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. However, studies have found little evidence of such an effect. 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 (1.58 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 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, and breast cancer screening increases the detection of breast cancer progression. 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)

<table>
<thead>
<tr>
<th>Fifth of TDS</th>
<th>TDS range</th>
<th>No (%)</th>
<th>Odds ratio (95% CI)</th>
<th>No (%)</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (most affluent)</td>
<td>-∞ to -3.32</td>
<td>247/2349 (10.5)</td>
<td>1.00</td>
<td>635/2139 (29.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>-3.32 to -1.82</td>
<td>253/2319 (10.9)</td>
<td>1.02 (0.84 to 1.23)</td>
<td>603/2115 (28.5)</td>
<td>0.94 (0.82 to 1.07)</td>
</tr>
<tr>
<td>3</td>
<td>-1.82 to -0.07</td>
<td>300/2333 (12.9)</td>
<td>1.19 (0.99 to 1.43)</td>
<td>633/2091 (30.1)</td>
<td>1.01 (0.89 to 1.16)</td>
</tr>
<tr>
<td>4</td>
<td>0.07 to 2.59</td>
<td>290/2242 (12.9)</td>
<td>1.20 (1.00 to 1.44)</td>
<td>642/2028 (31.7)</td>
<td>1.10 (0.96 to 1.26)</td>
</tr>
<tr>
<td>5 (most deprived)</td>
<td>2.59 to ∞</td>
<td>365/2277 (16.0)</td>
<td>1.53 (1.28 to 1.82)</td>
<td>664/2009 (33.1)</td>
<td>1.15 (1.01 to 1.31)</td>
</tr>
</tbody>
</table>

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.
The Apgar score has played a crucial role in the delivery room assessment of newborn babies since 1953, but this system has its limitations and is prone to inter-observer variation. Moreover, scoring definitions in textbooks vary slightly and no specific guidelines are available for scoring intubated babies. We studied variations between observers and focused on the scoring of respiratory effort in resuscitated and intubated newborn babies.

**Participants, methods, and results**

We developed a questionnaire with three case presentations of newborns in which the Apgar score had to be determined.

**Case 1**—A full term newborn baby is breathing irregularly at five minutes after birth. Oxygen and mask and bag ventilation are applied. The infant's heart rate is 120 beats/min. The infant cries in response to stimulation, has some flexion of extremities, and is pink with blue extremities.

**Case 2**—A full term newborn baby is born after a breech extraction. The infant is immediately intubated and ventilated because of apnoea. At five minutes, the heart rate is 120 beats/min, the infant is completely flaccid on the ventilator, does not respond to stimulation, and is pink.

**Case 3**—A preterm boy, born at 25 weeks of gestation, is intubated and ventilated immediately after birth. At five minutes the child is active on the ventilator with a heart rate of 120 beats/min and is pink with blue extremities. His muscle tone is normal for gestational age and response to stimulation is good.

Further consideration of the possible impact of interventions on socioeconomic inequalities in health is needed.

We thank Caroline Brook and Cheryl Craig at NYCRIS for help in abstracting the data used in this analysis.

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.

Funding: This analysis was funded by the Faculty of Public Health: BUPA joint research fellowship (2001-4) awarded to JA. All of the authors are independent from this funding source. Competing interests: DF is director of information and research at NYCRIS.

Ethical approval: Not needed.


doi 10.1136/bmj.38114.679387.AE