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Papers

Are there socioeconomic gradients in stage and grade of breast cancer at diagnosis? Cross sectional analysis of UK cancer registry data

Jean Adams, Martin White, David Forman

Socioeconomic gradients in uptake of breast cancer screening in the United Kingdom should, intuitively, lead to socioeconomic gradients in disease progression at diagnosis.¹ However, studies have found little evidence of such an effect.²⁻⁵ Although this could be interpreted as evidence that socioeconomic gradients in uptake of screening do not have clinically important consequences, all of the published studies have used data from before (pre-1988) or during the early stages (1988-95) of implementation of the national breast cancer screening programme. We investigated the relation between socioeconomic position and progression of breast cancer at diagnosis by using recent data from the Northern and Yorkshire Cancer Registry and Information Service (NYCRIS), which is estimated to achieve around 93% ascertainment.

Methods and results

We assessed progression of breast cancer (ICD-10 C50) as both stage and grade at diagnosis. We defined advanced stage as nodal or metastatic spread and high grade as poorly differentiated, undifferentiated, or anaplastic disease. We used Townsend deprivation scores of enumeration district of residence at registration—from 1991 census data standardised to the Northern and Yorkshire region as a whole—to quantify socioeconomic position.

All 12 793 women with breast cancer registered with NYCRIS between 1998 and 2000 were eligible for inclusion. Full information was available for 11 512 (90.0%) women on stage of cancer at diagnosis and for 10 388 (81.2%) women on grade of cancer at diagnosis. The table shows the odds ratios for advanced stage or high grade of breast cancer at diagnosis by fifths of Townsend score.

Stage at diagnosis was advanced in 1455 (12.6%) women, and grade was high in 3176 (30.6%). We found significant trends

according to Townsend score in the likelihood of advanced stage ($\chi^2=25.52$, $P<0.0001$) and high grade at diagnosis ($\chi^2=8.34$, $P=0.004$); women in the most deprived fifth had odds ratios of 1.53 (95% confidence interval 1.28 to 1.82) for advanced stage and 1.15 (1.00 to 1.31) for high grade at diagnosis, compared with those in the most affluent fifth. An age stratified analysis found that the effect of socioeconomic position on disease progression at diagnosis was stronger in women potentially exposed to breast cancer screening than in those not exposed (see bmj.com for full details). Compared with women in the most affluent fifth, the odds of women in the most deprived fifth having advanced stage at diagnosis was 1.75 (1.38 to 2.22) in those eligible for screening (aged 50-74 in 1998-2000) and 1.42 (1.22 to 1.65) in those not eligible (aged <50 or ≥ 75 in 1998-2000). Odds ratios for high grade at diagnosis were 1.21 (1.02 to 1.43) and 0.90 (0.76 to 1.05).

Comment

We have found strong socioeconomic trends in the chance of both advanced stage and high grade of breast cancer at diagnosis. Women living in more materially deprived areas tended to have more advanced disease at diagnosis than those living in less deprived areas.

Socioeconomic variations in the use of hormone replacement therapy may have confounded our results in relation to grade at diagnosis. Furthermore, tumour grade may not be an accurate marker of breast cancer progression. However, the direction of effect seen here is consistent in terms of both stage and grade, with a stronger magnitude of effect in relation to



Further information and an extra table are on bmj.com

Odds ratios with tests for trend of odds of advanced stage or high grade of breast cancer at diagnosis by fifths of Townsend deprivation score, adjusted for age (Northern and Yorkshire region, 1998-2000)

Fifth of TDS	TDS range	Advanced stage at diagnosis*		High grade at diagnosis†	
		No (%)	Odds ratio (95% CI)	No (%)	Odds ratio (95% CI)
1 (most affluent)	-8.89 to -3.32	247/2349 (10.5)	1.00	635/2139 (29.7)	1.00
2	-3.32 to -1.82	253/2319 (10.9)	1.02 (0.84 to 1.23)	603/2115 (28.5)	0.94 (0.82 to 1.07)
3	-1.82 to 0.07	300/2325 (12.9)	1.19 (0.99 to 1.43)	632/2097 (30.1)	1.01 (0.89 to 1.16)
4	0.07 to 2.59	290/2242 (12.9)	1.20 (1.00 to 1.44)	642/2028 (31.7)	1.10 (0.96 to 1.26)
5 (most deprived)	2.59 to 8.45	365/2277 (16.0)	1.53 (1.28 to 1.82)	664/2009 (33.1)	1.15 (1.00 to 1.31)
Test for trend of odds			$\chi^2=25.52$, $P<0.0001$		$\chi^2=8.34$, $P=0.004$

TDS=Townsend deprivation score.

*Defined as nodal or metastatic spread.

†Defined as poorly differentiated, undifferentiated, or anaplastic.

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stage. This is the first work in this area to use data from NYCRIS, and, although it is unlikely, our results might reflect geographical, rather than temporal, variations in breast cancer progression by socioeconomic position.

Clear socioeconomic gradients in the uptake of breast screening have been reported,¹ and breast cancer screening increases the detection of breast cancers early in their clinical course. The socioeconomic gradients in disease progression at diagnosis may thus be due in part to socioeconomic gradients in uptake of breast cancer screening. The finding that no such gradients were present in data collected before the implementation of the national breast cancer screening programme supports this explanation, although such data are from other parts of the United Kingdom and rarely have complete stage data. Other factors must explain the gradient in women who were not screened.

The national breast cancer screening programme may have led to socioeconomic inequalities in disease progression at diagnosis in the United Kingdom. Further consideration of the possible impact of interventions on socioeconomic inequalities in health is needed.

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Contributors: JA conceived the study, did the analysis, and drafted the paper. MW supervised the analysis and critically appraised an earlier draft of the manuscript. DF facilitated data extraction and critically appraised an earlier draft of the manuscript. JA will act as guarantor.

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Competing interests: DF is director of information and research at NYCRIS.

Ethical approval: Not needed.

What is already known on this topic

Socioeconomic gradients exist in uptake of breast cancer screening in the United Kingdom

What this study adds

Significant socioeconomic trends exist in the likelihood of breast cancer being diagnosed at high grade or advanced stage

These trends are stronger in women potentially exposed to the breast cancer screening programme

- 1 Sutton S, Bickler G, Sancho-Aldridge J, Siadi G. Prospective study of predictors of attendance for breast screening in inner London. *J Epidemiol Community Health* 1994;48:65-73.
- 2 Thomson C, Hole D, Twelves C, Brewster D, Black R. Prognostic factors in women with breast cancer: distribution by socioeconomic status and effect on difference in survival. *J Epidemiol Community Health* 2001;55:308-15.
- 3 Macleod U, Ross S, Gillis C, McConnachie A, Twelves C, Watt G. Socio-economic deprivation and stage of disease at presentation in women with breast cancer. *Ann Oncol* 2000;11:105-7.
- 4 Brewster D, Thomson C, Hole D, Black R, Stroner P, Gillis C. Relation between socioeconomic status and tumour stage in patients with breast, colorectal, ovarian, and lung cancer: results from four national, population based studies. *BMJ* 2001;322:830-1.
- 5 Carnon A, Ssemwogerere A, Lamont D, Hole D, Mallon E, George W, et al. Relation between socioeconomic deprivation and pathological prognostic factors in women with breast cancer. *BMJ* 1994;309:1054-7.

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