Loss in life expectancy after a colon cancer diagnosis by socioeconomic group: does the indicator of socioeconomic position matter?

Elisavet Syriopoulou

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

Department of Medical Epidemiology and Biostatistics, Karolinska Institutet

E-mail: elisavet.syriopoulou@ki.se

7th September 2023

Motivation

- Aim: to estimate loss in life expectancy after a colon cancer diagnosis in Sweden by socioeconomic position (SEP).
- How should we define SEP?
- The definition of SEP varies between studies and countries.
- In England, the most widely used index is an area-level measure called The Index of Multiple Deprivation (which is based on seven domains of deprivation that are combined and weighted to produce an overall measure).
- Often education or income quartiles are used as a proxy for SEP.
- Different indicators capture different pathways that affect health outcomes.

WHICH INDICATOR SHOULD WE CHOOSE?

Highest education level attained:

- 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.
- However, the school system changes over time.
- Sensitivity analysis could be performed by birth cohorts that have undergone schooling within the same system.

WHICH INDICATOR SHOULD WE CHOOSE?

Highest education level attained:

- 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.
- However, the school system changes over time.
- Sensitivity analysis could be performed by birth cohorts that have undergone schooling within the same system.

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.

Income as an indicator for SEP

Types of income:

- an individual's disposable income
- household income
- part of household income that accounts for the number of individuals in a household

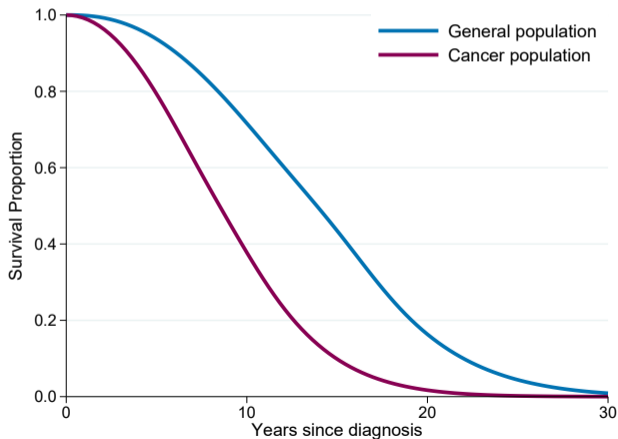## Income as an indicator for SEP

Types of income:

- an individual's disposable income
- household income
- part of household income that accounts for the number of individuals in a household

Older retired individuals may be misclassified more often to the lowest SEP and the same also applies to females.

- Older individuals have lower survival, and if misclassified to lower SEP the true disparity may be *overestimated*.
- Females often have better survival than males, and if misclassified the true disparity may be *underestimated*.
- Does allocating patients to income quartiles separately by sex and age groups can possibly help address this?
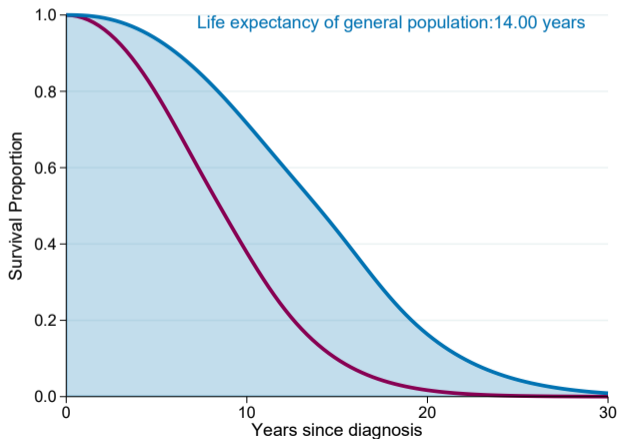
LOSS IN LIFE EXPECTANCY

Loss in life expectancy (LLE) after a cancer diagnosis is reduction in the life expectancy of an individual following a cancer diagnosis.

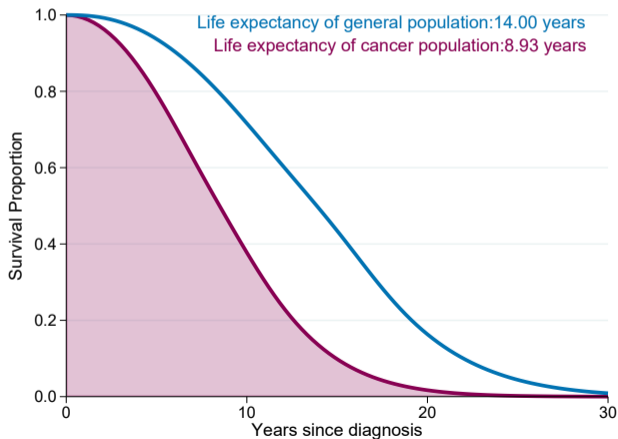## LOSS IN LIFE EXPECTANCY

Loss in life expectancy (LLE) after a cancer diagnosis is reduction in the life expectancy of an individual following a cancer diagnosis.

Loss in life expectancy

Loss in life expectancy (LLE) after a cancer diagnosis is reduction in the life expectancy of an individual following a cancer diagnosis.

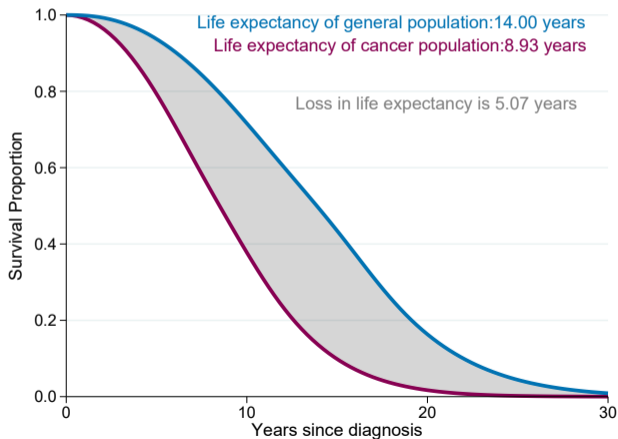## LOSS IN LIFE EXPECTANCY

Loss in life expectancy (LLE) after a cancer diagnosis is reduction in the life expectancy of an individual following a cancer diagnosis.

Expected mortality rates

- LLE is the difference between the life expectancy of the general population and the cancer population.
- For the life expectancy of the general population, we use expected mortality rates from population lifetables.
- These are typically stratified by factors such as sex, age, year.
- Having sufficiently stratified lifetables is essential to get unbiased estimates!

Data

- Data included all adults diagnosed with a first-time diagnosis of colon cancer in Sweden between 2008-2016 and follow-up time to the end of 2017.
- Patient data originated from the Colorectal Cancer Database (CRCBaSe), a register-linkage of the Swedish Colorectal Cancer Registry (SCRCR) and other national registries.
- Data includes comparators from the general population matched to the colon cancer population on birth year, sex, year of CRC diagnosis, and county.
- Data on income and education were gathered from Longitudinal Integrated Database for Health Insurance and Labour Market Studies (LISA).

Exposure of interest

- We defined SEP using one of the following:
  - highest attained education (results not shown here)
  - individual disposable income
  - part of household income
- We created income quartiles either for the overall population, or separately for each sex, or age-groups, or both, to account for SEP misclassification in women and older individuals (7 different ways to create quartiles).
- Cut-offs were based on the controls (proxy for the general population).

|	Part of household income			
Individual disposable income	Q1	Q2	Q3	Q4
Q1	5910	2218	1152	355
Q2	3080	5202	1418	368
Q3	278	2670	5695	1554
Q4	87	276	1867	7396

Data were analysed using flexible parametric survival models.

AGE AND SEX STANDARDISED RELATIVE SURVIVAL BY INCOME QUARTILE
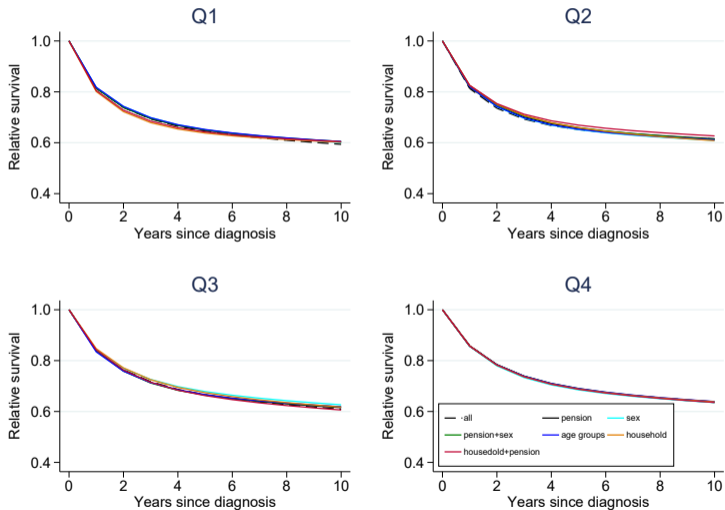
Age and sex standardised LLE

Indicator for SEP	Q1	Q4	Difference Q4-Q1
Life expectancy in the general population			
IDI (overall)	13.93	15.98	**2.05**
IDI (by sex)	14.03	16.03	2.00
IDI (by age-groups)	13.99	15.99	2.00
PHI (overall)	13.50	16.18	**2.67**
Life expectancy in the cancer population			
IDI (overall)	8.70 (8.38 - 9.02)	10.46 (10.17 - 10.75)	**1.76**
IDI (by sex)	8.84 (8.53 - 9.16)	10.42 (10.15 - 10.71)	1.59
IDI (by age-groups)	8.77 (8.52 - 9.03)	10.46 (10.12 - 10.81)	1.69
PHI (overall)	8.48 (8.19 - 8.77)	10.45 (10.16 - 10.75)	**1.98**
Loss in life expectancy after a colon cancer diagnosis			
IDI (overall)	5.24 (4.91 - 5.55)	5.53 (5.24 - 5.81)	**0.29**
IDI (by sex)	5.19 (4.87 - 5.50)	5.61 (5.32 - 5.88)	0.41
IDI (by age-groups)	5.22 (4.96 - 5.48)	5.53 (5.18 - 5.88)	0.31
PHI (overall)	5.03 (4.73 - 5.32)	5.73 (5.43 - 6.02)	**0.70**

Relative survival by income quartile (60 year old females)
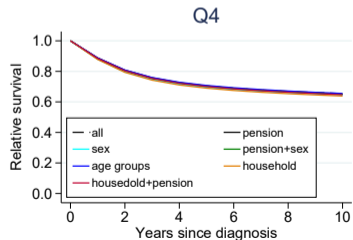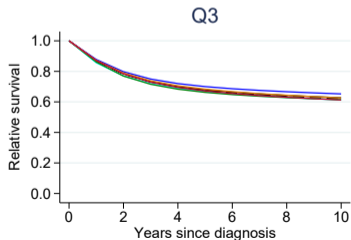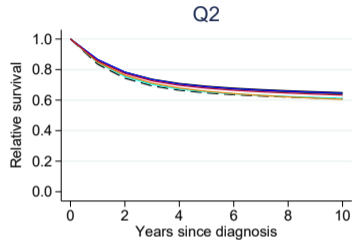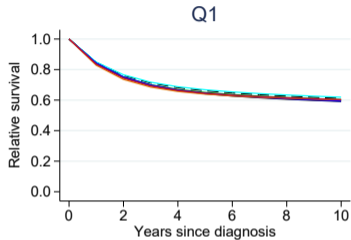
Relative survival in Q2 (60 year old females)
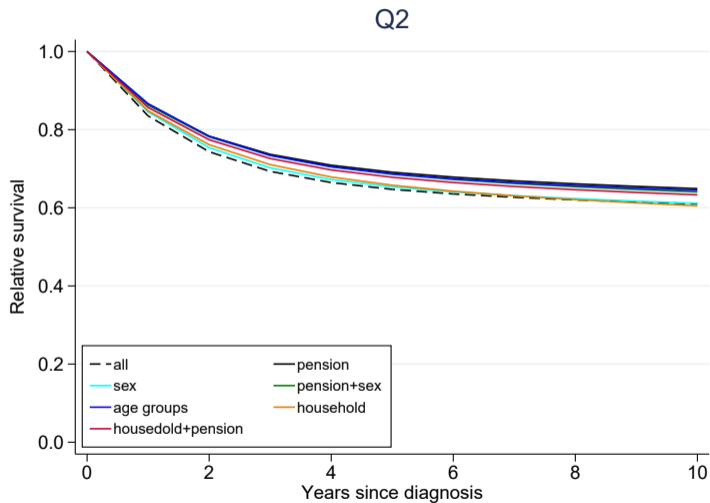
LLE FOR FEMALES DIAGNOSED AT 60 YEARS OLD

Indicator for SEP	Q1	Q4	Difference Q4-Q1
	Life expectancy in the general population		
IDI (overall)	24.54	26.79	**2.25**
IDI (by sex)	24.78	26.74	1.97
IDI (by age-groups)	24.56	26.94	2.38
PHI (overall)	23.35	27.23	**3.88**
	Life expectancy in the cancer population		
IDI (overall)	15.17 (14.33 - 16.07)	17.59 (16.83 - 18.40)	**2.42**
IDI (by sex)	15.48 (14.58 - 16.44)	17.33 (16.65 - 18.04)	1.85
IDI (by age-groups)	14.78 (14.07 - 15.51)	17.61 (16.66 - 18.62)	2.84
PHI (overall)	14.40 (13.58 - 15.27)	17.34 (16.59 - 18.12)	**2.94**
	Loss in life expectancy after a colon cancer diagnosis		
IDI (overall)	9.36 (8.47 - 10.21)	9.19 (8.39 - 9.96)	**-0.17**
IDI (by sex)	9.29 (8.34 - 10.19)	9.42 (8.71 - 10.10)	0.12
IDI (by age-groups)	9.79 (9.05 - 10.49)	9.33 (8.32 - 10.28)	-0.46
PHI (overall)	8.95 (8.08 - 9.77)	9.89 (9.11 - 10.64)	**0.94**

SUMMARY

- Exploring how cancer prognosis varies by SEP is of high importance.
- Carefully consideration should be given to the indicators used to conceptualise SEP and what they measure.
- In our analysis, different definitions led to large variation on the estimated disparities, especially for age-specific measures.
- The choice of how to conceptualise SEP should be based not on the magnitude of the estimated disparities but on what indicator best reflects the SEP pathway that is of interest.

Summary

- Education reflects receptiveness to health education messages and the ability to communicate with and access health services.
- Household income should be chosen if interest is on material resources or the purchasing powers of households.
- Individual income should be used if an individual's status or material success and socioeconomic standing is to be measured.
- Household based measures cannot be replaced by individual measures, as the latter may be not a good indicator for the SEP of those with low individual income but access to other sources of income.

References

1. Andersson TM-L, Dickman PW, Eloranta S, Lambe M, Lambert PC. Estimating the loss in expectation of life due to cancer using flexible parametric survival models. Stat Med. 2013;32(30):5286–300.

2. Syriopoulou E, Bower H, Andersson TM-L, Lambert PC, Rutherford MJ. Estimating the impact of a cancer diagnosis on life expectancy by socio-economic group for a range of cancer types in England. Br J Cancer. 2017 Oct;117(9):1419–26.

3. Geyer S. Income, income, or income? The effects of different income measures on health in a national survey. J Epidemiol Community Health. 2011 Jun;65(6):491–6.

4. Galobardes B, Shaw M, Lawlor DA, Lynch JW. Indicators of socioeconomic position (part 1). J Epidemiol Community Health. 2006 Jan;60(1):7–12.