Socioeconomic differences in cancer survival

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Abstract

Study objective—The aim was to investigate the relationship between socioeconomic status and cancer survival.

Design—This was a prospective study, linking census and vital registration records for an approximate 1% representative sample of those enumerated in England and Wales in the 1971 census.

Setting—The study population is nationwide.

Participants—The study sample consists of 250 588 men and 262 484 women. During 1971–81, 17 844 cases of cancer were registered, and of those registered, 13 532 died during 1971–1983.

Measurements and main results—Socioeconomic status was assessed in terms of housing tenure. Council tenants, the low socioeconomic group, had poorer survival than owner occupiers, the high socioeconomic group, for the combined group of all neoplasms, and for 11 out of 13 neoplasms examined in males, and 12 out of 15 neoplasms examined in females. Differences were found irrespective of age, cause of death and prognosis of the cancer. Survival analysis by length of follow up indicated that council tenants were more likely to present at a later stage than owner occupiers.

Conclusions—Wide survival differentials were observed between socioeconomic groups. Differences in survival for cancers of poor prognosis (eg, oesophagus, pancreas, lung) where treatment has little effect, cannot be attributed to socioeconomic differences in treatment. The survival differences for cancers of good prognosis (eg, corpus uteri, bladder, skin) could, in part, be due to differences in treatment. It is probable that delay in seeking care is one of the major contributing causes.

In the discussion of social inequalities in health there has been much debate on the role of medical care. In England and Wales there are large socioeconomic differences in incidence and mortality from cancer. To understand the potential importance of socioeconomic differences in prompt detection and treatment of cancer it is essential to have data on differences in cancer survival. These have been examined less extensively than differences in cancer incidence. The first studies, conducted by Cohart in 1955, detected an association between socioeconomic status and cancer survival only for breast cancer.¹

Two decades later, interest in survival patterns was renewed when large differences among ethnic groups in the USA became evident, possibly due to differences in the timing of cancer detection.²

To obtain nationally representative figures, we examined cancer survival for the period 1971–1983 in England and Wales, in the OPCS Longitudinal Study, a 1% sample of people identified in the 1971 census.

Methods

The OPCS Longitudinal Study is a cohort study of an approximately 1% representative sample of those enumerated in England and Wales in the 1971 census and it links census and vital registration records.^{3–5} The present analysis is based on death records incorporated from the National Health Service central register, population characteristics from the 1971 census, and cancer incidence from the National Cancer Registration Scheme. The Longitudinal Study sample consists of 250 588 men and 262 484 women. During the years 1971–1981, 9196 men and 8652 women were registered with cancer and of those, 7466 men and 6066 women died during the follow up period (1971–1983).

Study members were classified by housing tenure. Owner-occupiers (50% of the population) should be regarded as the “high” socioeconomic status group and council tenants (30% of the population) as “low”. Two smaller groups, those in privately rented accommodation and those in institutions, have been excluded from comparisons here.

Indirect methods of standardisation were used and Standardised Case Fatality Ratios (SFR) were calculated using the case fatality rates of the whole Longitudinal Study population for the cancer in question as the standard. Standardisation was carried out for age and period of follow up, to take into account possible time trends in incidence. Exact Poisson 95% confidence intervals were estimated for standardised ratios using computerised tables. For the life table analysis the SAS LIFETEST procedure was used.

Results

Both male and female council tenants had significantly worse survival than owner-occupiers when SFRs were calculated for all malignant neoplasms (tables I and II). This overall figure is, however, affected by the different distribution of cancers among incident cases. Cancers with poor prognosis make up a larger proportion of all cancers in lower socioeconomic groups than in

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higher, especially in men. Among council tenants, 48% of male cases and 20% of female were registered with lung, stomach, pancreatic, and oesophageal cancer, compared to 38% of male owner-occupiers and 16% in female.

Of 13 sites examined in men, which comprised 86% of the total number of cancer cases, council tenants had higher SFRs than owner-occupiers in 11 (table I). In women, council tenants had higher SFRs than owner-occupiers in 12 of the 15 sites examined, which comprised 85% of the total number of cancer cases (table II).

Among major sites in men, relative differences in case fatality rates were more pronounced for cancers of the colon, bladder and skin; the first of those significant at the $p < 0.05$ level. Among major cancers in women, the largest excesses in case fatality among council tenants were for pancreas, skin, corpus uteri, and bladder; significant for the first two. For prostate cancer and for the leukaemias in men, and for stomach, rectal, and breast cancer in women, owner-occupiers had higher case fatality rates than council tenants.

Table III shows median survival time for all neoplasms, lung cancer and for cancers of good prognosis, by housing tenure. Differences in length of survival were large for good prognosis cancers, especially cancer of the bladder, the corpus uteri, and malignant melanoma. Survival analysis by length of follow up for cancers where wide differences were observed indicated that owner-occupiers had lower case fatality rates than council tenants throughout long periods of follow up. Case fatality rates were especially high for council tenants in the initial months of the follow up period.

Table 1 Standardised case fatality ratios (SFR) with 95% confidence intervals (CI) for men, by socioeconomic status. Cancers are grouped by prognosis.

	Housing tenure			
	Owner-occupiers		Council tenants	
	Observed	SFR (95% CI)	Observed	SFR (95% CI)
All neoplasms	3131	92 (88-95)	2198	110 (105-114)
<i>Prognosis: 1-19% five year relative survival</i>				
Oesophagus	79	93 (74-117)	56	103 (78-134)
Stomach	313	96 (86-108)	210	106 (92-122)
Pancreas	130	96 (81-115)	55	107 (80-139)
Lung	922	96 (90-102)	889	104 (97-111)
<i>Prognosis: 20-39% five year relative survival</i>				
Colon	207	89 (77-102)	109	128 (105-154)
Rectum	175	92 (79-107)	111	109 (90-132)
Prostate	295	103 (92-116)	136	94 (79-112)
Lymphomas ^a	76	102 (80-127)	46	116 (85-154)
Leukaemias	86	105 (84-130)	35	96 (67-134)
<i>Prognosis: 40-59% five year relative survival</i>				
Bladder	173	91 (78-106)	122	111 (92-132)
<i>Prognosis: 60% + five year relative survival</i>				
Larynx	26	97 (63-142)	29	119 (80-171)
Other skin	183	91 (78-105)	103	114 (93-138)
Testis	15	99 (55-163)	8	160 (69-315)

^a SFRs for both groups are above 100 because the third housing tenure group has low case fatality.

Death certificates do not always show a person with a cancer to have died of this cancer. Patterns observed for any cause of death were similar to those based only on deaths from primary cancer. An analysis of socioeconomic differences in survival by age, showed that difference persisted in all age groups.

Discussion

In this large, nationally representative study, council tenants had higher case fatality rates than owner-occupiers in 11 out of 13 major cancers in men and in 12 out of 15 major sites in women.

Less privileged socioeconomic groups have usually been found to have worse survival than more privileged, although this has varied over time and in different populations and cancer sites. In the OPCS Longitudinal Study population, relative differences were pronounced for cancers of the testis, colon, bladder, and skin in men, and pancreas, skin, corpus uteri, and bladder in women. This accords, in part, with findings from the SEER Program in the USA: the widest survival differences between blacks and whites were for cancers of the bladder and the corpus uteri.^{2,6} In other studies socioeconomic differences in colon cancer are inconsistent,⁷⁻¹⁴ in cancer of the pancreas they are small,^{2,7,8,10} and there are few published data on skin or testicular cancer.^{7,8}

In most studies, low socioeconomic groups have worse survival for prostate cancer^{2,7-9,11,15,16} or breast cancer,^{7-9,11,14,15,17-20} contrary to the findings in the Longitudinal Study and three other studies.^{10,21,22} There are no obvious reasons for this inconsistency.

The higher case fatality of the lower socioeconomic groups cannot be ascribed to differences in causes of death other than cancer. The socioeconomic differences were observed whether deaths from any cause, or only deaths from the primary cancer, were considered.

Possible explanations of socioeconomic differences in survival include: differences in treatment, stage of presentation, in host resistance, in tumour characteristics, and in time of diagnosis (lead time bias). We consider each in turn.

TREATMENT

Survival differences in the Longitudinal Study were consistent and wide for the group of cancers with the best prognosis, eg, corpus uteri, testis, and malignant melanoma, but were also evident for cancers with bad prognosis: oesophagus, pancreas, lung. The large socioeconomic differences in survival for good prognosis cancers are as expected if differences in treatment are playing a role. The differences in survival for poor prognosis cancers, where treatment has little effect, suggest that socioeconomic differences in treatment are far from being the most important factor.

STAGE AT PRESENTATION

Variation in stage of cancer at presentation has been identified as a contributing but not a complete cause of survival differentials in other studies.^{2,6,7,10,16,17,23} The National Cancer

Registration Scheme in England and Wales, and hence the OPCS Longitudinal Study, does not provide any information on stage. The high case fatality of council tenants in the very first period of follow up may indicate that compared to owner-occupiers, a higher proportion of council tenants presented at a late stage of their cancer. In England and Wales, high socioeconomic groups may make more use of preventive health services,²⁴ and have better compliance with cervical cancer screening.^{25 26} Diverse results have been found for breast cancer and colorectal cancer screening.²⁷⁻²⁹

HOST RESISTANCE AND TUMOUR CHARACTERISTICS
Lower socioeconomic status may also be related to lower resistance affecting the rate of progression of the disease.⁷⁻¹² Influences of host characteristics, eg, immune response and nutritional status, on the progression of a cancer are well known. The degree to which such characteristics influence socioeconomic differences in survival is still questionable. Differences in tumour characteristics have been examined mainly among ethnic groups, eg, different histological types for cancer of the corpus uteri in black and white Americans,⁶ but evidence is still limited.

LEAD TIME BIAS

Diagnostic patterns have been shown to affect comparison of incidence and case fatality rates and validity of long term comparisons of survival rates has been questioned.^{30 31} The survival of

Table III Median survival time (years) for all neoplasms, lung cancer, and cancers of good prognosis by socioeconomic status. Median survival is not age adjusted.

	Housing tenure	
	Owner-occupiers	Council tenants
(a) Men		
All neoplasms	0.83	0.57
Lung	0.27	0.25
<i>Prognosis: 40-59% five year relative survival</i>		
Bladder	3.52	2.81
<i>Prognosis: 60% + five year relative survival</i>		
Larynx	5.87	4.39
Other skin	> 10	> 10
Testis	> 10	> 10
(b) Women		
All neoplasms	2.90	1.83
Lung	0.39	0.39
<i>Prognosis: 40-59% five year relative survival</i>		
Breast	5.15	5.80
Cervix uteri	6.16	6.65
Bladder	4.48	1.75
<i>Prognosis: 60% + five year relative survival</i>		
Malignant melanoma	> 10	6.25
Other skin	> 10	> 10
Corpus uteri	> 10	7.19

high socioeconomic groups could appear better not because prompt diagnosis altered the natural history of the disease but simply because diagnosis has taken place earlier in the natural history of the disease—lead time bias. Such information as is available on stage at presentation indicates that high socioeconomic groups are frequently diagnosed earlier and lead time could therefore be one of the factors contributing to survival differentials.

CONCLUSIONS

The prospective and record linkage character of the OPCS Longitudinal study provided the opportunity of examining cancer survival differences in a large representative sample of the population of England and Wales. Wide differences were observed between socioeconomic groups. It is probable that delay in seeking care is one of the major contributing causes. Treatment, host resistance, and other factors may also contribute.

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Table II Standardised case-fatality ratios (SFR) with 95% confidence intervals (CI) for women, by socioeconomic status. Cancers are grouped by prognosis.

	Housing tenure			
	Owner-occupiers		Council tenants	
	Observed	SFR (95% CI)	Observed	SFR (95% CI)
All neoplasms	2719	94 (90-97)	1601	105 (101-111)
<i>Prognosis: 1-19% five year relative survival</i>				
Oesophagus	54	92 (70-121)	41	116 (83-158)
Stomach	182	102 (87-118)	126	96 (80-115)
Pancreas	96	96 (78-118)	39	145 (108-198)
Lung	265	94 (83-106)	220	106 (93-122)
<i>Prognosis: 20-39% five year relative survival</i>				
Colon	279	92 (82-103)	133	102 (85-121)
Rectum	136	104 (88-124)	67	85 (66-108)
Ovary	176	94 (80-109)	81	107 (85-134)
Lymphomas	58	93 (71-120)	34	116 (89-174)
Leukaemias	72	96 (75-121)	33	115 (79-161)
<i>Prognosis: 40-59% five year relative survival</i>				
Breast	605	99 (91-107)	302	97 (87-109)
Cervix uteri ^a	72	95 (75-120)	72	97 (76-122)
Bladder	59	83 (63-107)	37	117 (82-161)
<i>Prognosis: 60% + five year relative survival</i>				
Malignant melanoma	16	81 (46-105)	18	121 (72-191)
Other skin	125	88 (73-105)	71	125 (98-157)
Corpus uteri	75	85 (67-107)	47	120 (88-160)

^a SFRs for both groups are below 100 because the third housing tenure group has high case fatality.

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