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Income disparities in loss in life expectancy after colon and rectal cancers: a Swedish register-based study

Elisavet Syriopoulou

Joint work with E Osterman, A Miething, C Nordenvall, T M-L Andersson

Department of Medical Epidemiology and Biostatistics, Karolinska Institutet

E-mail: elisavet.syriopoulou@ki.se

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Motivation

- Several studies have reported disparities in survival by socioeconomic position (SEP)
- The differences persist independently of the indicator used to conceptualise SEP and also in countries with universal access to healthcare
- Only a few studies have looked at the impact of CRC diagnosis on the whole of the remaining lifespan
- A Swedish study showed substantial losses in life expectancy after a colon cancer diagnosis but did not take SEP into account ¹
- An English study investigated differences in life expectancy by SEP and found a socioeconomic gradient for both colon and rectal cancers ²

¹ Andersson TM-L, et al. BMC Cancer 2015.

² Syriopoulou E, et al. Br J Cancer 2019.

Question of interest

What is the lifetime impact of a colon and rectal cancer diagnosis in Sweden? How does this differ by SEP?

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Data

- All adults diagnosed with a first-time diagnosis of colon or rectal cancers in Sweden between 2008 and 2021 and follow-up time to the end of 2021 (CRCBaSe)
- Comparators from the general population matched on birth year, sex, year of CRC diagnosis, and county
- Lifetables for the general population stratified by sex, calendar year, age (from the Human Mortality Database) as a proxy for the mortality rates of each patient if they did not have the cancer
 - lifetables extended to include income using the data from the comparators

Income quartiles

- We used individualised disposable income and in specific disposable income per consumption unit for family (variable DisInkKE)
 - disposable income per consumption unit for a family is obtained by the sum of the disposable income of all members of the family divided with the consumption weight that applies to the household
- For each individual, the disposable income per consumption unit for a family was obtained as the average of the 3 years prior to their diagnosis
- We allocate individuals in income quartiles
- We created quartiles separately for individuals above 65 years old and below 65 years old to deal with potential misclassification of the oldest retired individuals to lower SEP due to lower income compared with the working group

Choice of the SEP indicator

- Income vs Education:
 - Education: A good proxy of an individual's ability to navigate the health system and process the information given and has been found to associate with health awareness
 - Income: It may affect health outcomes through the ability to have a healthier lifestyle (e.g. good housing, safe neighbourhoods) and easy access to health resources. It can also be an indicator of an individual's relative position in society as well as the degree of integration into society
- Household-based income indicator may be more appropriate for representing the availability of material resources and corresponding health awareness among individuals with lower individual disposable income but access to more household resources
- For instance, when using individual disposable income to allocate patients in SEP groups, housewives with low individual income but with access to a higher household income may be misclassified to lower SEP group

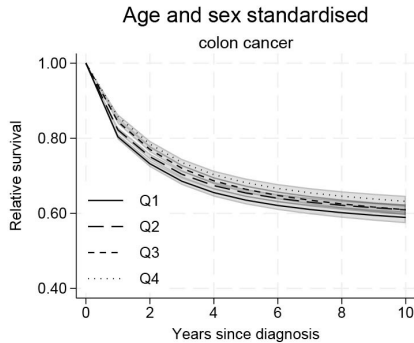
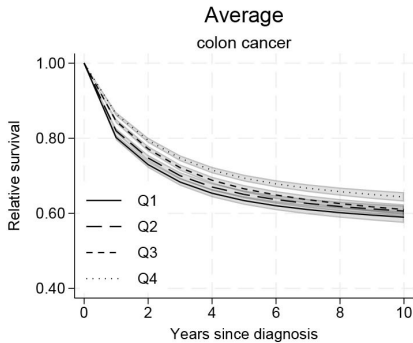
Statistical analysis

- Data were analysed separately for colon and rectal cancers
- Used flexible parametric survival models (FPMs)
- Each model included sex, age (continuous, non-linear) and individualised income (4 groups)
- We allowed time-dependent effects for all variables
- Interactions were also included between sex and income, and income and age at diagnosis

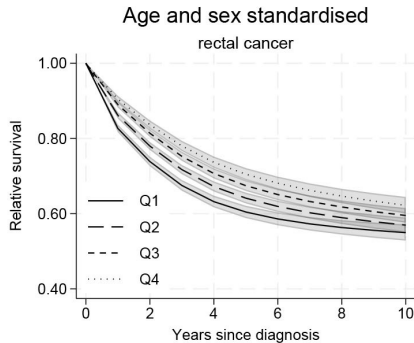
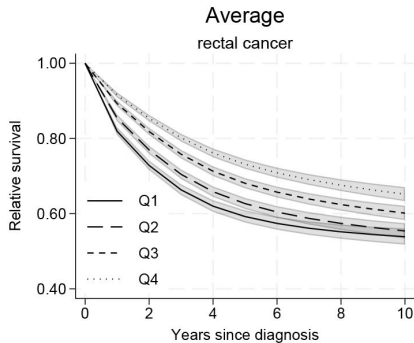
Descriptive statistics

- The analysis included 58,162 patients with colon cancer and 27,691 patients with rectal cancer
- The number of patients diagnosed with colon cancer was similar in males and females, while rectal cancer was more common in males
- There were more males diagnosed in the highest income groups, while the opposite was observed for females

Relative survival for colon cancer



Relative survival for rectal cancer



Estimates of Life Expectancy (LE)

Average estimates - colon cancer	Q1	Q4
Life expectancy (general population)	13.64	17.83
Life expectancy (cancer population)	8.81 (8.61–9.01)	12.10 (11.88–12.32)
Loss in life expectancy	4.83 (4.63–5.03)	5.73 (5.51–5.94)
Proportion of life lost	35% (34–37)	32% (31–33)
Total years lost	2714	9320

Average estimates - rectal cancer	Q1	Q4
Life expectancy (general population)	14.69	19.63
Life expectancy (cancer population)	9.22 (8.92–9.53)	13.61 (13.23–14.01)
Loss in life expectancy	5.47 (5.16–5.76)	6.02 (5.63–6.40)
Proportion of life lost	37% (35–39)	31% (29–33)
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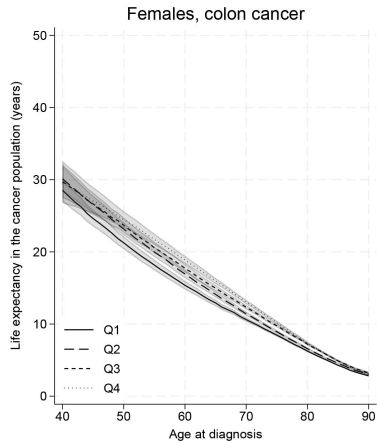
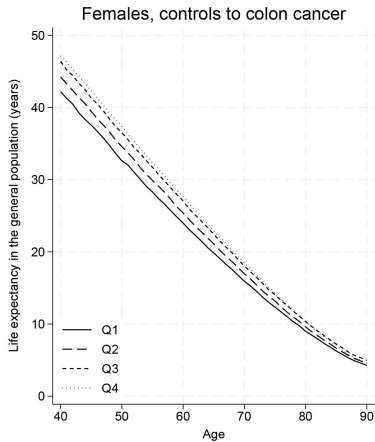
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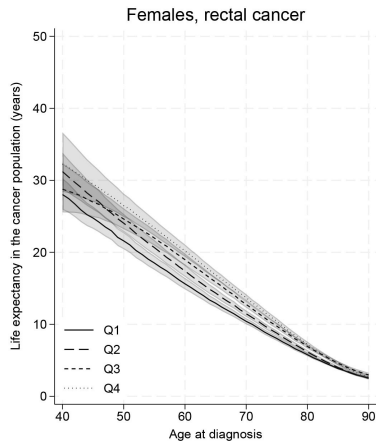
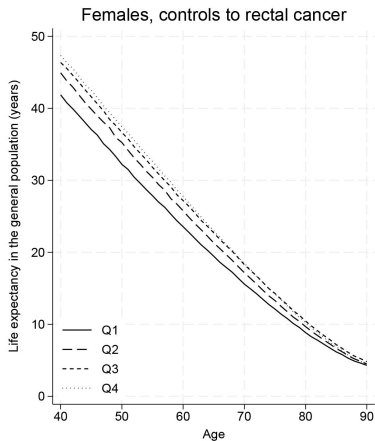
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Age-specific life expectancy (colon cancer)



Age-specific life expectancy (rectal cancer)



Females with colon cancer

Income	Measure	Age 40	Age 70
Q1	LE w/t cancer	42.20	15.94
	LE with cancer	28.52 (26.99 – 30.14)	10.61 (10.32 – 10.92)
	LLE	13.68 (12.06 – 15.21)	5.32 (5.02 – 5.62)
	PLL	32% (29% – 36%)	33% (32% – 35%)
Q4	LE w/t cancer	47.16	10.37
	LE with cancer	29.53 (26.75 – 32.59)	7.36 (7.16 – 7.55)
	LLE	17.64 (14.57 – 20.42)	3.01 (2.82 – 3.20)
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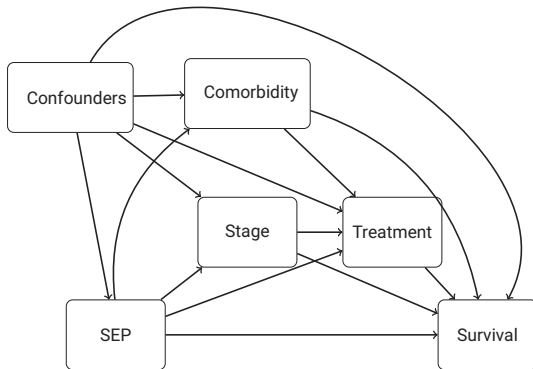
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Summary

- We found that the loss in life expectancy after a CRC diagnosis differs substantially by income group
- Rectal cancer resulted in a higher LLE compared with colon cancer
- Males lost a larger proportion of their lives compared to females
- All patients lost a substantial part of their remaining life expectancy (more than 30%)
- Patients with early-onset CRC (<50 years at diagnosis) lost more than one-third of their life expectancy following their cancer diagnosis (up to 43%)

Next steps

We want to understand the reasons behind these differences:



We also want to understand the impact of those differences in work-related outcomes; which subgroups return to work earlier and why (e.g. late treatment side effects?)