

Trends in cancer incidence by social class in South Australia, as inferred from occupational status

I N T R O D U C T I O N

Previous analyses of South Australian Cancer Registry data by socioeconomic status of residential postcode have pointed to an elevated incidence in upper socioeconomic postcodes of cancers of the colon, female breast, prostate and skin (melanoma).¹ By comparison, incidence rates for stomach, laryngeal, lung and cervical cancers were higher in the lower socioeconomic postcodes.¹ These gradients are consistent with trends reported for other populations.^{2,3}

In this chapter, social-class gradients of cancer incidence are re-examined for the 1977-98 diagnostic period, this time using occupational records to infer social class. Data on social gradients of cancer have facilitated responses to questions about cancer risk from local community groups, and have helped meet requests from health planners for information on local-service requirements. It seems appropriate, therefore, to explore these gradients further and seek confirmation of earlier findings, using a different methodology.

M E T H O D S

The process of collecting occupational data for the South Australian Cancer Registry has been described in Chapter 3, together with the limitations of these data. Occupational information was employed in the present study to classify cases according to the Congalton scale as upper (A), mid-upper (B), mid-lower (C), or lower (D) status.⁴ This was feasible for 18,292 cases.

The relative probability (relative risk) of a cancer originating in a specified anatomical site, as opposed to another site, was analysed by Congalton status using multiple regression. Covariables comprised age at diagnosis (expressed as dummy variables, ie, as under 40 (reference), 40-49, 50-59, 60-69, 70-79 or 80 years and over) and where applicable, sex. In this analysis, Cox proportional hazards regression was adapted by treating survival as a constant, and by using the censoring variable to indicate anatomical site.^{5,6} In all instances, assumptions underlying these tests, such as an absence of colinearity, were tested and found to be met.⁵

Initially, results are compared with earlier ones for South Australia, based on socioeconomic status of residential postcode.¹ Additional results then are compared with trends reported in the international literature. All results are standardized by age, and where applicable by sex, as previously described.

R E S U L T S

The relative probability of a cancer of a specified site (95% confidence limits) was found to vary by Congalton status as follows:

- For cancers found in previous analyses to be more common in the upper socioeconomic postcodes of Adelaide:¹

<i>Cancers (sites)</i>	<i>Congalton scale</i>				<i>P value</i>
	<i>D (lower) (reference)</i>	<i>C</i>	<i>B</i>	<i>A (upper)</i>	
Colon (n=1,484)	1.00	1.10 (0.96, 1.25)	1.33 (1.15, 1.54)	1.31 (1.03, 1.67)	<0.001
Female breast (n=2,168)	1.00	0.93 (0.83, 1.03)	1.60 (1.44, 1.79)	0.69 (0.52, 0.91)	<0.001
Prostate (n=1,346)	1.00	1.35 (1.18, 1.55)	1.29 (1.09, 1.52)	1.57 (1.25, 1.97)	<0.001
Skin (melanoma) (n=1,240)	1.00	1.31 (1.13, 1.52)	1.47 (1.25, 1.74)	1.96 (1.53, 2.52)	<0.001

In general, the present data confirm postcode findings by pointing to a predominance of these cancers among cases from the middle to upper classes. The only exception applied to female breast cancer, which appears to be comparatively uncommon in the highest class.

- For cancers found in previous analyses to be more common in the lower socioeconomic postcodes of Adelaide:¹

<i>Cancers (sites)</i>	<i>Congalton scale</i>				<i>P value</i>
	<i>D (lower) (reference)</i>	<i>C</i>	<i>B</i>	<i>A (upper)</i>	
Stomach (n=574)	1.00	0.96 (0.80, 1.16)	0.75 (0.58, 0.96)	0.42 (0.24, 0.72)	<0.001
Larynx (n=201)	1.00	0.59 (0.44, 0.80)	0.38 (0.24, 0.62)	0.44 (0.20, 0.94)	<0.001
Lung (n=2,263)	1.00	0.82 (0.74, 0.90)	0.64 (0.57, 0.73)	0.55 (0.44, 0.70)	<0.001
Cervix (n=261)	1.00	0.83 (0.62, 1.12)	0.95 (0.69, 1.32)	0.54 (0.24, 1.25)	0.317

Again, the present data generally confirm postcode findings by pointing to a predominance of these cancers among cases from the lower classes. The evidence was least compelling for cervical cancer (p=0.317), although the highest class still had the lowest relative probability of this disease. With a larger study group, this finding could well have been statistically significant.

Other cancers showing a variation in relative probability (95% confidence limits) by Congalton status included:

<i>Cancers (sites)</i>	<i>Congalton scale</i>				<i>P value</i>
	<i>D (lower) (reference)</i>	<i>C</i>	<i>B</i>	<i>A (upper)</i>	
Oesophagus (n=194)	1.00	0.96 (0.69, 1.31)	0.58 (0.36, 0.93)	0.61 (0.28, 1.33)	0.054
Lip (n=390)	1.00	0.71 (0.51, 0.88)	0.58 (0.43, 0.79)	0.41 (0.22, 0.76)	<0.001
Soft tissue (n=215)	1.00	0.95 (0.69, 1.33)	1.01 (0.68, 1.49)	1.87 (1.10, 3.19)	0.116
Testis (n=378)	1.00	1.18 (0.92, 1.51)	0.95 (0.71, 1.28)	1.85 (1.18, 2.90)	0.028
Cranial nerves etc. (n=31)	1.00	1.06 (0.39, 2.87)	1.67 (0.58, 4.83)	5.74 (1.85, 17.88)	0.021
Multiple myeloma etc. (n=240)	1.00	1.17 (0.85, 1.62)	1.25 (0.86, 1.84)	1.92 (1.15, 3.20)	0.121

For sites apart from the lip and oesophagus, the data point to a predominance of these cancers among cases from the upper classes. These results, and the reverse trend for oesophageal cancer, generally are consistent with trends for other populations, although little evidence has been published in this context for soft-tissue tumours.^{2,3,7-11} Meanwhile, the elevation for lip cancer is consistent with the outdoor environment of many occupations of comparatively low social status, where there would be an increased potential for sun exposure.³

D I S C U S S I O N

The data are consistent with earlier findings for South Australia in pointing to an elevated frequency of colon, prostate, and skin (melanoma) cancers among cases from the upper social classes.¹ More active screening and related investigations among upper socioeconomic sections of the population probably have contributed to these trends.¹ Similar trends have been observed for other population groups and other causes have been suggested.^{2,3} Variations in fat intake and other dietary components have been postulated for colon and prostate cancers, together with variations in sexual behaviour for prostatic lesions.³ Low parity and delayed age at first birth also have been linked to an elevated risk of colon cancer in females,³ which may have contributed to the social gradient of this disease. Meanwhile, differences in sun exposure, including childhood exposure, probably have affected melanoma trends.^{2,3}

The present elevation in frequency of female-breast cancer among cases from the mid-upper classes accords with earlier findings of an upper socioeconomic gradient of this disease.¹ Again, more active screening and variations in reproductive history are thought to have contributed.^{2,3} The present finding of a lower frequency for the upper as opposed to mid-upper class is contradictory, however, and may have occurred by chance.

The data are consistent with earlier findings for South Australia in showing a reduced frequency of cancers of the stomach, larynx, lung and (possibly) cervix among cases from the upper social classes.¹ The trend for stomach cancer may have been due to dietary factors, although variations in exposure to *Helicobacter pylori* also could have contributed.^{2,3} Similar social gradients for laryngeal cancer in other populations have been attributed to tobacco and excess alcohol consumption, whereas the gradients for lung cancer have been linked to tobacco consumption and (less so) to variations in exposure to asbestos and other occupational carcinogens.^{2,3} Meanwhile, excesses of cervical cancer in lower socioeconomic groups generally have been attributed to a low screening coverage, and sometimes to variations in sexual behaviour.³

The present data show an excess of oesophageal cancers among cases from the lower social classes. This is consistent with earlier findings for South Australian males,¹ and with gradients found in other populations, which are thought to have been influenced by tobacco smoking, alcohol consumption, and in some instances, nutritional differences.^{2,3,7} Meanwhile, the excess of lip cancers for the lower social classes probably reflects outdoor working conditions prone to sun exposure, and possibly effects of tobacco smoking and alcohol consumption.³

The elevated frequency of testicular cancers among cases from the upper classes also is consistent with international findings, although the reason is unknown.^{2,3,8} There are suspicions that experiences early in life may have contributed, such as exposures to viral infections or foetal exposures to oestrogen-like compounds.³

The elevated frequency of cancers of the cranial nerves and related structures among cases from the upper classes also accords with the gradient observed in other populations.^{3,10} The reason for this elevation, and the accompanying elevation for multiple myelomas and immunoproliferative neoplasms, is not known, although variations in access to diagnostic services have been cited as a possible contributor in some populations.^{3,11}

The present data point to an increased frequency of soft-tissue tumours in the upper social classes, although the overall trend by social class was not statistically significant ($p=0.116$). This result was unexpected. It has not been a common finding for other populations,^{2,3} and could well have occurred by chance.

S U M M A R I Z I N G C O M M E N T S

The occupational information available to the Registry is limited, such that population-based incidence rates could not be calculated. As a consequence, it was necessary to restrict analyses to comparisons of site distributions of cancers by occupational status. Nonetheless, the results show similar social gradients for individual cancers to earlier postcode analyses for South Australia,¹ and generally accord with trends reported for other populations.^{2,3}

There is evidence of an elevated frequency in the upper social classes of colon, prostate, skin (melanoma), testicular, and some nervous-system tumours, and of multiple myelomas and immunoproliferative neoplasms. A reverse social gradient is suggested, however, for cancers of the stomach, larynx, lung, oesophagus, lip and (possibly) cervix.

ABSTRACT

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Depending on the cancer, these trends likely were influenced by variations in screening and allied early-detection initiatives, diet and food storage, tobacco smoking, alcohol consumption, infection rates, and sun and other environmental exposures.³ Background trends in cancer rates of this type have an important application in the planning of cancer-control services and warrant ongoing review.

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