Can Multi-Cancer Early Detection Tests Reduce Cancer Mortality?

MSR112

Jade Xiao[1], Andrew ElHabr[1], Christopher Tyson[2], Xiting Cao[2], Sana Raoof[3], A. Mark Fendrick[4], A. Burak Ozbay[2], Paul Limburg[2], Tomasz M. Beer[2], Ashish Deshmukh[5], Andrew Briggs[6], Jagpreet Chhatwal[7,8]

[1] Value Analytics Labs, Boston, MA, USA; [2] Exact Sciences Corporation, Madison, WI, USA; [3] Memorial Sloan Kettering Cancer Center, New York, NY, USA; 4 School of Public Health, University of Michigan, Ann Arbor, MI, USA; [5] Medical University of South Carolina, Charleston, SC, USA; [6] London School of Hygiene & Tropical Medicine, London, UK; [7] Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA; [8] Center for Health Decision Science, Harvard University, Boston, MA, USA

1 BACKGROUND

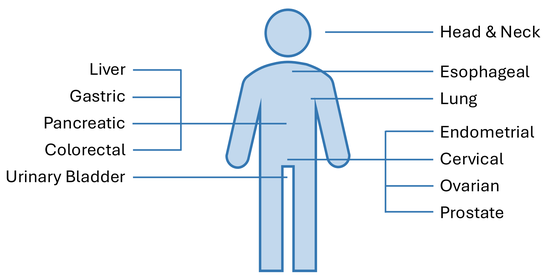
- Cancer is the second leading cause of death in the United States.[1]
- Early detection could reduce cancer-related mortality by averting progression to late-stage cancer, which is associated with lower likelihood of cure and survival.[2,3]
- Currently, around half of cancer cases in the US are detected at an advanced stage,[4] and routine screening is recommended for only four cancer types (breast, cervical, colorectal, lung).[5]
- Blood-based multi-cancer early detection (MCED) tests could revolutionize cancer screening by simultaneously detecting multiple cancer types.

2 OBJECTIVE

To evaluate the potential impact of an MCED test on cancer mortality, considering different levels of uptake and adherence.

3 METHODS

- We developed **Si**mulation Model for **MCED** (SiMCED), a microsimulation model of 14 solid tumor cancer types that account for nearly 80% of all cancer incidence and mortality:[6]



- In the absence of a diagnosis, cancer progresses according to cancer type- and stage-specific dwell times.
- Unobserved cancer prevalence and incidence were estimated using a backwards induction approach.[7,8]
- The model was calibrated to reproduce incidence rates of usual care diagnosis as captured in the SEER database (**Figure 1**).[6]
- MCED test sensitivities were derived from a large, multi-center, prospectively-collected, retrospective case-control study (ASCEND-2).[9]

Presented at ISPOR 2025

Corresponding author: JagChhatwal@mgh.harvard.edu

Supplemental screening with an MCED test could be effective for reducing 10-year cancer mortality. Even when uptake and adherence were more modest, MCED testing still conferred meaningful mortality benefits.

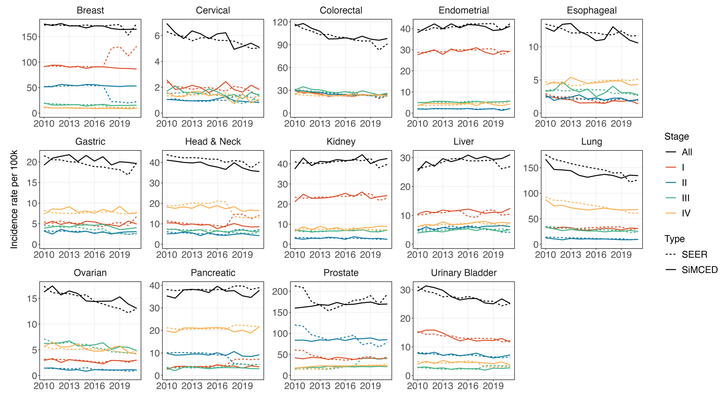


Figure 1: Calibration results

- After a cancer diagnosis, individuals follow SEER survival curves to determine the time and cause of death, i.e., cancer- or non-cancer-related.
- Using a 10-year horizon, we simulated the life course of 5 million adults aged 50-84 years, representative of the US population.
- The model was run twice, once without MCED testing (**Usual care**) and once with annual MCED testing (**Usual care + MCED**).
- In the base case, **uptake** (the probability that an individual will take the MCED test at all) and **adherence** (the probability that an individual will take the MCED test each year, independent of previous years) were assumed to be perfect. Scenario analysis was performed to evaluate mortality reduction with decreased levels of uptake and adherence.

4 RESULTS

- Compared to usual care only, supplemental MCED testing reduced 10-year cancer mortality by 18% (2,612 versus 2,149 per 100,000), assuming perfect MCED uptake and adherence (**Table 1**).
- The largest absolute reductions were observed for lung, colorectal, pancreatic, and liver cancer.
- In the scenario analysis (**Table 2**), 10-year mortality reduction was:
  - 13% (2,612 versus 2,282) with 100% uptake and 70% adherence;
  - 12% (2,612 versus 2,293) with 70% uptake and 100% adherence; and
  - 9% (2,612 versus 2,385) with 70% uptake and 70% adherence.

Cancer type	Usual care	Usual care + MCED	Absolute change	Relative change
Breast	124	93	-31	-25%
Cervical	18	10	-8	-44%
Colorectal	308	205	-103	-33%
Endometrial	63	50	-13	-21%
Esophageal	84	75	-9	-11%
Gastric	115	84	-31	-27%
Head and Neck	117	99	-18	-15%
Kidney	92	79	-13	-14%
Liver	178	140	-38	-21%
Lung	964	831	-133	-14%
Ovarian	71	63	-8	-11%
Pancreatic	295	252	-43	-15%
Prostate	82	79	-3	-4%
Urinary Bladder	101	89	-12	-12%
Total	**2,612**	**2,149**	**-463**	**-18%**

Table 1: Reduction in 10-year cancer mortality by cancer type (per 100,000)

Table 2: Reduction in 10-year cancer mortality by scenario (per 100,000)

Scenario	Usual care	Usual care + MCED	Absolute change	Relative change
100% uptake + 70% adherence	2,612	2,282	-330	-13%
70% uptake + 100% adherence	2,612	2,293	-319	-12%
70% uptake + 70% adherence	2,612	2,385	-227	-9%

5 LIMITATIONS

- There is uncertainty around epidemiological parameters. We demonstrated the robustness (not included in this poster) of our conclusions to variations in these parameters.
- Routine screening for the four cancer types is modeled implicitly via rates of usual care diagnosis. Therefore, SiMCED does not capture the potential correlation between adherence to MCED testing and adherence to routine screening.

6 CONCLUSIONS

- Our study suggests that supplemental screening with an MCED test could be effective for reducing cancer mortality.
- Even when uptake and adherence were more modest, MCED testing still conferred meaningful mortality benefits.

References

1. Siegel RL et al. Cancer statistics, 2024. *CA Cancer J Clin*. 2024;74(1):12-49.
2. Yu M et al. A flexible quantitative framework to assess the potential contribution of early cancer detection to improved cancer survival. *J Clin Oncol*. 2023;41(16_suppl):e22508-e22508.
3. McGarvey N et al. Increased healthcare costs by later stage cancer diagnosis. *BMC Health Serv Res*. 2022;22(1):1155.
4. Crosby D et al. Early detection of cancer. *Science*. 375(6586):eaay9040.
5. Centers for Disease Control and Prevention. Screening Tests. www.cdc.gov/cancer/dcpc/prevention/screening.htm
6. National Cancer Institute. Surveillance, Epidemiology, and End Results Program. https://seer.cancer.gov/index.html
7. ElHabr A et al. EPH232 The Large Hidden Prevalence Rate of Cancer Using Backward Induction Method Reveals Screening Opportunity in Earlier Stages. *Value Health*. 26:S205.
8. Chhatwal J et al. Correlation of unobserved incidence of cancer in earlier stages with the observed incidence. *J Clin Oncol*. 41(16_suppl):10634-10634.
9. Gainullin V et al. Abstract A056: Performance of multi-biomarker class reflex testing in a prospectively-collected cohort. *Clin Cancer Res*. 2024;30(21_Supplement):A056.

This study was funded by Exact Sciences Corp., Madison, WI.