended surveillance modalities following the guidelines are unclear

1. Sung, Hyuna, et al. "Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries." *CA: a cancer journal for clinicians* 71.3 (2021): 209-249.

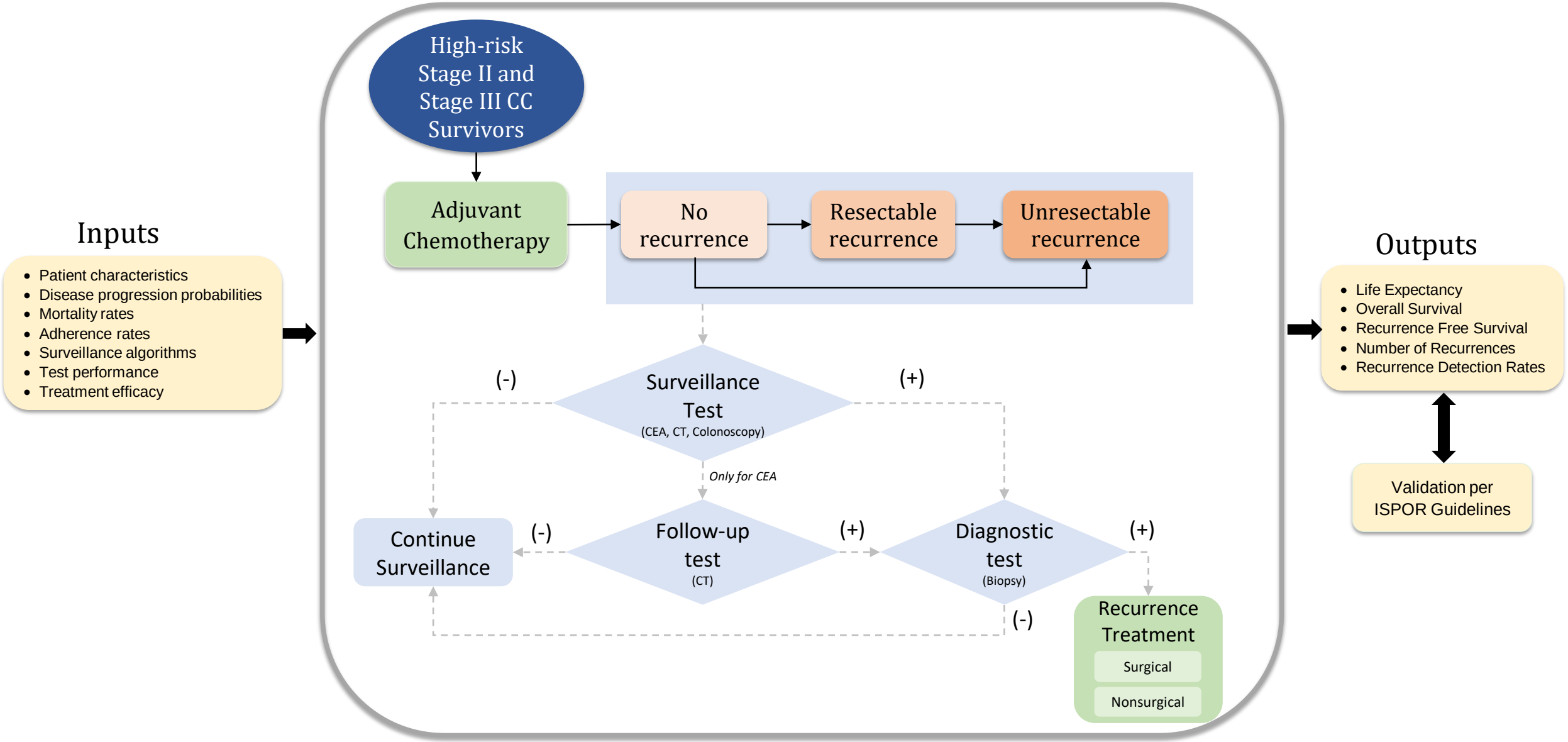
OBJECTIVE & APPROACH

- Our objective was to provide a better understanding of current CC surveillance by evaluating the clinical outcomes of high-risk Stage II and Stage III CC survivors following the current SOC guidelines
- We developed an individual-level state-transition model to capture the post-surgery journey of a CC survivor over a lifetime horizon

Simulation of CC Survivors



Simulation of CC Survivors

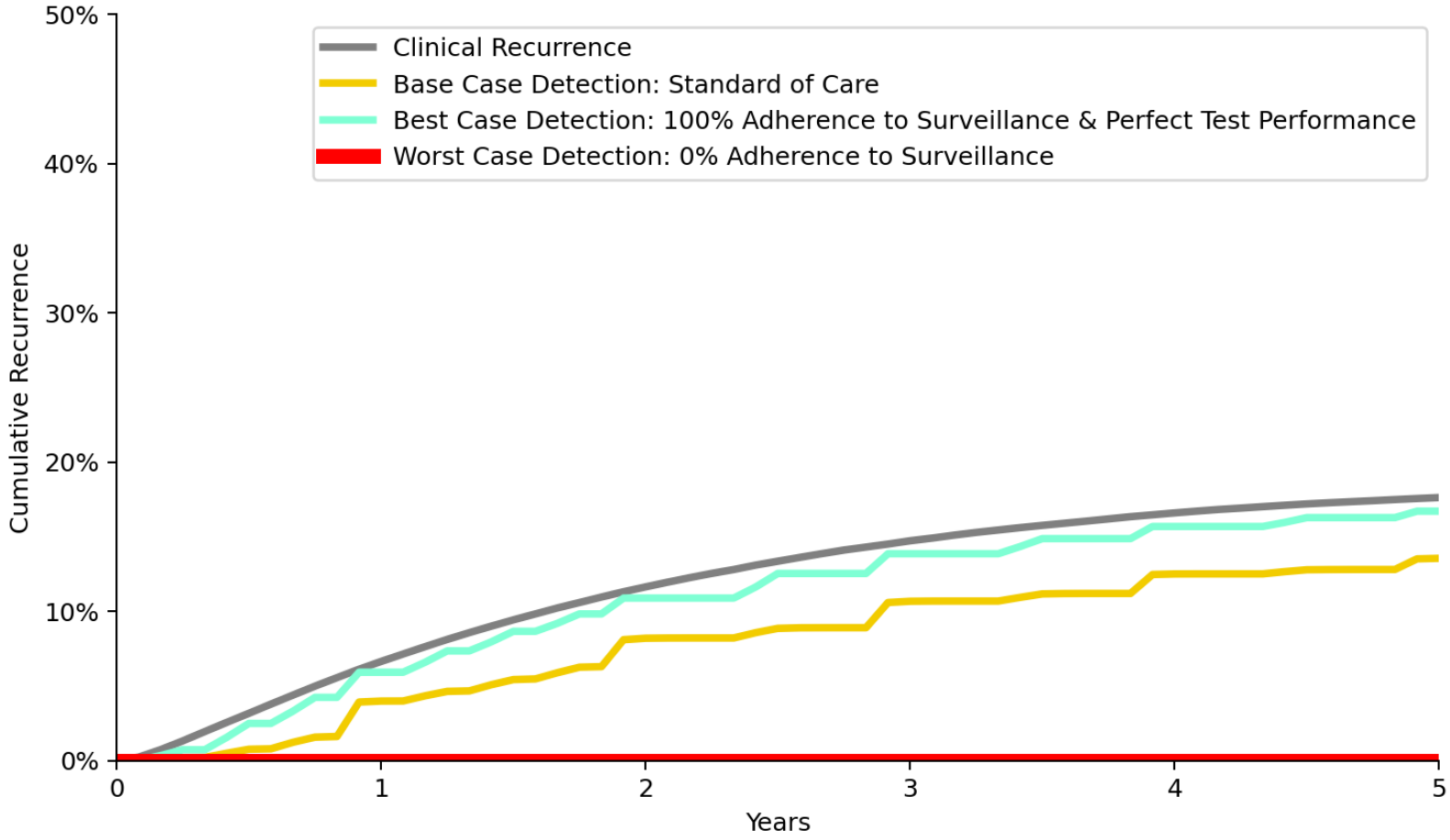


Comparison with Previous Models

Model Features	Kuntz et al., 2020	Rose et al., 2019	Wanis et al., 2019	Rose et al., 2014	Castelli et al., 2007	Borie et al., 2004	Our Model
Adjuvant chemotherapy							
Surveillance algorithms recommended by NCCN guidelines (e.g., CEA, colonoscopy, CT)							
Lead time of tests							
Prevalence of ctDNA							
Disease progression by ctDNA status							
Recurrence treatment							

RESULTS:

Internal Validation



RESULTS:

External Validation

5-year Recurrence Detection Rates	Snyder et al. [1]	Our Model
Stage II	**16.03%**	**13.14%**
Stage III	**31.19%**	**25.01%**

- A real-world study reporting detection rates is used as the benchmark for external validation
- Lower detected recurrence rates predicted from the model can be explained by the uncertainty in these three factors:
  - Different surveillance algorithms
  - Performance of surveillance modalities
  - Adherence to surveillance

1. Snyder, Rebecca A., et al. "Association between intensity of posttreatment surveillance testing and detection of recurrence in patients with colorectal cancer." *Jama* 319.20 (2018): 2104-2115.

RESULTS:

Basecase Analysis: Survival Outcomes

	15-year Recurrence-Free Survival	15-year Overall Survival	Average Life Expectancy
High-risk Stage II	**59.0%**	**60.4%**	**17.1**
Stage III	**51.1%**	**54.9%**	**16.0**

RESULTS:

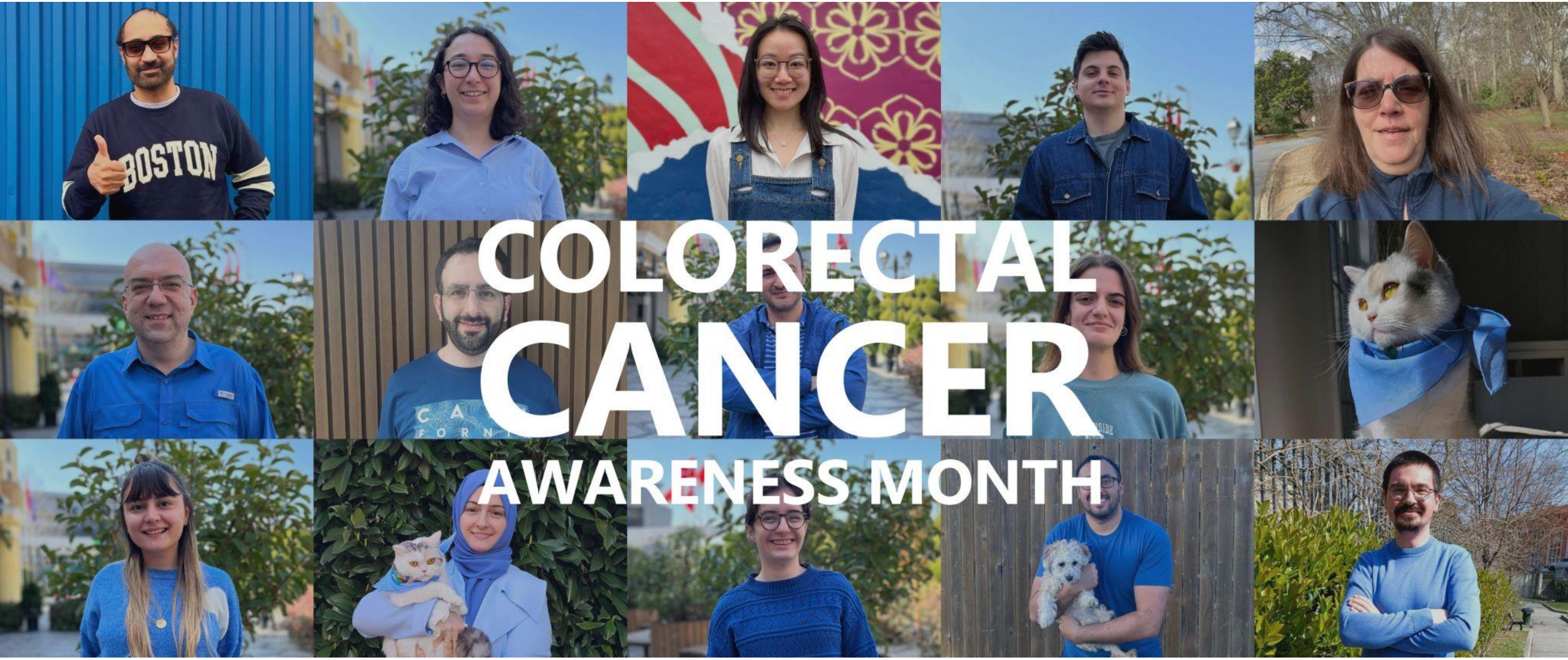
Basecase Analysis: Recurrence Outcomes (per 10,000 survivors)

15-year Outcomes	Locoregional		Distant		Total	
	Clinical Recurrences	Detected Recurrences	Clinical Recurrences	Detected Recurrences	Clinical Recurrences	Detected Recurrences
High-risk Stage II	**230**	**180 (78%)**	**480**	**330 (68%)**	**710**	**510 (72%)**
Stage III	**470**	**390 (83%)**	**1,350**	**970 (72%)**	**1,820**	**1,360 (75%)**

- In 15 years, overall
  - 28% of recurrences remained undetected for high-risk Stage II
  - 25% of recurrences remained undetected for Stage III

CONCLUSIONS

- Our model enables the evaluation of long-term clinical outcomes in high-risk Stage II and Stage III CC survivors
- Model predictions showed suboptimal recurrence detection rates, highlighting the unmet need in recurrence detection
- Our model could serve as a foundational tool for evaluating current practices and emerging tests to inform clinical decision-making



EXACT SCIENCES

Corresponding Author:

Sumeyye Samur, PhD
ssamur@valueanalyticslabs.com

Value Analytics Labs