

# Cost-Effectiveness of Prevention: Alzheimer's Disease and Hereditary Breast and Ovarian Cancer

Kuopio Health Insights 2024. 14<sup>th</sup> August 2024, Musiikkikeskus, Kuopio

#KHI2024 #prevention #effectiveness #costeffectiveness #value

Erkki Soini, ESIOR Oy

LinkedIn: erkkisoini

Contact:  
[erkki.soini@esior.fi](mailto:erkki.soini@esior.fi)  
+358 400 533 971

### ◆ Challenges are here

- Investments to research are decreasing
- Wellbeing service counties face economic challenges

⇒ **Impacting and preparing for future**

### ◆ Health economics – core aims

- **Efficiency** – only effectiveness is worth paying for  
**Cost-effectiveness** – benefits are gained with reasonable cost
- **Equity** – allocation based on values

⇒ **Evaluation and prediction**

### ◆ Decision making – core needs

- **Evidence** – relevant and proactive information
- **Implementation** – applying the evidence in practice

⇒ **Forethought and operations**

**Hypotheses: Prevention could be cost-effective e.g.,**

- **In primary care:** Screening patients for Alzheimer's disease (AD)
- **When using biobank samples:** Returning genotyping information to women with potential germline BRCA1/2 or PALB2 carrier status



## Data

Gain insight into your competitive advantage



## Analysis

Demonstrate your competitive advantage



## Knowledge

Transform insights into action and competitive advantage



## Communication

Make a difference with effective communication

Contact:  
[erkki.soini@esior.fi](mailto:erkki.soini@esior.fi)  
+358 400 533 971



## Case 1:

ISPOR –

### Predictive Cost-Effectiveness Evaluation of Using a Machine Learning-Based Alzheimer's Disease Risk Prediction Tool for Users of Social and Health Services Aged over 65 in Finland

Contact:  
[erkki.soini@esior.fi](mailto:erkki.soini@esior.fi)  
+358 400 533 971

## Acknowledgements

### Project team

- **ESIOR Oy:** Leena Haikonen-Salo, Kari Jalkanen, Erkki Soini
- **VTT:** Jouni Ihalainen, Markus Forsberg

### Funding

- VTT Technical Research Centre of Finland Ltd with the Regional Council of Pohjois-Savo/the European Regional Development Fund (ERDF), grant A75593





## Population:

Unselected patients aged 65 years or over who have used social and health services in the city of Kuopio

No diagnosis of memory disorder at the baseline

## Is AD-risk prediction cost-effective?

- The number of people with memory disorder is estimated to be at least two-fold in the next 25 years.
- Important: Early identification, diagnosis, effective care.
- The market authorizations of disease-modifying drug treatments that influence the progression of Alzheimer's disease (AD) are needed.
- *How accurate* should the AD-risk prediction tool be and *how early* should it be used so that its use is cost-effective from Finnish healthcare perspective.



# The cost-effectiveness model (positive = asymptomatic dementia)

- Setting: Evaluating expected cost-effectiveness over 15 years (3 % per annum discounting)
- Negative (true) prediction: Only AD risk prediction costs included

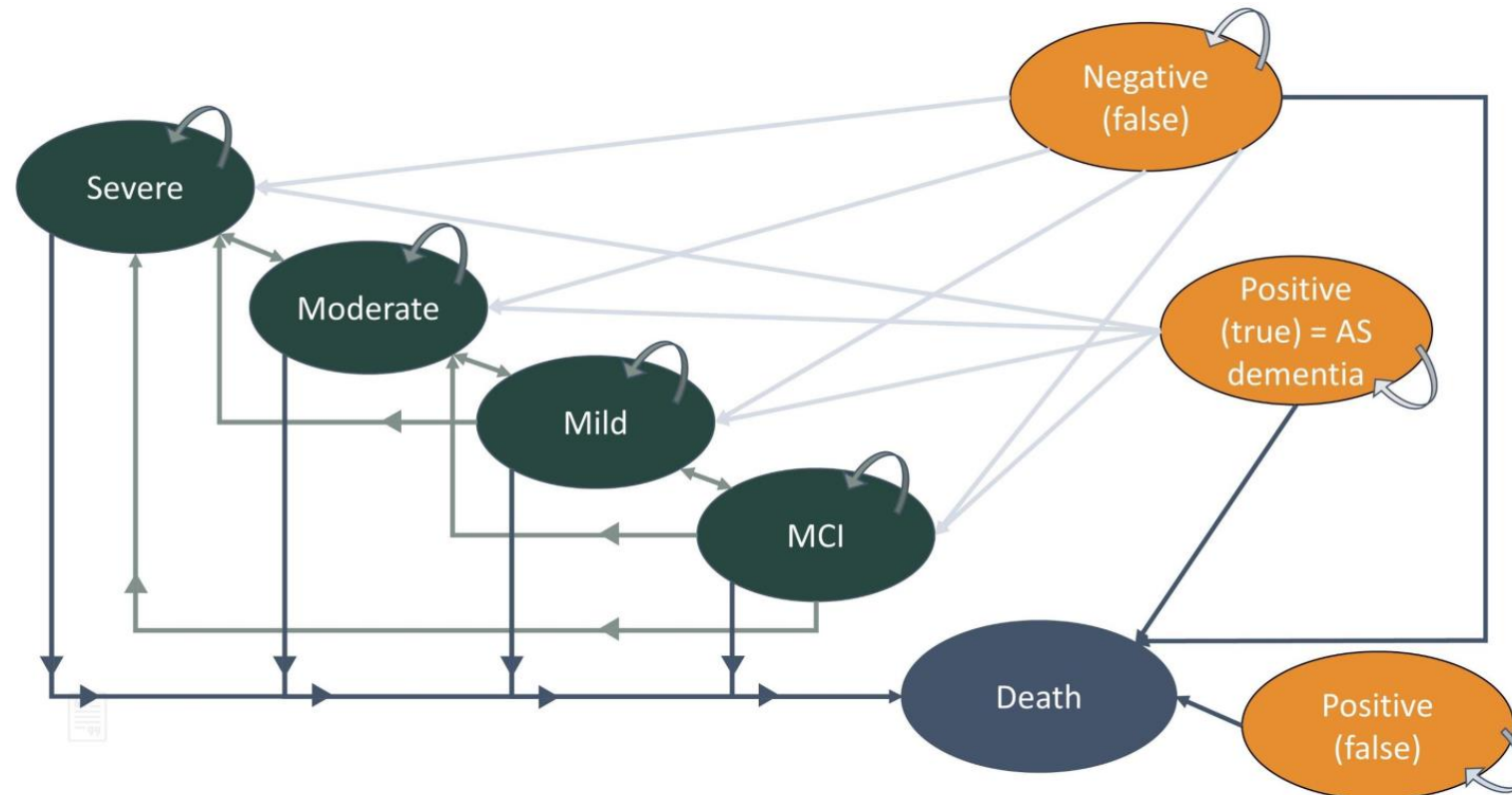


Figure 1. Structure of the state-transition model. The orange circles are the starting states of the model, into which the population is initially divided based on the accuracy of the risk prediction model. For true positives and false negatives, the person was certain to develop AD. MCI, mild cognitive impairment; AS, asymptomatic dementia, preclinical memory disorder.

## Deterministic results

- Better accuracy of the AD-risk prediction model resulted in better cost-effectiveness.

Usually, the AD-risk prediction group saved costs and gained benefits compared to current situation, i.e., was dominant

Table 2. Incremental cost-effectiveness ratio (€/QALY) in different accuracy and time scenarios. The intervention was both more effective and cost reducing (dominating) in most of the scenarios.

Accuracy	Time (years before diagnosis)				
	1	2	3	4	5
50 %	Dominates	Dominates	1 503	8 191	15 996
60 %	Dominates	Dominates	Dominates	6 026	13 513
70 %	Dominates	Dominates	Dominates	4 480	11 739
80 %	Dominates	Dominates	Dominates	3 321	10 409
90 %	Dominates	Dominates	Dominates	2 419	9 375



## Probabilistic results

- Very large gains in QALYs are possible with very small risk of QALY loss.

The AD-risk prediction group had high probabilities of cost-effectiveness

0 €/QALY: 55 %  
 20 000 €/QALY: 80 %  
 30 000 €/QALY: 100 %

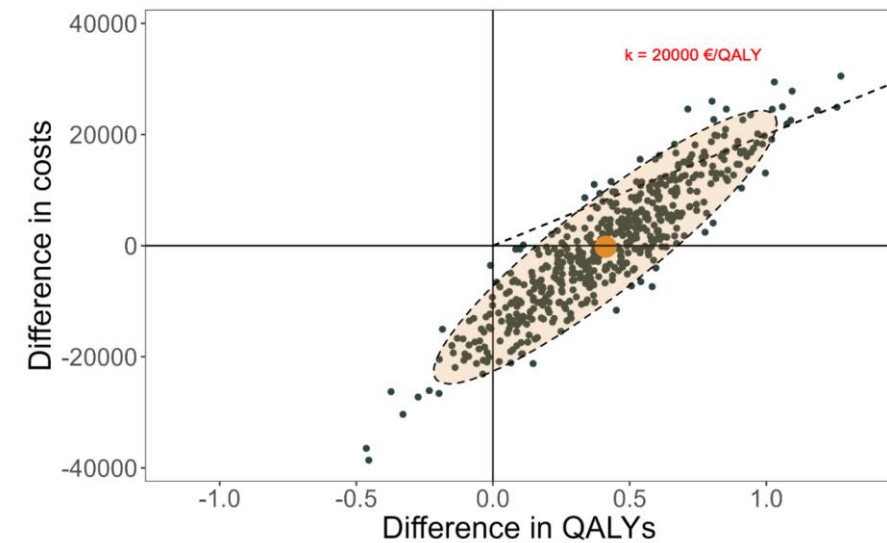


Figure 2. Cost-effectiveness plane from the base case analysis (80% and 3 years), where the straight dashed line indicates the willingness-to-pay limit of €20,000/QALY and the orange dot the average PSA ICER.





## Case 2:

ISPOR –

Lifetime Cost-Effectiveness  
of Hereditary Breast and  
Ovarian Cancer Prevention  
Based on FinnGen and  
Biobank Data, Data Returning  
Process, and Prophylaxis

Contact:  
erkki.soini@esior.fi  
+358 400 533 971

## Acknowledgements

### Project team

- **ESIOR Oy:** Christian Asseburg, Erkki Soini, Kari Jalkanen, Tuomas Lundström
- **FINBB:** Marco Hautalahti, Johanna Mäkelä
- **Biobank of Helsinki:** Olli Carpén, Minja Pehrsson
- **HUS:** Tuomo Meretoja, Eveliina Salminen
- **TAYS:** Annika Auranen

### Funding

- Ministry of Social Affairs and Health (STM)
- Finnish Biobank Cooperative (FINBB)



ESIOR







## Population:

**Women unaware of having susceptible germline mutations (BRCA1/2, PALB2) conferring high risk of hereditary breast and ovarian cancer (HBOC) aged 20-79 years**

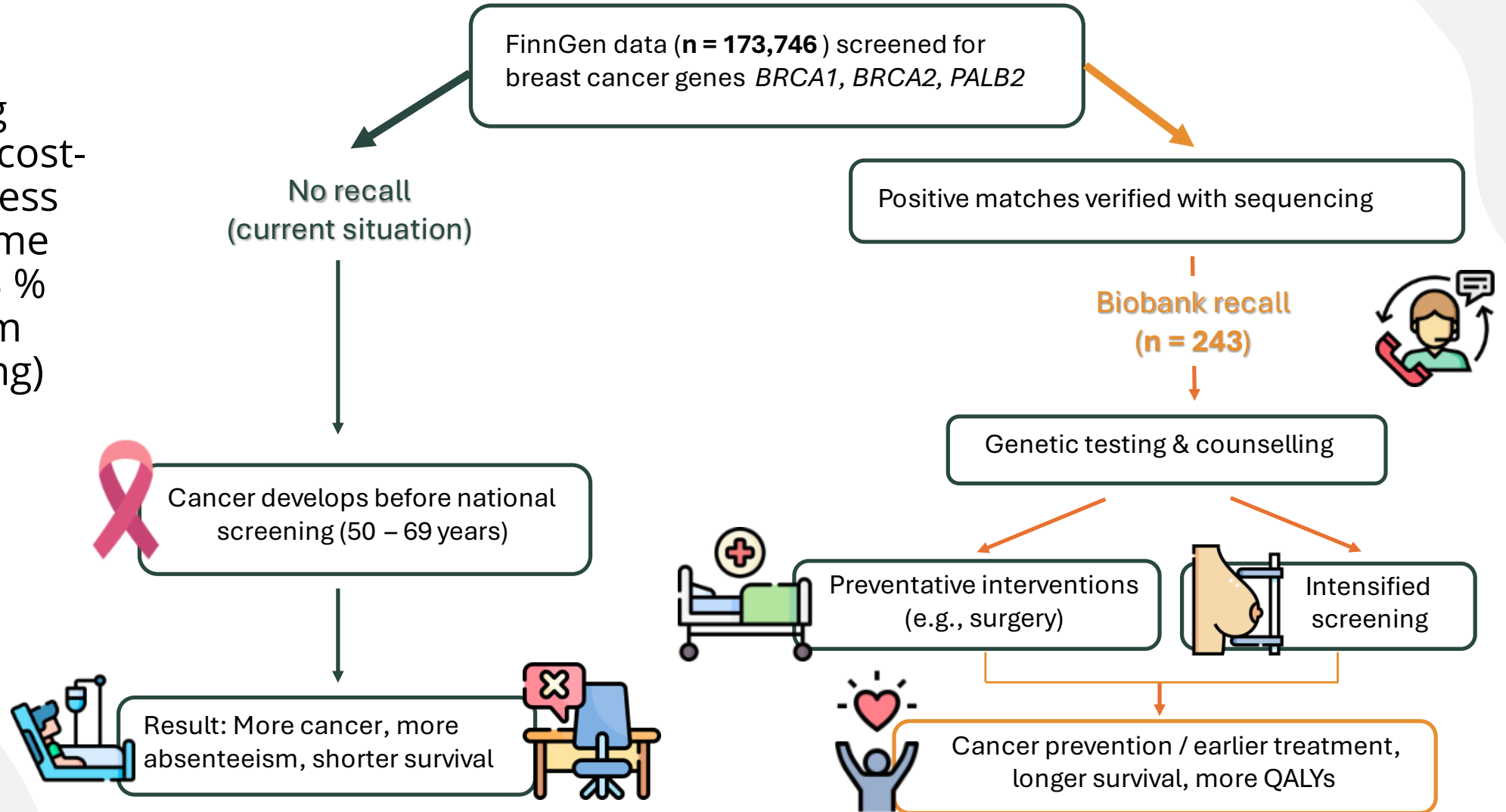
First-degree relatives were included in the sensitivity analysis

## Is returning biobank information cost-effective?

- The FinnGen biobank study has genotyped >500,000 individuals and returned this data to biobanks.
- We screened the genotypes for pathogenic variants in BRCA1, BRCA2, and PALB2 genes, and verified the pathological findings by sequencing.
- We compared the cost-effectiveness two processes over the lifetime of the individuals:
  - recall based on the susceptible genotyping data
  - current system (i.e., no recall).

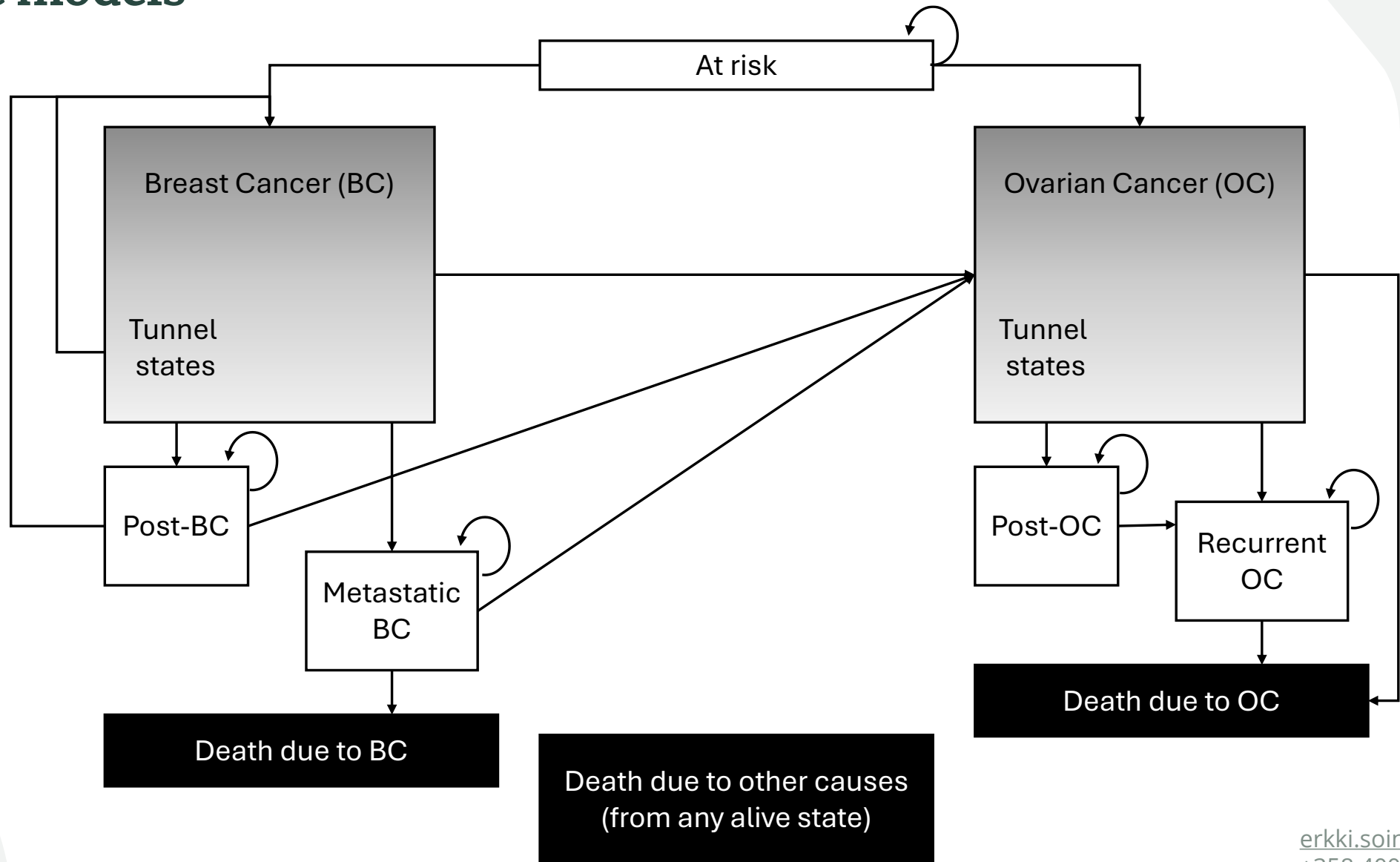
# The two processes

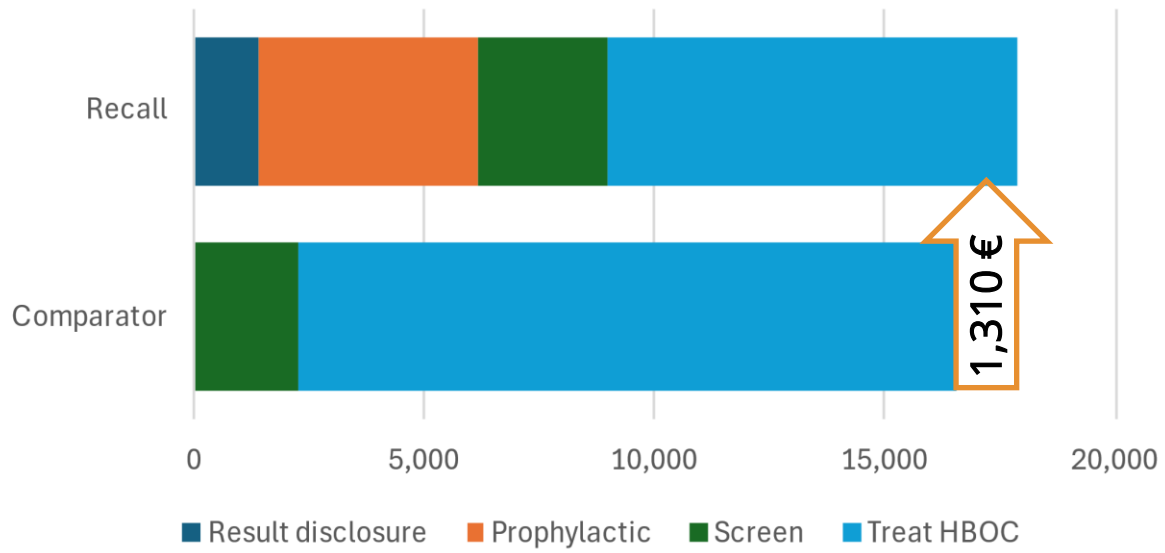
- Setting: Evaluating expected cost-effectiveness over lifetime horizon (3 % per annum discounting)



# The disease models

- Setting: Modelling patient pathways when cancer occurs





**Results:**  
**Lifetime costs increase 1310 euro**

**Results:**  
**Significant benefits gained**

Expected benefits due to recall process	Without relatives (n=243)	With relatives (n=502)
<b>Avoided breast cancers (difference), undiscounted</b>	42 (-42 %)	87 (-42%)
<b>Avoided deaths due to breast cancer (difference), undiscounted</b>	10 (-45 %)	21 (-45%)
<b>Avoided ovarian cancers (difference), undiscounted</b>	4.5 (-31 %)	9.2 (-31%)
<b>Avoided deaths due to ovarian cancer (difference), undiscounted</b>	4.3 (-32 %)	8.8 (-32%)
<b>Life-years gained, undiscounted (discounted with 3% per annum, p.a.)</b>	293 (117)	605 (242)
<b>Quality-adjusted life-years (QALY) gained, undiscounted (discounted with 3% p.a.)</b>	161 (59)	333 (122)
<b>Net health benefit (additional value gained with 28,245 €/QALY gained)</b>	1.35 M€	2.84 M€

The recall is expected to be cost-effective when woman has:

BRCA1/2 and 20-79 years of age  
or

PALB2 and 30-59 years of age

Return on investment (ROI) was on average 320 %



## Note 1. Savings and value gains can take place

*The value of pharmaceutical research for patients, healthcare and society – ESiOR*

*ISPOR - Should Hospitals Do Contract Research? Costs, Net Monetary Benefit, and Return on Public Sector Investments in Research at Kuopio University Hospital*

*Threefold cost in high-risk heart patients – a SPESiOR study - ESiOR*

*Self-care counselling by community pharmacies reduces the public health care provider costs - ESiOR*

## Note 2. Clever use of data can lead to large savings and value gains

Contact:  
[erkki.soini@esior.fi](mailto:erkki.soini@esior.fi)  
 +358 400 533 971

## Thank you!

- The use of the AD risk prediction tool has a high probability of cost-effectiveness.
- Returning genomic information to women resulted in noteworthy health gains and was feasible and cost-effective.

ESiOR



Lääketeollisuus  
Pharma Industry Finland



Wellbeing services  
county of North Savo



POHJOIS-KARJALAN  
HYVINVOINTIALUE



APTEEKKARILIITTO