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Social inequality and incidence of and survival from cancers of the oesophagus, stomach and pancreas in a population-based study in Denmark, 1994–2003

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ABSTRACT

We investigated the effect of socioeconomic, demographic and health-related indicators on the incidence of and survival from cancers of the oesophagus, stomach and pancreas diagnosed during 1994–2003 with follow-up through 2006 in Denmark using information from nationwide registers. The analyses were based on data on 2075 patients with cancer of the oesophagus, 2673 with stomach cancer and 3657 with pancreatic cancer in a cohort of 3.22 million persons born between 1925 and 1973 and aged ⩾30 years. Overall, we found decreasing incidence rates of all three gastrointestinal cancers with increasing social advantage; this was most pronounced for oesophageal cancer and least for pancreatic cancer. The effect of socioeconomic position on survival after these cancers was less clear, perhaps due to the poor relative survival from these cancers and the fact that all three cancers are relatively rare in Denmark.

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1. Introduction

The incidences of oesophageal and stomach cancer in Europe have varied over the past decade, whereas those of pancreatic cancer have been fairly stable.[1] In Denmark, where cancer registration began in 1943, the incidence rate of stomach cancer has been decreasing continuously for 60 years. In 2003, 382 cases of oesophageal cancer (accounting for 1.4% of all cancers that year), 524 cases of stomach cancer (1.9%) and 752 of pancreatic cancer (2.8%) were diagnosed, making them relatively rare cancers.[2] Associations have been found between low socioeconomic position (SEP) and increased risks for oesophageal and stomach cancers, whereas the results

for pancreatic cancer and SEP have been less consistent.[3–5] In analyses with adjustment for known risk factors such as tobacco smoking, alcohol intake and infection with *Helicobacter pylori*, the social gradients persist, although the findings may be somewhat attenuated.[3,6–8] Few studies have addressed the association between social inequality and survival from these three cancers, which in general have poor prognoses.[9,10] The aim of this study was to evaluate the role of social inequality in the incidence of and survival from cancers of the oesophagus, stomach and pancreas. The study was part of a large nationwide, population-based registry study of social inequality and cancer incidence and survival in Denmark.

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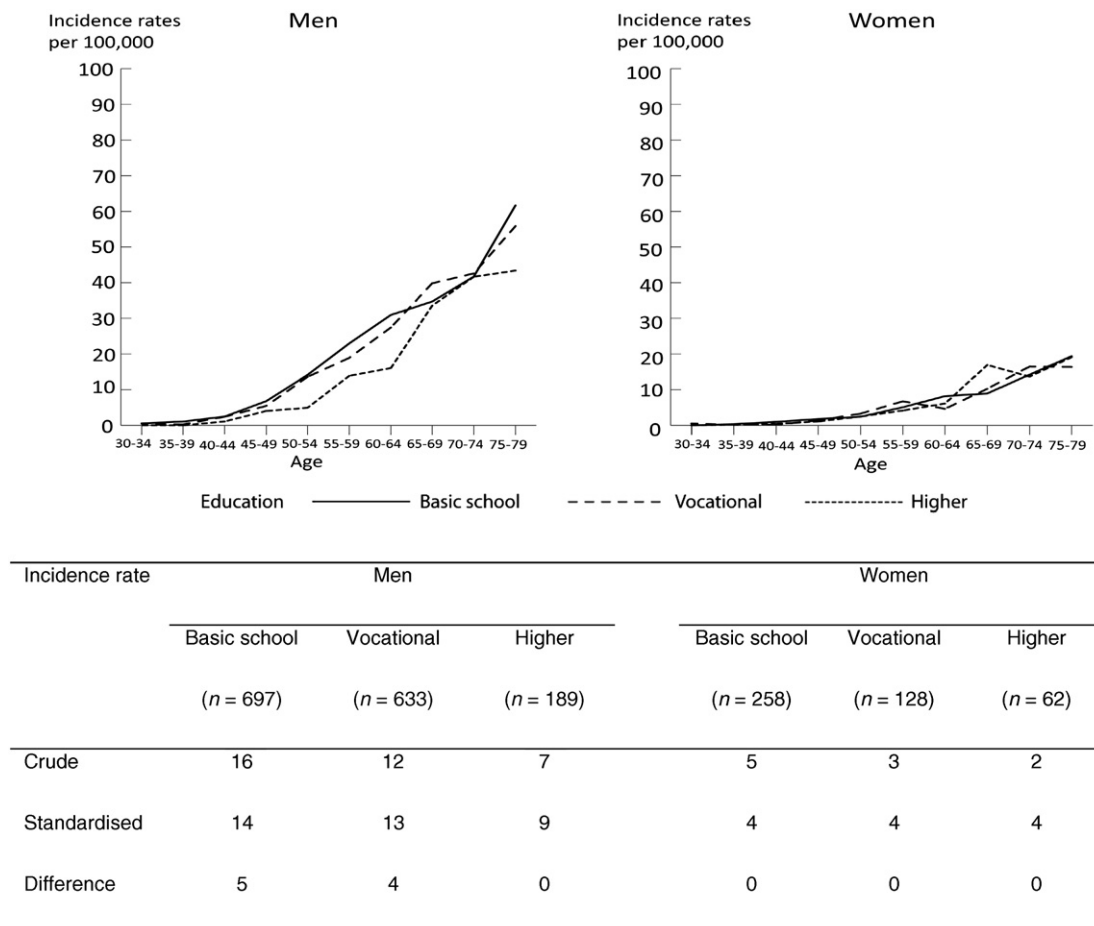 E-mail address: baastrup@cancer.dk (R. Baastrup).

2. Material and methods

The material and methods are described elsewhere.[11] Briefly, the study population comprised all 3.22 million Danish residents born between 1925 and 1973 without a previous cancer and who entered the cohort at age 30 (see Fig. 1 in [11]) Information on socioeconomic, demographic and health-related indicators was obtained from various Danish registers based on administrative data.[11] Crude, age-specific and age-standardised incidence rates are presented for cancers of the oesophagus (ICD-10 C15), stomach (ICD-10 C16) and pancreas (ICD-10 C25) diagnosed in the cohort during 1994–2003. The incidence rates were standardised by age (in 5-year age groups) and period (in two 5-year periods), with the total study population as the standard.[12] Further, we used log-linear Poisson regression to model incidence rate ratios (IRRs), first adjusted for period (in 5-year periods) and age (as two continuous variables: age and age^2 in years) and second by adding education and disposable income to the models. For each level of each indicator, we conducted relative survival

analyses, adjusting for population mortality amongst the incident cancer cases during 1994–2003 with follow-up through 2006.[11] Population mortality rates were stratified by age, period and the respective indicator. Except for the analyses of ethnicity, all analyses included only residents born in Denmark to at least one Danish-born parent with Danish citizenship.[11]

3. Results

We included 2075 persons with oesophageal cancer, 2673 with stomach cancer and 3657 with pancreatic cancer in the cohort over the period 1994–2003, representing 58%, 51% and 52%, respectively, of all cases of oesophageal, stomach, and pancreatic cancer diagnosed in Denmark in that period. Amongst Danish persons the male:female ratios were 3.4, 2.2 and 1.1, respectively, and the age- and period-standardised incidence rates of oesophageal, stomach and pancreatic cancer were 12, 14 and 15 per 100,000 person–years for men and 4, 6 and 13 per 100,000 person–years for women, respectively.

Incidence rate	Men			Women		
	Basic school	Vocational	Higher	Basic school	Vocational	Higher
	(*n* = 697)	(*n* = 633)	(*n* = 189)	(*n* = 258)	(*n* = 128)	(*n* = 62)
Crude	16	12	7	5	3	2
Standardised	14	13	9	4	4	4
Difference	5	4	0	0	0	0

Persons with unknown level of education not included

Fig. 1 – Age-specific incidence rates per 100,000 person–years for oesophageal cancer by education amongst persons born in 1925–1973, Denmark, 1994–2003. Supplementary table shows the crude incidence rate and the incidence rate standardised by age (5-year age groups) and period (two 5-year periods) with the total study population as the standard and the incidence rate difference with higher education as the reference.

3.1. Incidence of oesophageal cancer

The age- and period-standardised incidence rate of oesophageal cancer was lower amongst men with higher education than those with vocational education or basic schooling only. This tendency was not seen amongst women (Fig. 1).

The adjusted IRRs generally showed a lower oesophageal cancer incidence for both men and women with greater social advantage (Table 1). Income, affiliation to the work market, housing tenure and size of dwelling were all significantly associated with oesophageal cancer; early retirement pensioners and people living in dwellings smaller than 50 m^2 were especially susceptible. Amongst men, higher education was associated with a lower incidence of oesophageal cancer, whereas education did not appear to affect the incidence in women. The IRR for oesophageal cancer by social class was significantly reduced in men for the creative core, creative professionals, the service class and the agricultural class compared with the manual class. The same tendency was seen amongst women. Unmarried persons had a higher IRR than those who were married. Further, the IRRs were high amongst persons living in capital areas and amongst persons with somatic or psychiatric comorbidity. Although based on small numbers, immigrants or their descendants from non-western countries had a reduced incidence of oesophageal cancer.

3.2. Relative survival from oesophageal cancer

The 1-year relative survival was 30% for men and 33% for women, whilst that 5 years after diagnosis was 6% for men and 8% for women.

Fig. 2 shows the age-standardised relative survival and the excess mortality rates in oesophageal cancer patients according to education. The curves are steep for both sexes within the first year after diagnosis. Only minor differences were seen between educational groups for men, whereas women with higher education had the best survival throughout the 5 years of follow-up, which is reflected by a lower excess mortality rate within the first 3 years after diagnosis.

The age-standardised 1- and 5-year relative survival by socioeconomic variables showed some association between SEP and short- and long-term relative survival (Table 2). In general, less advantaged groups in terms of education, income and affiliation to the work market tended to have lower relative survival. However, confidence intervals overlapped between groups.

3.3. Incidence of stomach cancer

The age- and period-standardised incidence rate of stomach cancer was lower amongst men with higher education than those with basic or vocational education. A similar but less pronounced pattern was found for women (Fig. 3).

The adjusted IRRs for stomach cancer indicated decreasing incidence with increasing social advantage, which was most consistent for level of education, disposable income, affiliation to the work market and house tenure (Table 3). A similar association was observed by social class. The relatively small group of immigrants or descendants from non-western countries had higher IRRs than men and women of

Danish ethnicity. The IRR was also increased in persons with somatic comorbidity.

3.4. Relative survival from stomach cancer

The 1-year relative survival was 39% for men and 37% for women, whilst that 5 years after diagnosis was 13% for men and 15% for women.

Fig. 4 shows steep relative survival and excess mortality curves during the first year after diagnosis for both sexes and no apparent difference by education. Overall, there was no consistent pattern of association between socioeconomic and demographic variables and age-standardised relative survival for stomach cancer (Table 4). Married and cohabiting men appeared to have better long- and short-term relative survival, whereas single women had the longest 1- and 5-year relative survival. Lower relative survival was found amongst persons with depression, although the results were based on small numbers.

3.5. Incidence of pancreatic cancer

In both sexes, education had only a small effect on the age- and period-standardised incidence rate of pancreatic cancer, reflected in the somewhat lower incidence rate in persons with a high educational level than those who were less well educated (Fig. 5).

The adjusted IRRs for pancreatic cancer indicated decreasing incidence with increasing social advantage, which was most consistent for education, affiliation to the work market and housing tenure (Table 5). The IRR of pancreatic cancer was reduced in persons living in provincial and rural areas, and there was a tendency towards a reduced IRR in the agricultural class. Unmarried people had higher IRRs than those who were married. No consistent trend was seen for ethnicity, but the numbers were small. Finally, the IRR was increased in persons with somatic comorbidity but tended to be lower in those with psychiatric comorbidity, except for women with depression.

3.6. Relative survival from pancreatic cancer

The 1-year relative survival was 15% for men and 16% for women, whilst that 5 years after diagnosis was 3% for men and 2% for women.

Fig. 6 shows steep survival curves for both sexes within the first 6 months after diagnosis, which levelled off after 2 years. This is reflected in a high excess mortality rate soon after diagnosis, which declined rapidly thereafter. The relative survival was similar for all educational levels. It should be noted, however, that the findings were based on small numbers. There was no consistent association between socioeconomic, demographic and health variables and the age-standardised relative survival for pancreatic cancer (Table 6).

4. Discussion

Overall, we found an inverse social gradient in the incidence rates of oesophageal, stomach, and pancreatic cancer. This was most pronounced for oesophageal cancer and least for

Table 1 – Incidence rate ratios (IRRs) with 95% confidence intervals (95% CIs) for oesophageal cancer in Danish persons born between 1925 and 1973 and aged ⩾30 years, by socioeconomic, demographic and health-related variables, Denmark, 1994–2003

	Men			Women		
	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)
Level of education						
Basic or high school	697	1.00	1.00	258	1.00	1.00
Vocational education	633	0.96 (0.86–1.07)	1.00 (0.90–1.12)	128	1.04 (0.84–1.30)	1.12 (0.90–1.39)
Higher education	189	0.64 (0.55–0.76)	0.77 (0.65–0.91)	62	0.98 (0.74–1.31)	1.15 (0.86–1.55)
Unknown	36	1.42 (1.02–1.99)	1.47 (1.05–2.05)	5	1.10 (0.45–2.67)	1.15 (0.47–2.78)
Disposable income[c]						
Lowest (1st quartile)	555	1.18 (1.05–1.33)	1.16 (1.03–1.30)	174	1.12 (0.90–1.38)	1.14 (0.92–1.41)
Middle (2nd–3rd quartile)	728	1.00	1.00	209	1.00	1.00
Highest (4th quartile)	272	0.62 (0.54–0.71)	0.65 (0.56–0.75)	70	0.67 (0.51–0.88)	0.65 (0.49–0.86)
Affiliation to work market[d]						
Working	718	1.00	1.00	139	1.00	1.00
Unemployed or other	240	2.08 (1.79–2.41)	1.87 (1.60–2.17)	82	1.82 (1.37–2.41)	1.79 (1.34–2.40)
Early retirement pensioner	243	2.80 (2.41–3.24)	2.43 (2.08–2.84)	104	2.62 (2.00–3.44)	2.62 (1.96–3.49)
Social class[e]						
Creative core	57	0.53 (0.41–0.70)	0.73 (0.53–0.99)	5	0.76 (0.30–1.94)	0.80 (0.30–2.11)
Creative professional	176	0.56 (0.47–0.66)	0.67 (0.56–0.80)	25	0.68 (0.41–1.12)	0.69 (0.40–1.18)
Bohemian	8	0.82 (0.41–1.64)	0.97 (0.48–1.97)	0	–	–
Service	348	0.77 (0.67–0.87)	0.82 (0.72–0.93)	234	0.92 (0.65–1.28)	0.92 (0.65–1.29)
Manual	763	1.00	1.00	40	1.00	1.00
Agricultural	56	0.48 (0.37–0.63)	0.48 (0.36–0.63)	7	0.66 (0.30–1.48)	0.66 (0.30–1.48)
Unknown	147	0.93 (0.78–1.11)	0.93 (0.78–1.12)	142	1.03 (0.72–1.47)	1.02 (0.72–1.46)
Housing tenure						
Owner-occupied	863	1.00	1.00	240	1.00	1.00
Rental	664	2.02 (1.83–2.24)	1.90 (1.71–2.10)	212	1.59 (1.31–1.91)	1.54 (1.27–1.85)
Unknown	28	1.94 (1.33–2.83)	1.80 (1.23–2.62)	1	0.27 (0.04–1.92)	0.26 (0.04–1.86)
Size of dwelling (m^2)						
0–49	86	2.47 (1.97–3.11)	2.26 (1.79–2.85)	12	2.07 (1.15–3.74)	1.97 (1.09–3.55)
50–99	728	1.92 (1.71–2.15)	1.83 (1.63–2.06)	216	1.35 (1.09–1.66)	1.30 (1.05–1.61)
100–149	490	1.00	1.00	149	1.00	1.00
⩾150	251	0.77 (0.66–0.90)	0.82 (0.70–0.95)	76	0.89 (0.68–1.18)	0.93 (0.70–1.23)
Cohabiting status						
Married	978	1.00	1.00	249	1.00	1.00
Cohabiting	100	1.23 (1.00–1.52)	1.20 (0.97–1.48)	33	1.69 (1.17–2.44)	1.72 (1.19–2.49)
Single	165	1.56 (1.32–1.85)	1.42 (1.20–1.68)	26	1.35 (0.90–2.02)	1.27 (0.84–1.91)
Widow or widower	79	1.52 (1.21–1.92)	1.46 (1.16–1.84)	84	1.39 (1.07–1.80)	1.34 (1.04–1.75)
Divorced	233	2.13 (1.84–2.45)	1.95 (1.68–2.25)	61	1.51 (1.14–2.00)	1.39 (1.05–1.85)
Type of district						
Capital area	628	1.00	1.00	181	1.00	1.00
Provincial city	672	0.62 (0.56–0.69)	0.57 (0.51–0.64)	204	0.68 (0.56–0.83)	0.65 (0.53–0.80)
Rural area	174	0.66 (0.56–0.78)	0.59 (0.50–0.70)	50	0.74 (0.54–1.01)	0.70 (0.51–0.96)
Peripheral rural area[f]	81	0.67 (0.53–0.85)	0.59 (0.47–0.74)	18	0.57 (0.35–0.93)	0.53 (0.33–0.86)
Ethnicity[g]						
Danish	1555	1.00	1.00	453	1.00	1.00
Immigrant or descendant from western country	33	1.10 (0.78–1.56)	1.08 (0.76–1.53)	21	1.82 (1.18–2.82)	1.81 (1.16–2.81)
Immigrant or descendant from non-western country	12	0.35 (0.20–0.62)	0.28 (0.15–0.49)	1	0.11 (0.02–0.80)	0.09 (0.01–0.69)
Charlson comorbidity index[h]						
None	1137	1.00	1.00	332	1.00	1.00
1	275	1.53 (1.34–1.75)	1.47 (1.29–1.68)	77	2.05 (1.59–2.64)	2.02 (1.57–2.60)
⩾2	143	1.61 (1.35–1.93)	1.53 (1.28–1.83)	44	2.05 (1.49–2.82)	2.03 (1.47–2.79)
Depression						
No	1523	1.00	1.00	422	1.00	1.00
Yes	32	1.15 (0.81–1.63)	1.09 (0.77–1.55)	31	2.12 (1.47–3.05)	2.06 (1.43–2.97)

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Table 1 – continued

	Men			Women		
	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)
Schizophrenia or other psychosis						
No	1532	1.00	1.00	445	1.00	1.00
Yes	23	1.67 (1.11–2.52)	1.50 (0.99–2.27)	8	1.47 (0.73–2.96)	1.41 (0.70–2.84)

a Adjusted for calendar period (in 5-year intervals) and age modelled as age and age^2 in years.
b Adjusted for calendar period and age (as above) and additionally for level of education and disposable income.
c Household income after taxation and interest, adjusted for number of persons in household; categorised by gender-specific distribution of household disposable income per person.
d For pensioners, work market affiliation before pension date was assigned and follow-up was done up to age 69.
e Based on theory of creative class[27]: the creative core (e.g. researchers, designers, architects), creative professionals (e.g. managers, business and finance, lawyers, doctors), bohemians (e.g. artists, models), the service class (e.g. nurses, hairdressers, caterers), the manual class (e.g. construction workers, transport and production workers) and the agricultural class (e.g. farmers, fishermen).
f More than 40 km to a local centre with adequate possibilities for employment and not sharing a border with a centre municipality.
g Included as a separate indicator, but ethnic groups were excluded from the study population in all other analyses presented in Table 1, e.g. education and income.
h The presence of disorders, as defined in the Charlson index, was defined as an in- or out-patient contact with one of the diagnoses listed in Table 1 in[11] between 1978 and 2 years before the diagnosis of cancer. Grouped according to the accumulated sum of scores.

Fig. 2 – Age-standardised relative survival and excess mortality rates per 100 person–years by level of education in patients born 1925–1973, with oesophageal cancer diagnosed in Denmark 1994–2003 and followed through 2006. Relative survival is the ratio of the observed survival of the cancer patients and the survival that would have been expected if the patients had had the same age-, period- and education-specific mortality as the total study population. Excess mortality is excess to the same population mortality and estimated in intervals since diagnosis. Estimates were standardised for age on the basis of the age distribution of all patients with oesophageal cancer in the study cohort.

Table 2 – One-year and 5-year relative survival (%) with 95% confidence interval (95% CI) by socioeconomic, demographic and health variables in patients aged ⩾30 years born between 1925 and 1973, with oesophageal cancer diagnosed in Denmark between 1994 and 2003 and followed through 2006

	Men					Women				
	1-year survival			5-year survival		1-year survival			5-year survival	
	No.	%	95% CI	%	95% CI	No.	%	95% CI	%	95% CI
Level of education										
Basic or high school	689	27	24–30	5	4–7	253	30	25–37	6	3–10
Vocational education	624	30	27–34	8	6–10	128	27	20–36	7	4–13
Higher education	187	36	30–43	7	4–12	62	52	41–66	16	9–29
Unknown	34	34	21–54	3	0–19	5	29	13–67	0	–
Disposable income[b]										
Lowest (1st quartile)	546	25	22–29	4	2–6	170	31	24–40	5	3–11
Middle (2nd–3rd quartile)	718	31	28–35	8	6–10	208	31	25–38	8	5–13
Highest (4th quartile)	270	34	28–41	7	4–11	70	29	22–40	8	4–16
Affiliation to work market[c]										
Working	713	36	33–40	8	7–11	139	43	37–52	13	8–19
Unemployed or other	236	24	19–31	5	3–9	82	38	28–51	4	1–13
Early retirement pensioner	236	24	18–32	4	2–8	103	26	17–39	4	1–14
Social class[d]										
Creative core	55	31	21–46	3	1–12	5	68	54–85	11	3–45
Creative professional	176	31	25–38	8	5–13	25	55	39–76	14	5–38
Bohemian	8	17	7–41	0	–	0	–	–	–	–
Service	341	30	25–35	7	5–10	233	34	29–41	8	5–13
Manual	753	30	27–34	7	5–9	38	38	26–56	14	5–34
Agricultural	56	24	16–38	10	5–21	7	63	42–94	9	1–98
Unknown	145	25	19–34	3	1–9	140	25	18–35	5	2–12
Housing tenure										
Owner-occupied	852	30	27–34	7	5–9	237	33	27–39	9	6–14
Rental	654	30	26–33	6	4–8	210	31	26–39	6	3–11
Unknown	28	21	9–45	4	1–23	1	0	–	0	–
Size of dwelling (m^2)										
0–49	84	19	12–29	3	1–10	12	32	14–77	0	–
50–99	715	30	27–34	6	4–8	213	28	22–35	7	4–12
100–149	487	30	26–34	9	7–12	148	39	32–47	9	5–15
⩾150	248	33	27–39	5	3–9	75	35	26–48	9	5–19
Cohabiting status										
Married	968	32	29–35	7	6–9	248	36	30–42	11	8–16
Cohabiting	98	34	25–45	7	3–15	33	31	19–50	2	0–16
Single	162	21	15–28	4	2–10	24	38	23–62	5	1–31
Widow/widower	79	25	17–39	5	1–27	83	32	21–50	8	3–25
Divorced	227	23	18–29	4	2–9	60	23	14–37	2	0–17
Type of district										
Capital area	622	30	27–34	5	4–8	180	33	27–40	5	3–10
Provincial city	661	30	27–34	8	6–10	201	32	26–39	10	6–16
Rural area	172	34	28–42	7	4–12	49	33	23–49	8	3–21
Peripheral rural area[e]	79	17	10–28	3	1–11	18	46	29–74	10	2–44
Ethnicity[f]										
Danish	1534	30	28–32	6	5–8	448	33	28–37	8	6–11
Immigrant or descendant from western country	33	13	5–34	2	0–13	20	40	24–67	8	2–33
Immigrant or descendant from non-western country	12	55	43–71	2	0–11	1	0	–	0	–
Charlson comorbidity index[g]										
None	1129	31	28–33	6	5–8	329	34	29–39	8	6–12
1	269	28	23–34	7	4–11	76	29	19–43	8	3–20
⩾2	136	25	18–34	7	4–14	43	22	13–40	5	1–23
Depression										
No	1504	30	28–32	7	5–8	418	32	28–37	7	5–11
Yes	30	17	7–38	5	1–34	30	38	25–59	13	5–36

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Table 2 – *continued*									
	Men					Women			
	1-year survival			5-year survival		1-year survival			5-year survival	
	No.	%	95% CI	%	95% CI	No.	%	95% CI	%	95% CI
Schizophrenia or other psychosis										
No	1514	30	27–32	7	5–8	441	33	28–37	8	6–11
Yes	20	31	16–58	0	–	7	19	6–58	15	3–67

a Ratio of observed survival of cancer patients and survival that would have been expected if the patients had had the same age–, period-, socioeconomic, demographic or health-related indicator-specific mortality as the total study population; for 'social class' and 'ethnicity', expected survival is adjusted only for age, not period, because of low power.

b Household income after taxation and interest, adjusted for number of persons in household; categorised by gender-specific distribution of household disposable income per person.
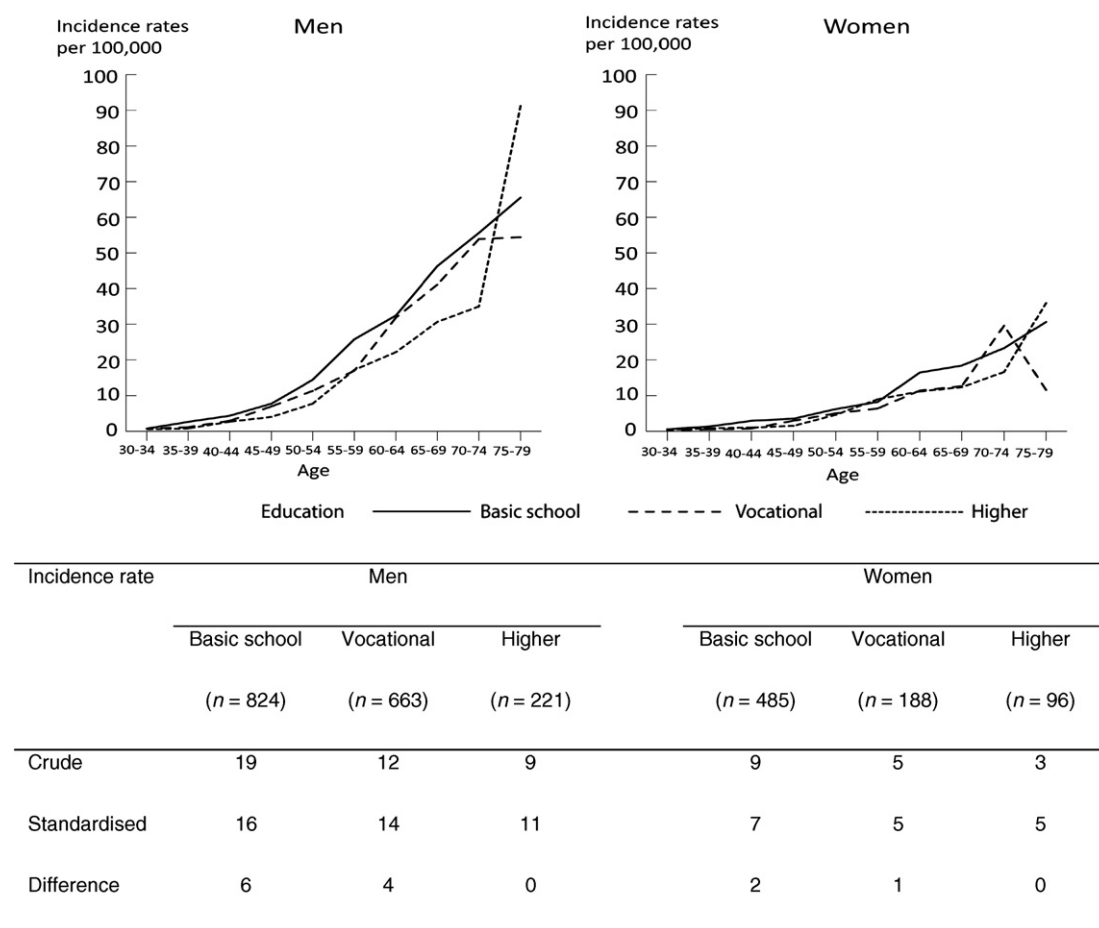
c For pensioners, work market affiliation before pension date was assigned and follow-up was done up to age 69.

d Based on theory of creative class[27]: the creative core (e.g. researchers, designers, architects), creative professionals (e.g. managers, business and finance, lawyers, doctors), bohemians (e.g. artists, models), the service class (e.g. nurses, hairdressers, caterers), the manual class (e.g. construction workers, transport and production workers) and the agricultural class (e.g. farmers, fishermen).

e More than 40 km to a local centre with adequate possibilities for employment and not sharing a border with a centre municipality.

f Excluded from the study population in all other analyses presented in Table 2.

g The presence of disorders, as defined in the Charlson index, was defined as an in- or out-patient contact with one of the diagnoses listed in Table 1 in[11] between 1978 and 2 years before the diagnosis of cancer. Grouped according to the accumulated sum of scores.

Incidence rate	Men			Women		
	Basic school	Vocational	Higher	Basic school	Vocational	Higher
	(*n* = 824)	(*n* = 663)	(*n* = 221)	(*n* = 485)	(*n* = 188)	(*n* = 96)
Crude	19	12	9	9	5	3
Standardised	16	14	11	7	5	5
Difference	6	4	0	2	1	0

Persons with unknown level of education not included

Fig. 3 – Age-specific incidence rates per 100,000 person–years for stomach cancer by education amongst persons born in 1925–1973, Denmark, 1994–2003. Supplementary table shows the crude incidence rate and the incidence rate standardised by age (5-year age groups) and period (two 5-year periods) with the total study population as the standard and the incidence rate difference with higher education as the reference.

Table 3 – Incidence rate ratios (IRRs) with 95% confidence intervals (95% CIs) for stomach cancer in Danish persons born between 1925 and 1973 and aged ⩾30 years, by socioeconomic, demographic and health-related variables, Denmark, 1994–2003

	Men			Women		
	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)
Level of education						
Basic or high school	824	1.00	1.00	485	1.00	1.00
Vocational education	663	0.86 (0.77–0.95)	0.89 (0.80–0.99)	188	0.78 (0.66–0.92)	0.81 (0.68–0.96)
Higher education	221	0.64 (0.55–0.75)	0.73 (0.63–0.86)	96	0.75 (0.60–0.94)	0.81 (0.64–1.02)
Unknown	23	0.79 (0.52–1.19)	0.80 (0.53–1.21)	10	1.13 (0.60–2.11)	1.15 (0.62–2.16)
Disposable income[c]						
Lowest (1st quartile)	634	1.23 (1.10–1.37)	1.20 (1.07–1.34)	280	1.07 (0.91–1.26)	1.03 (0.88–1.22)
Middle (2nd–3rd quartile)	763	1.00	1.00	362	1.00	1.00
Highest (4th quartile)	334	0.75 (0.66–0.85)	0.80 (0.70–0.91)	137	0.75 (0.61–0.91)	0.78 (0.64–0.96)
Affiliation to work market[d]						
Working	956	1.00	1.00	312	1.00	1.00
Unemployed or other	187	1.16 (0.99–1.36)	1.06 (0.90–1.24)	121	1.20 (0.97–1.49)	1.13 (0.91–1.41)
Early retirement pensioner	176	1.49 (1.26–1.75)	1.28 (1.08–1.52)	141	1.61 (1.30–1.99)	1.43 (1.15–1.79)
Social class[e]						
Creative core	58	0.54 (0.41–0.70)	0.70 (0.52–0.94)	8	0.57 (0.28–1.19)	0.72 (0.34–1.53)
Creative professional	234	0.74 (0.64–0.86)	0.86 (0.73–1.01)	53	0.70 (0.50–1.00)	0.84 (0.57–1.22)
Bohemian	7	0.70 (0.33–1.48)	0.82 (0.39–1.72)	0	–	–
Service	379	0.82 (0.73–0.93)	0.87 (0.77–0.99)	389	0.75 (0.59–0.96)	0.81 (0.64–1.04)
Manual	773	1.00	1.00	80	1.00	1.00
Agricultural	111	0.94 (0.77–1.14)	0.90 (0.74–1.10)	11	0.53 (0.28–1.00)	0.53 (0.28–1.00)
Unknown	169	1.03 (0.87–1.22)	1.03 (0.87–1.21)	238	0.90 (0.70–1.16)	0.91 (0.71–1.18)
Housing tenure						
Owner-occupied	1140	1.00	1.00	457	1.00	1.00
Rental	558	1.26 (1.14–1.40)	1.19 (1.08–1.32)	315	1.25 (1.08–1.45)	1.21 (1.04–1.40)
Unknown	33	1.69 (1.19–2.38)	1.57 (1.11–2.22)	7	0.96 (0.46–2.03)	0.93 (0.44–1.96)
Size of dwelling (m²)						
0–49	69	1.43 (1.12–1.83)	1.28 (1.00–1.64)	10	0.97 (0.51–1.82)	0.92 (0.49–1.73)
50–99	602	1.13 (1.01–1.26)	1.07 (0.96–1.20)	364	1.30 (1.10–1.52)	1.25 (1.07–1.47)
100–149	674	1.00	1.00	267	1.00	1.00
⩾150	386	0.88 (0.78–1.00)	0.93 (0.82–1.06)	138	0.90 (0.73–1.10)	0.93 (0.76–1.15)
Cohabiting status						
Married	1229	1.00	1.00	464	1.00	1.00
Cohabiting	111	1.06 (0.87–1.29)	1.03 (0.85–1.26)	34	0.87 (0.61–1.24)	0.86 (0.60–1.22)
Single	163	1.19 (1.01–1.41)	1.06 (0.90–1.26)	44	1.17 (0.86–1.59)	1.15 (0.84–1.58)
Widow or widower	72	1.06 (0.83–1.35)	1.01 (0.79–1.29)	117	1.09 (0.88–1.35)	1.06 (0.86–1.31)
Divorced	156	1.15 (0.97–1.36)	1.05 (0.89–1.24)	120	1.61 (1.32–1.97)	1.56 (1.27–1.91)
Type of district						
Capital area	505	1.00	1.00	240	1.00	1.00
Provincial city	920	1.06 (0.95–1.18)	0.99 (0.89–1.11)	431	1.09 (0.93–1.28)	1.03 (0.88–1.21)
Rural area	211	0.99 (0.85–1.17)	0.90 (0.77–1.06)	73	0.82 (0.63–1.06)	0.76 (0.58–0.98)
Peripheral rural area[f]	95	0.97 (0.78–1.21)	0.87 (0.70–1.09)	35	0.84 (0.59–1.20)	0.77 (0.54–1.10)
Ethnicity[g]						
Danish	1731	1.00	1.00	779	1.00	1.00
Immigrant or descendant from western country	38	1.16 (0.84–1.60)	1.21 (0.88–1.68)	22	1.12 (0.73–1.71)	1.12 (0.73–1.71)
Immigrant or descendant from non-western country	65	1.69 (1.32–2.17)	1.54 (1.18–2.00)	38	2.36 (1.70–3.27)	1.85 (1.26–2.73)
Charlson comorbidity index[h]						
None	1310	1.00	1.00	621	1.00	1.00
1	274	1.31 (1.15–1.49)	1.27 (1.11–1.45)	97	1.43 (1.16–1.78)	1.40 (1.12–1.74)
⩾2	147	1.41 (1.18–1.68)	1.35 (1.14–1.61)	61	1.59 (1.22–2.07)	1.54 (1.18–2.01)
Depression						
No	1694	1.00	1.00	752	1.00	1.00
Yes	37	1.20 (0.87–1.66)	1.16 (0.83–1.60)	27	1.06 (0.72–1.56)	1.03 (0.70–1.51)

Table 3 – *continued*

	Men			Women		
	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)
Schizophrenia or other psychosis						
No	1709	1.00	1.00	766	1.00	1.00
Yes	22	1.44 (0.95–2.20)	1.32 (0.86–2.01)	13	1.40 (0.81–2.42)	1.32 (0.76–2.29)

a Adjusted for calendar period (in 5-year intervals) and age modelled as age and age^2 in years.
b Adjusted for calendar period and age (as above) and additionally for level of education and disposable income.
c Household income after taxation and interest, adjusted for number of persons in household; categorised by gender-specific distribution of household disposable income per person.
d For pensioners, work market affiliation before pension date was assigned and follow-up was done up to age 69.
e Based on theory of creative class[27]: the creative core (e.g. researchers, designers, architects), creative professionals (e.g. managers, business and finance, lawyers, doctors), bohemians (e.g. artists, models), the service class (e.g. nurses, hairdressers, caterers), the manual class (e.g. construction workers, transport and production workers) and the agricultural class (e.g. farmers, fishermen).
f More than 40 km to a local centre with adequate possibilities for employment and not sharing a border with a centre municipality.
g Included as a separate indicator, but ethnic groups were excluded from the study population in all other analyses presented in Table 1, e.g. education and income.
h The presence of disorders, as defined in the Charlson index, was defined as an in- or out-patient contact with one of the diagnoses listed in Table 1 in[11] between 1978 and 2 years before the diagnosis of cancer. Grouped according to the accumulated sum of scores.
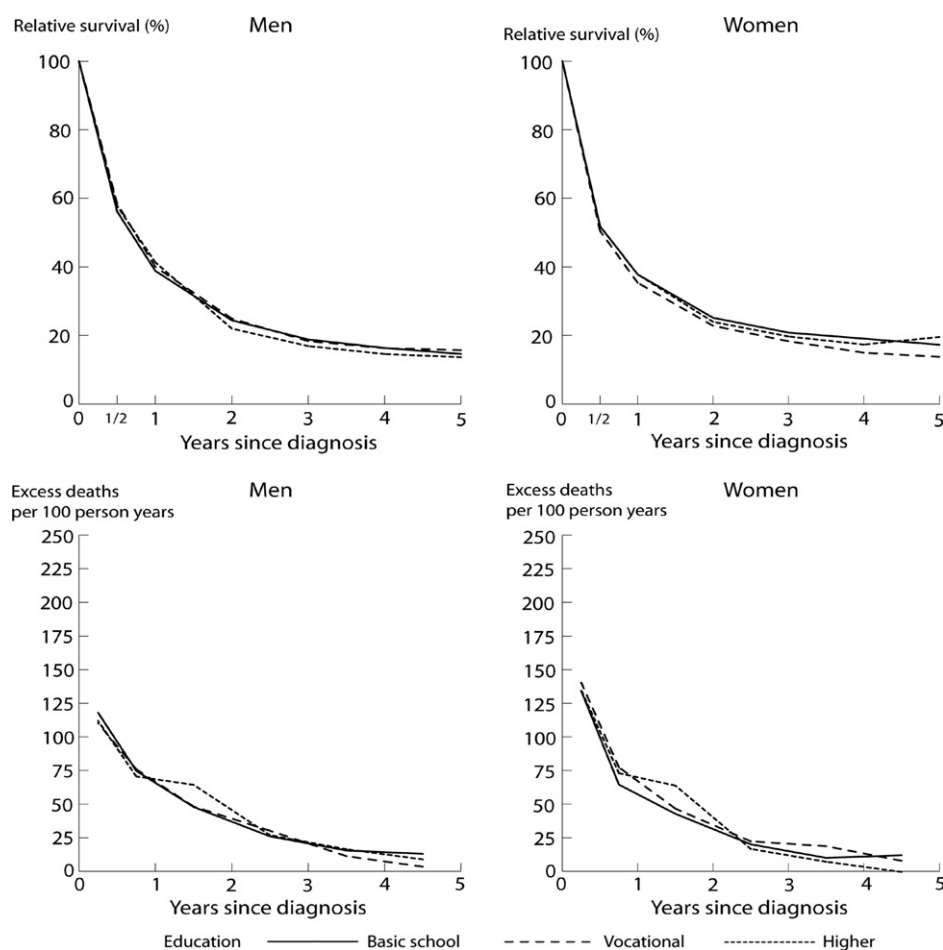

Fig. 4 – Age-standardised relative survival and excess mortality rates per 100 person–years by level of education in patients born 1925–1973, with stomach cancer diagnosed in Denmark 1994–2003 and followed through 2006. Relative survival is the ratio of the observed survival of the cancer patients and the survival that would have been expected if the patients had had the same age-, period- and education-specific mortality as the total study population. Excess mortality is excess to the same population mortality and estimated in intervals since diagnosis. Estimates were standardised for age on the basis of the age distribution of all patients with stomach cancer in the study cohort.

Table 4 – One-year and 5-year relative survival (%) with 95% confidence interval (95% CI) by socioeconomic, demographic and health variables in patients aged ⩾30 years born between 1925 and 1973, with stomach cancer diagnosed in Denmark between 1994 and 2003 and followed through 2006

	Men					Women				
	1-year survival			5-year survival		1-year survival			5-year survival	
	No.	%	95% CI	%	95% CI	No.	%	95% CI	%	95% CI
Level of education										
Basic or high school	811	39	36–42	13	11–16	480	38	34–43	16	13–20
Vocational education	651	40	36–44	14	11–17	186	35	29–43	12	8–18
Higher education	221	41	35–48	10	7–16	96	38	29–49	15	9–25
Unknown	22	36	24–56	4	1–25	10	13	4–41	14	5–45
Disposable income[b]										
Lowest (1st quartile)	622	37	33–42	12	10–16	278	37	31–45	15	10–21
Middle (2nd–3rd quartile)	752	39	35–43	14	11–17	357	36	31–41	14	11–18
Highest (4th quartile)	331	41	35–48	13	9–19	137	42	33–54	18	12–28
Affiliation to work market[c]										
Working	945	44	41–47	15	13–17	309	43	38–48	20	16–24
Unemployed or other	185	35	28–44	12	7–18	121	39	30–51	14	8–23
Early retirement pensioner	170	35	28–45	12	7–21	139	34	24–47	15	8–27
Social class[d]										
Creative core	59	39	29–54	13	7–26	8	64	40–103	34	14–83
Creative professional	229	43	37–50	13	9–19	53	50	37–67	21	11–37
Bohemian	7	75	60–93	0	–	0	–	–	–	–
Service	374	36	32–41	12	9–16	387	37	32–42	13	10–17
Manual	764	40	36–43	13	10–15	78	38	28–51	27	18–39
Agricultural	107	42	34–53	17	11–27	11	39	19–81	21	8–55
Unknown	165	35	28–43	12	8–19	235	34	28–42	12	8–18
Housing tenure										
Owner-occupied	1127	40	37–43	12	10–14	455	39	35–44	18	14–22
Rental	545	39	35–43	14	11–17	310	34	29–39	10	7–15
Unknown	33	41	27–64	18	9–36	7	20	7–59	14	3–62
Size of dwelling (m^2)										
0–49	65	38	28–52	16	9–29	8	17	6–49	9	2–52
50–99	594	38	35–43	12	9–15	363	34	30–40	11	8–16
100–149	666	39	35–43	12	10–15	264	38	32–44	17	13–22
⩾150	380	42	38–48	15	11–19	137	42	34–52	20	14–29
Cohabiting status										
Married	1212	41	38–44	14	12–16	462	39	35–44	17	14–21
Cohabiting	111	39	30–49	16	10–25	34	33	19–56	2	0–14
Single	159	29	22–38	7	4–13	42	49	35–69	21	10–44
Widow/widower	72	41	29–58	12	7–21	115	33	23–48	10	4–23
Divorced	151	33	26–42	9	5–15	119	31	24–41	11	7–19
Type of district										
Capital area	493	40	36–45	12	9–15	235	35	30–42	12	8–17
Provincial city	908	40	36–43	14	12–17	430	37	32–42	16	13–20
Rural area	209	37	31–45	10	6–15	72	43	33–55	15	9–27
Peripheral rural area[e]	95	37	28–48	12	7–22	35	48	35–65	24	14–43
Ethnicity[f]										
Danish	1705	39	37–42	13	11–15	772	37	34–41	15	12–18
Immigrant or descendant from western country	38	36	23–55	12	6–25	22	55	37–82	38	22–68
Immigrant or descendant from non-western country	65	52	40–68	28	18–43	37	48	32–71	25	12–49
Charlson comorbidity index[g]										
None	1295	40	38–43	13	11–15	615	36	32–40	15	12–18
1	269	37	31–43	13	9–18	96	48	38–59	20	13–30
⩾2	141	32	25–40	7	4–14	61	35	24–51	9	4–21
Depression										
No	1670	40	38–42	13	11–15	745	38	34–41	15	13–18
Yes	35	16	7–35	8	2–29	27	17	8–35	0	–

Table 4 – *continued*											
	Men					Women					
	1-year survival			5-year survival		1-year survival			5-year survival		
	No.	%	95% CI	%	95% CI	No.	%	95% CI	%	95% CI	
Schizophrenia or other psychosis											
No	1685	40	37–42	13	11–15	759	38	34–41	15	13–18	
Yes	20	32	17–62	0	–	13	8	1–49	0	–	

a Ratio of observed survival of cancer patients and survival that would have been expected if the patients had had the same age-, period-, socioeconomic, demographic or health-related indicator-specific mortality as the total study population; for 'social class' and 'ethnicity', expected survival is adjusted only for age, not period, because of low power.

b Household income after taxation and interest, adjusted for number of persons in household; categorised by gender-specific distribution of household disposable income per person.
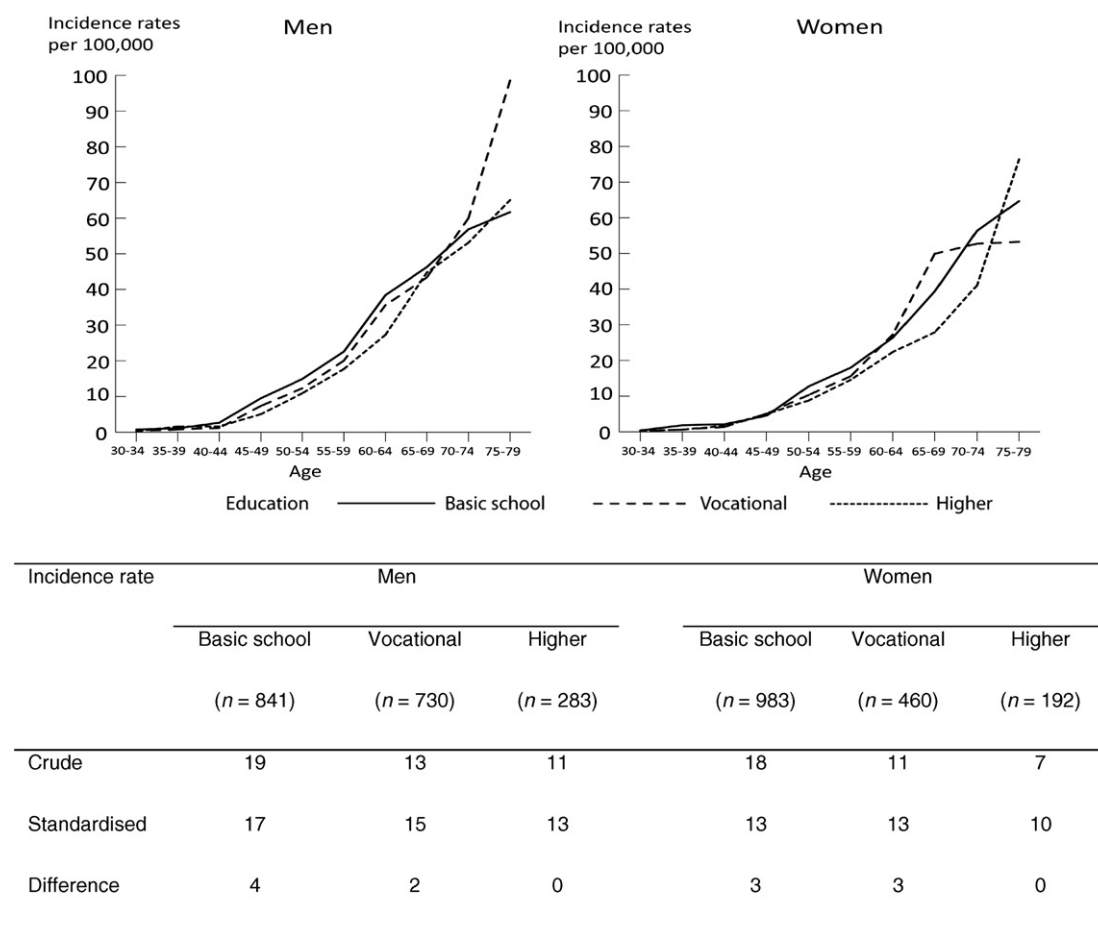
c For pensioners, work market affiliation before pension date was assigned and follow-up was done up to age 69.

d Based on theory of creative class[27]: the creative core (e.g. researchers, designers, architects), creative professionals (e.g. managers, business and finance, lawyers, doctors), bohemians (e.g. artists, models), the service class (e.g. nurses, hairdressers, caterers), the manual class (e.g. construction workers, transport and production workers) and the agricultural class (e.g. farmers, fishermen).

e More than 40 km to a local centre with adequate possibilities for employment and not sharing a border with a centre municipality.

f Excluded from the study population in all other analyses presented in Table 2.

g The presence of disorders, as defined in the Charlson index, was defined as an in- or out-patient contact with one of the diagnoses listed in Table 1 in[11] between 1978 and 2 years before the diagnosis of cancer. Grouped according to the accumulated sum of scores.

Incidence rate	Men			Women		
	Basic school	Vocational	Higher	Basic school	Vocational	Higher
	(n = 841)	(n = 730)	(n = 283)	(n = 983)	(n = 460)	(n = 192)
Crude	19	13	11	18	11	7
Standardised	17	15	13	13	13	10
Difference	4	2	0	3	3	0

Persons with unknown level of education not included

Fig. 5 – Age-specific incidence rates per 100,000 person–years for pancreatic cancer by education amongst persons born in 1925–1973, Denmark, 1994–2003. Supplementary table shows the crude incidence rate and the incidence rate standardised by age (5-year age groups) and period (two 5-year periods) with the total study population as the standard and the incidence rate difference with higher education as the reference.

Table 5 – Incidence rate ratios (IRRs) with 95% confidence intervals (95% CIs) for pancreatic cancer in Danish persons born between 1925 and 1973 and aged ⩾30 years, by socioeconomic, demographic and health-related variables, Denmark, 1994–2003

	Men			Women		
	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)
Level of education						
Basic or high school	841	1.00	1.00	983	1.00	1.00
Vocational education	730	0.93 (0.84–1.03)	0.93 (0.84–1.03)	460	0.99 (0.88–1.10)	0.99 (0.88–1.11)
Higher education	283	0.81 (0.71–0.93)	0.83 (0.72–0.96)	192	0.80 (0.69–0.94)	0.82 (0.69–0.96)
Unknown	25	0.84 (0.56–1.24)	0.84 (0.56–1.25)	20	1.16 (0.74–1.80)	1.16 (0.75–1.81)
Disposable income[c]						
Lowest (1st quartile)	591	1.00 (0.89–1.11)	0.98 (0.87–1.09)	569	0.95 (0.85–1.07)	0.94 (0.83–1.05)
Middle (2nd–3rd quartile)	846	1.00	1.00	762	1.00	1.00
Highest (4th quartile)	442	0.89 (0.80–1.00)	0.93 (0.82–1.05)	324	0.87 (0.77–1.00)	0.91 (0.79–1.04)
Affiliation to work market[d]						
Working	995	1.00	1.00	637	1.00	1.00
Unemployed or other	218	1.30 (1.12–1.50)	1.30 (1.12–1.51)	264	1.17 (1.01–1.36)	1.15 (0.99–1.34)
Early retirement pensioner	213	1.69 (1.46–1.97)	1.65 (1.41–1.93)	280	1.37 (1.19–1.59)	1.34 (1.15–1.57)
Social class[e]						
Creative core	99	0.90 (0.73–1.11)	1.06 (0.83–1.35)	18	0.76 (0.47–1.25)	0.93 (0.56–1.55)
Creative professional	273	0.84 (0.73–0.96)	0.91 (0.78–1.06)	115	0.86 (0.67–1.09)	0.99 (0.76–1.28)
Bohemian	11	1.09 (0.60–1.97)	1.19 (0.65–2.16)	3	0.83 (0.26–2.60)	0.95 (0.30–2.98)
Service	450	0.96 (0.85–1.07)	0.98 (0.87–1.10)	850	0.90 (0.76–1.08)	0.93 (0.78–1.11)
Manual	796	1.00	1.00	148	1.00	1.00
Agricultural	99	0.81 (0.66–1.00)	0.79 (0.64–0.98)	27	0.68 (0.45–1.03)	0.69 (0.46–1.04)
Unknown	151	0.89 (0.75–1.06)	0.89 (0.75–1.06)	494	0.95 (0.79–1.14)	0.96 (0.80–1.16)
Housing tenure						
Owner-occupied	1205	1.00	1.00	928	1.00	1.00
Rental	657	1.42 (1.29–1.56)	1.40 (1.27–1.54)	707	1.35 (1.23–1.49)	1.33 (1.21–1.47)
Unknown	17	0.85 (0.53–1.38)	0.85 (0.52–1.37)	20	1.41 (0.90–2.19)	1.39 (0.89–2.17)
Size of dwelling (m^2)						
0–49	74	1.51 (1.19–1.92)	1.51 (1.18–1.92)	23	1.08 (0.71–1.64)	1.08 (0.71–1.64)
50–99	699	1.28 (1.15–1.42)	1.27 (1.14–1.41)	776	1.30 (1.17–1.45)	1.29 (1.16–1.44)
100–149	695	1.00	1.00	548	1.00	1.00
⩾150	411	0.91 (0.80–1.02)	0.92 (0.81–1.04)	308	0.99 (0.86–1.14)	1.01 (0.87–1.16)
Cohabiting status						
Married	1300	1.00	1.00	978	1.00	1.00
Cohabiting	119	1.11 (0.92–1.35)	1.10 (0.91–1.33)	102	1.36 (1.10–1.67)	1.34 (1.09–1.65)
Single	173	1.24 (1.06–1.46)	1.22 (1.04–1.44)	87	1.15 (0.92–1.44)	1.18 (0.94–1.47)
Widow or widower	91	1.26 (1.01–1.56)	1.25 (1.01–1.55)	273	1.10 (0.96–1.27)	1.09 (0.95–1.26)
Divorced	196	1.36 (1.17–1.58)	1.35 (1.16–1.58)	215	1.35 (1.17–1.57)	1.35 (1.17–1.57)
Type of district						
Capital area	646	1.00	1.00	575	1.00	1.00
Provincial city	938	0.84 (0.76–0.93)	0.82 (0.74–0.91)	829	0.87 (0.78–0.97)	0.85 (0.77–0.95)
Rural area	187	0.69 (0.58–0.81)	0.66 (0.56–0.78)	168	0.78 (0.66–0.93)	0.76 (0.64–0.91)
Peripheral rural area[f]	108	0.86 (0.70–1.06)	0.82 (0.67–1.01)	83	0.83 (0.66–1.04)	0.80 (0.64–1.01)
Ethnicity[g]						
Danish	1879	1.00	1.00	1655	1.00	1.00
Immigrant or descendant from western country	44	1.23 (0.91–1.66)	1.26 (0.93–1.71)	31	0.74 (0.52–1.05)	0.74 (0.52–1.06)
Immigrant or descendant from non-western country	25	0.61 (0.41–0.90)	0.60 (0.40–0.90)	23	0.71 (0.47–1.07)	0.66 (0.42–1.03)
Charlson comorbidity index[h]						
None	1360	1.00	1.00	1310	1.00	1.00
1	358	1.61 (1.43–1.82)	1.60 (1.42–1.80)	207	1.36 (1.17–1.57)	1.34 (1.16–1.56)
⩾2	161	1.45 (1.23–1.72)	1.44 (1.22–1.70)	138	1.57 (1.32–1.88)	1.55 (1.30–1.86)
Depression						
No	1850	1.00	1.00	1584	1.00	1.00
Yes	29	0.85 (0.59–1.22)	0.84 (0.58–1.21)	71	1.28 (1.01–1.62)	1.27 (1.00–1.61)

Table 5 – continued

	Men			Women		
	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)	Obs	IRR[a] (95% CI)	Adjusted IRR[b] (95% CI)
Schizophrenia or other psychosis						
No	1864	1.00	1.00	1637	1.00	1.00
Yes	15	0.91 (0.55–1.51)	0.88 (0.53–1.46)	18	0.90 (0.57–1.43)	0.88 (0.56–1.41)

a Adjusted for calendar period (in 5-year intervals) and age modelled as age and age^2 in years.
b Adjusted for calendar period and age (as above) and additionally for level of education and disposable income.
c Household income after taxation and interest, adjusted for number of persons in household; categorised by gender–specific distribution of household disposable income per person.
d For pensioners, work market affiliation before pension date was assigned and follow-up was done up to age 69.
e Based on theory of creative class[27]: the creative core (e.g. researchers, designers, architects), creative professionals (e.g. managers, business and finance, lawyers, doctors), bohemians (e.g. artists, models), the service class (e.g. nurses, hairdressers, caterers), the manual class (e.g. construction workers, transport and production workers) and the agricultural class (e.g. farmers, fishermen).
f More than 40 km to a local centre with adequate possibilities for employment and not sharing a border with a centre municipality.
g Included as a separate indicator, but ethnic groups were excluded from the study population in all other analyses presented in Table 1, e.g. education and income.
h The presence of disorders, as defined in the Charlson index, was defined as an in- or out-patient contact with one of the diagnoses listed in Table 1 in[11] between 1978 and 2 years before the diagnosis of cancer. Grouped according to the accumulated sum of scores.
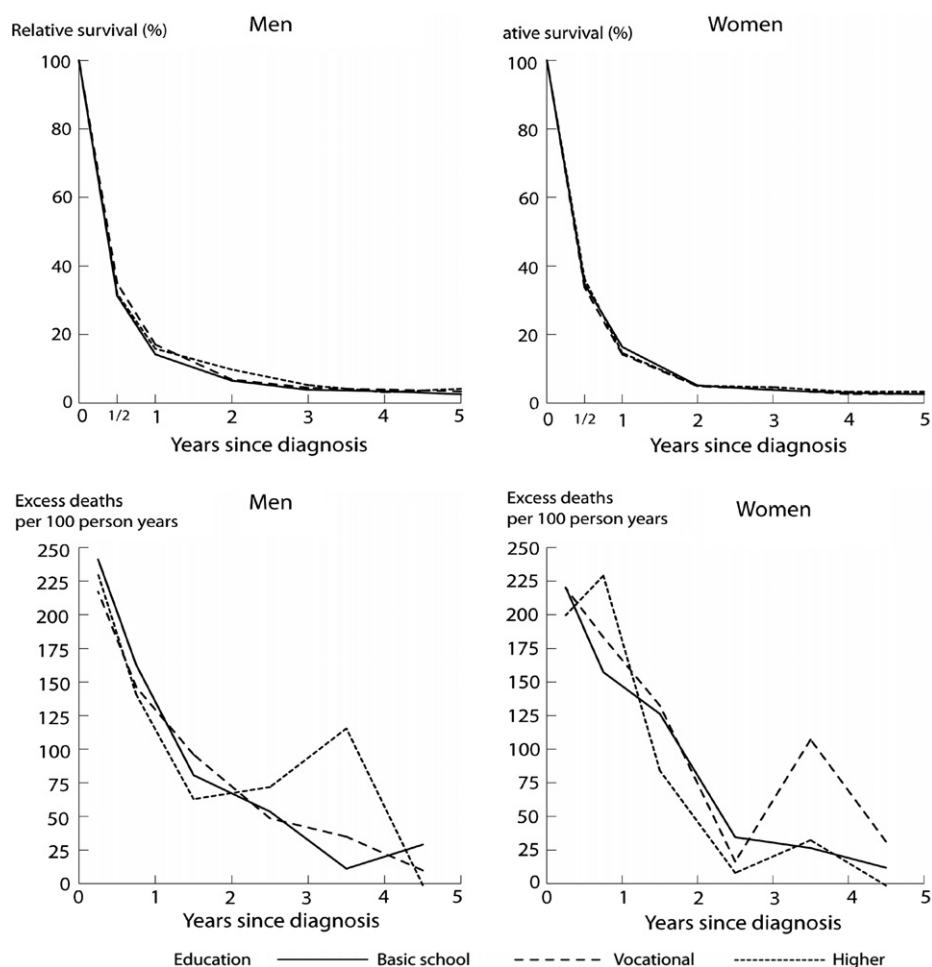

Fig. 6 – Age-standardised relative survival and excess mortality rates per 100 person–years by level of education in patients born 1925–1973, with pancreatic cancer diagnosed in Denmark 1994–2003 and followed through 2006. Relative survival is the ratio of the observed survival of the cancer patients and the survival that would have been expected if the patients had had the same age-, period- and education-specific mortality as the total study population. Excess mortality is excess to the same population mortality and estimated in intervals since diagnosis. Estimates were standardised for age on the basis of the age distribution of all patients with pancreatic cancer in the study cohort.

Table 6 – 1-year and 5-year relative survival[a] (%) with 95% confidence interval (95% CI) by socioeconomic, demographic and health variables in patients aged ≥30 years born between 1925 and 1973, with pancreatic cancer diagnosed in Denmark between 1994 and 2003 and followed through 2006

	Men					Women				
	1-year survival			5-year survival		1-year survival			5-year survival	
	No.	%	95% CI	%	95% CI	No.	%	95% CI	%	95% CI
Level of education										
Basic or high school	818	14	12–17	2	1–4	956	16	14–19	2	2–4
Vocational education	715	17	14–20	3	2–4	455	14	11–18	2	1–3
Higher education	277	16	12–21	3	2–6	189	15	10–21	2	1–7
Unknown	23	9	3–29	3	0–39	20	25	13–51	0	–
Disposable income[b]										
Lowest (1st quartile)	573	17	14–21	3	2–5	559	15	11–19	1	1–2
Middle (2nd–3rd quartile)	827	13	11–16	2	1–3	741	16	14–19	2	1–4
Highest (4th quartile)	433	20	16–24	3	2–6	320	16	12–21	3	1–6
Affiliation to work market[c]										
Working	978	19	17–21	3	2–4	628	22	19–25	4	3–6
Unemployed or other	210	12	8–19	4	2–8	257	9	6–14	1	0–4
Early retirement pensioner	202	11	7–18	3	1–8	271	16	11–22	2	1–5
Social class[d]										
Creative core	98	19	13–28	3	1–9	18	15	5–47	10	2–46
Creative professional	269	17	13–22	3	1–6	113	15	9–23	2	0–9
Bohemian	11	16	3–73	0	–	3	–	–	–	–
Service	441	16	13–20	2	1–5	837	17	14–19	2	1–3
Manual	771	13	11–16	3	2–4	143	15	10–22	4	2–9
Agricultural	98	15	10–24	1	0–6	27	19	10–37	5	1–23
Unknown	145	17	12–25	3	1–8	479	15	12–18	2	1–4
Housing tenure										
Owner-occupied	1181	18	15–20	3	2–4	916	16	14–19	2	1–3
Rental	637	12	10–15	2	1–4	684	16	13–19	2	1–4
Unknown	15	0	–	0	–	20	0	–	0	–
Size of dwelling (m²)										
0–49	71	14	7–27	7	3–19	23	12	3–43	9	2–49
50–99	677	13	10–15	2	1–3	754	16	14–19	2	1–4
100–149	680	17	14–20	3	2–5	541	16	13–19	2	1–3
≥150	405	19	15–23	2	1–5	302	16	12–21	3	1–5
Cohabiting status										
Married	1274	16	14–18	3	2–4	960	16	14–18	3	2–4
Cohabiting	115	12	7–19	2	1–8	101	25	17–36	2	1–7
Single	168	12	8–19	3	1–7	82	18	11–29	3	1–11
Widow/widower	87	20	12–33	6	2–16	267	13	8–21	1	0–3
Divorced	189	13	9–20	2	1–6	210	15	11–21	1	0–3
Type of district										
Capital area	624	14	11–17	3	2–5	559	14	11–17	2	1–3
Provincial city	921	16	14–18	2	2–4	815	18	15–21	3	2–4
Rural area	185	17	12–23	3	1–7	165	14	10–21	2	1–6
Peripheral rural area[e]	103	21	15–31	5	2–12	81	12	6–21	0	–
Ethnicity[f]										
Danish	1833	15	14–17	3	2–4	1620	16	14–18	2	2–3
Immigrant or descendant from western country	42	14	6–32	2	0–11	30	30	18–48	2	0–22
Immigrant or descendant from non-western country	25	6	2–15	0	–	23	23	11–51	6	1–32
Charlson comorbidity index[g]										
None	1332	16	14–18	3	2–4	1285	16	14–18	2	2–3
1	347	15	11–19	1	1–3	202	18	13–25	2	0–6
≥2	154	11	7–18	2	0–6	133	8	4–15	2	0–7
Depression										
No	1804	16	14–17	3	2–4	1550	16	14–18	2	2–3
Yes	29	8	3–25	0	–	70	17	10–29	2	0–13

Table 6 – *continued*										
	Men					Women				
	1-year survival			5-year survival		1-year survival			5-year survival	
	No.	%	95% CI	%	95% CI	No.	%	95% CI	%	95% CI
Schizophrenia or other psychosis										
No	1819	16	14–17	3	2–4	1603	16	14–18	2	2–3
Yes	14	0	–	0	–	17	14	5–42	0	–

a Ratio of observed survival of cancer patients and survival that would have been expected if the patients had had the same age-, period-, socioeconomic, demographic or health-related indicator-specific mortality as the total study population; for 'social class' and 'ethnicity', expected survival is adjusted only for age, not period, because of low power.

b Household income after taxation and interest, adjusted for number of persons in household; categorised by gender-specific distribution of household disposable income per person.

c For pensioners, work market affiliation before pension date was assigned and follow-up was done up to age 69.

d Based on theory of creative class[27]: the creative core (e.g. researchers, designers, architects), creative professionals (e.g. managers, business and finance, lawyers, doctors), bohemians (e.g. artists, models), the service class (e.g. nurses, hairdressers, caterers), the manual class (e.g. construction workers, transport and production workers) and the agricultural class (e.g. farmers, fishermen).

e More than 40 km to a local centre with adequate possibilities for employment and not sharing a border with a centre municipality

f Excluded from the study population in all other analyses presented in Table 2.

g The presence of disorders, as defined in the Charlson index, was defined as an in- or out-patient contact with one of the diagnoses listed in Table 1 in[11] between 1978 and 2 years before the diagnosis of cancer. Grouped according to the accumulated sum of scores.

pancreatic cancer. This result is consistent with those of previous studies.[3–5,13] When the analyses were adjusted for education and income, the inverse association persisted for most demographic and socioeconomic factors. The presence of somatic comorbidity increased the IRRs for all three cancers. For stomach cancer, increased IRRs were found for immigrants and their descendants of both sexes from non-western countries.

Social differences in tobacco smoking are likely to explain some of the observed patterns, as smoking is an established risk factor for all three cancers.[14,15] In a Nordic overview of the most important known causes of cancer and the resulting numbers of potentially avoidable cases, it was estimated that more than half of all incident cases of oesophageal cancer and 20% of all those of stomach and pancreatic cancer are caused by tobacco smoking.[16] Strong socioeconomic inequalities in tobacco smoking habits have been observed in several northern European countries, including Denmark, with a higher prevalence in less educated groups.[17] Therefore, inequalities in tobacco-related cancers can be expected.

The dramatic decline in the incidence of stomach cancer in the absence of intervention in Denmark over the past few decades, as in many other parts of the world, mainly reflects a decline in the prevalence of *H. pylori* infection, probably due to better hygiene and standards of living. This decline in incidence occurred in parallel within different social classes.[13] The association between this bacterial infection and SEP-related factors has been addressed in several studies, and the results strongly point towards an association between low SEP and infection.[18] A Danish study of 3589 adults found that educational and occupational factors were related to chronic *H. pylori* infection.[19] As at least 60% of all stomach cancers are attributable to this common infection,[20] it is conceivable that at least part of the social gradient observed is due to social differences in both infection patterns and tobacco smoking habits.

More than 40% of all cases of oesophageal cancer are attributable to alcohol consumption,[21] and both oesophageal and pancreatic cancer have consistently been associated with obesity.[22] Both risk factors appear to be related to SEP, but whereas a social gradient in obesity is reported consistently,[23] the association, at least in Denmark, is weaker for alcohol consumption.[24]

These well-documented risk factors thus appear to contribute to the social inequality in the observed cancer incidence rates. Nevertheless, social gradients have also been found in studies in which adjustment was made for a number of the above-mentioned risk factors, although the estimates are somewhat attenuated,[3,6–8] indicating that some of the socioeconomic difference is attributable to other or yet unknown risk factors.

Survival after oesophageal, stomach and pancreatic cancer in Denmark is, in general, poor and lower than the mean European survival rates for these cancers.[25] One-third or fewer patients survive the first year after diagnosis, and only 5–15% (less than 5% for pancreatic cancer) survive 5 years. Previous studies of socioeconomic inequality and survival from oesophageal, stomach and pancreatic cancer have had inconsistent results, some showing weak social gradients in survival rates[10,26] and others showing no effect.[9] Overall, we found no clear association between SEP and survival from oesophageal, stomach or pancreatic cancer. This may be explained mainly by the poor survival and the fact that all three cancers are relatively rare in Denmark, resulting in very small numbers in most socioeconomic subcategories and, thus, poor precision in estimates of relative survival.

The overriding concern today is how to improve survival, which is a precondition of a proper evaluation of the effect of SEP on survival in a small country such as Denmark. Whilst the effects of social gradients on the incidences of oesophageal, stomach and pancreatic cancer in our study cohort appear to be clear, with increasing incidences of all three cancers with less social advantage, the effect of social

inequality on survival is less fully elucidated, probably because of the poor survival from these relatively rare cancers.

Conflict of interest statement

None declared.

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