Modelled Impact of a Multi-Cancer Early Detection Screening Programme on Cancer Treatment in England

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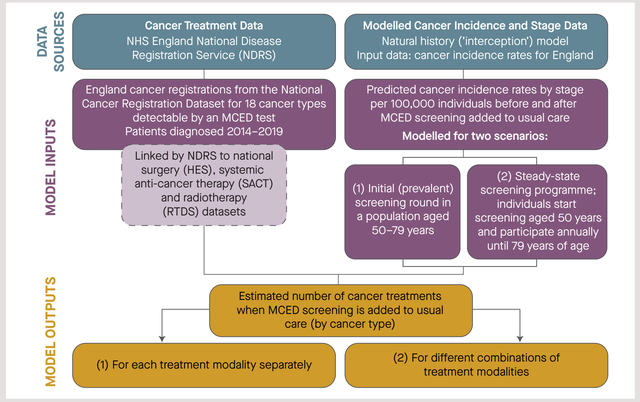
INTRODUCTION

- The number of cancer deaths could be substantially reduced if more cancers were diagnosed at early stages (usually stage I or II), when prognosis, treatment options, quality of life and survival are generally better than for cancers diagnosed at late stages (usually III or IV)[1].
- NHS England has the ambition to diagnose 75% of all cancers at stage I or II by 2028.
  - However, the percentage of cancers diagnosed at stage I or II has remained approximately 54% since 2013[2]; thus, substantial innovation is required to reach this target.
- Blood-based multi-cancer early detection (MCED) tests, which detect cancer signals such as circulating tumour DNA in the blood, are designed to screen for multiple cancer types with a single test before symptomatic presentation and detection in usual care[3,4].
- Modelling has shown that adding MCED screening to usual care could reduce late-stage diagnosis and cancer mortality[5].
- NHS resources are finite; thus, if MCED screening is introduced, treatment processes and pipelines must be optimised to improve efficiency and support the benefits of earlier diagnosis via curative cancer treatment.

OBJECTIVES

- Model how the cancer treatment landscape (tumour resection, systemic anti-cancer therapy [SACT], and radiotherapy) might change if an MCED screening programme in England were implemented alongside standard-of-care screening, and reduced late-stage incidence in line with modelled predictions.
- Inform discussions about how service delivery and workforce planning might need to be adapted to respond to future cancer treatment demand if an MCED screening programme is added to usual care in the future.

METHODS



Model Details and Assumptions

- The natural history 'interception' model used:
  - Cancer- and stage-specific dwell time estimates[6] in which cancers spend 1–2 years in stage I.
  - Cancer type- and stage-specific sensitivity estimates for the Galleri® MCED test (GRAIL Inc., Menlo Park, CA, USA) to calculate the proportion of MCED detectable cancers at prior stages[7].
- This analysis focused on treatments delivered in the immediate post-diagnosis period only.

Modelled Maximum Impact

- We assumed 100% MCED screening participation, to estimate the maximum potential impact of adding MCED screening to usual care.

KEY RESULTS: MODELLED OVERALL INCREASE IN RESECTIONS AND DECREASE IN SACT WITH MCED SCREENING ADDED TO USUAL CARE

MAXIMUM CHANGES IN DEMAND FOR RESECTIONS, SACT, AND RADIOTHERAPY COMPARED TO ACTUAL 2014-2019 CANCER REGISTRATION DATA

Figure 1. Resections.

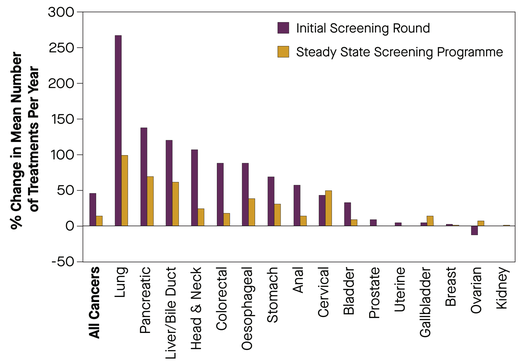


Figure 2. Systemic Anti-Cancer Therapy (SACT) Treatments.

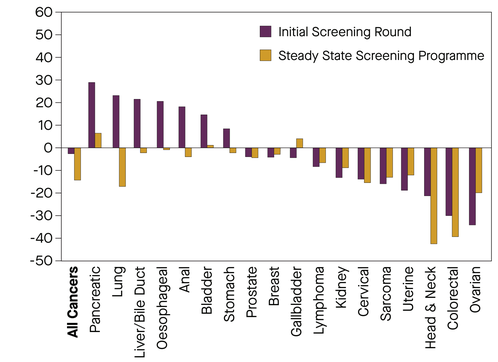


Figure 3. Radiotherapy Treatments.

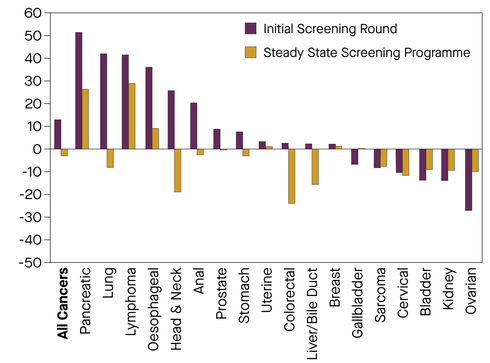


Table 1. Resections (n), Selected Cancer Types.

	All Cancers	Lung	Pancreatic	Liver/Bile Duct	Head & Neck	Colorectal
Initial Screening Round	+40,460	+14,760	+1,000	+1022	+4138	+14,992
Steady State Screening Programme	+12,643	+5469	+505	+519	+952	+3046

Table 2. Systemic Anti-Cancer Therapy (SACT) Treatments (n), Selected Cancer Types.

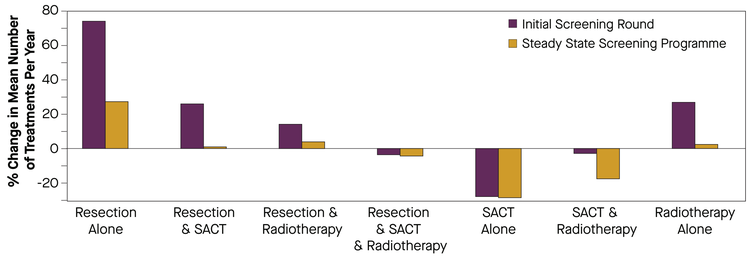
	All Cancers	Pancreatic	Lung	Liver/ Bile Duct	Head & Neck	Colorectal	Ovarian
Initial Screening Round	−1463	+633	+2345	+230	−563	−2952	−946
Steady State Screening Programme	−8329	+138	−1705	−23	−1113	−3925	−553

Table 3. Radiotherapy Treatments (n), Selected Cancer Types.

	All Cancers	Pancreatic	Lung	Oesophageal	Bladder	Kidney	Ovarian
Initial Screening Round	+7878	+197	+3460	+633	−151	−64	−19
Steady State Screening Programme	−1694	+101	−669	+159	−99	−43	−7

PREDICTED MAXIMUM OVERALL INCREASE IN RESECTIONS ALONE DUE TO EARLIER STAGE DIAGNOSIS

Figure 4. Modelled Maximum Increase or Decrease (n Shown Below the Graph) in the Mean Number of Different Treatment Modality Combinations Per Year After the Introduction of an MCED Screening Programme (All Cancers).



	Resection Alone	Resection & SACT	Resection & Radiotherapy	Resection & SACT & Radiotherapy	SACT Alone	SACT & Radiotherapy	Radiotherapy Alone
Initial Screening Round	+33,798	+3913	+2332	+417	−5432	−361	+5491
Steady State Screening Programme	+12,387	+124	+621	−488	−5663	−2301	+475

CONCLUSIONS

- If an MCED screening programme added to usual care reduced the number of late-stage cancers in line with modelled predictions[5,6]:
  - More patients would likely undergo resection and radiotherapy.
  - Fewer patients would likely receive SACT, particularly for solid tumours.
    - This may indicate a reduced need for palliative care given predicted reductions in late-stage cancers.
- Further investigation should elucidate differences in utilisation between curative and palliative radiotherapy, given differences in resource requirements for delivery.
- If the introduction of MCED screening resulted in changes to treatment in line with modelled predictions, this could yield better long-term survival and quality of life outcomes for patients, if future service delivery and workforce planning are optimised accordingly.

References

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Disclosures

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