GEOGRAPHICAL VARIATION IN RECORDED INCIDENCE OF CHILDHOOD CANCER IN ENGLAND AND WALES, 1976-2005

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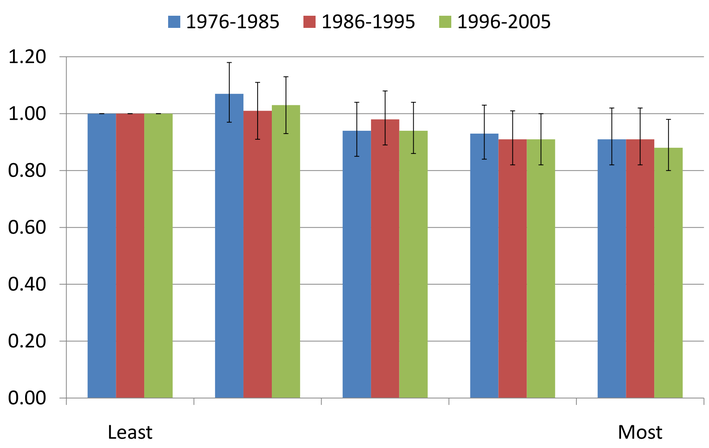
Aims We assessed regional and socio-economic variation in the recorded incidence of cancer under age 15 in England and Wales during 1976-2005, investigated changes over time, and considered possible explanations.

Methods Within each census decade (centred on 1981, 1991 and 2001), we fitted Poisson regression models (including age, sex, region, and either deprivation category or deprivation trend, as factors) to the recorded incidence rates for census wards categorised by region (Wales and the nine English Government Office Regions) and deprivation (child-population-weighted quintile categories of the relevant Carstairs deprivation index). Estimated incidence rate ratios with 95% confidence intervals are shown below, for comparisons that were statistically significant in at least one decade. We also used Poisson models to calculate 'step functions' suggesting probable timing of underlying changes in national reported incidence rates over time.

Leukaemia

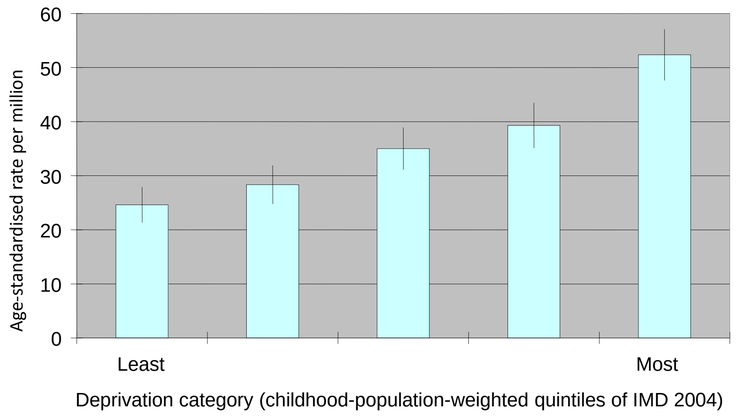
Trend with deprivation:
1976-1985 p<0.01
1986-1995 p<0.05
1996-2005 p<0.01



Relative rates by deprivation

- In all three decades, the recorded incidence of childhood leukaemia was lower in more deprived areas of England and Wales.
- Capture-recapture analysis and HES linkage for childhood leukaemia cases diagnosed around 2001 has found no evidence that registration of these cases was incomplete.
- Greaves' 'delayed infection' hypothesis is a possible explanation, but difficult to test.
- Incomplete diagnosis of leukaemia due to fatal infections is another possibility.

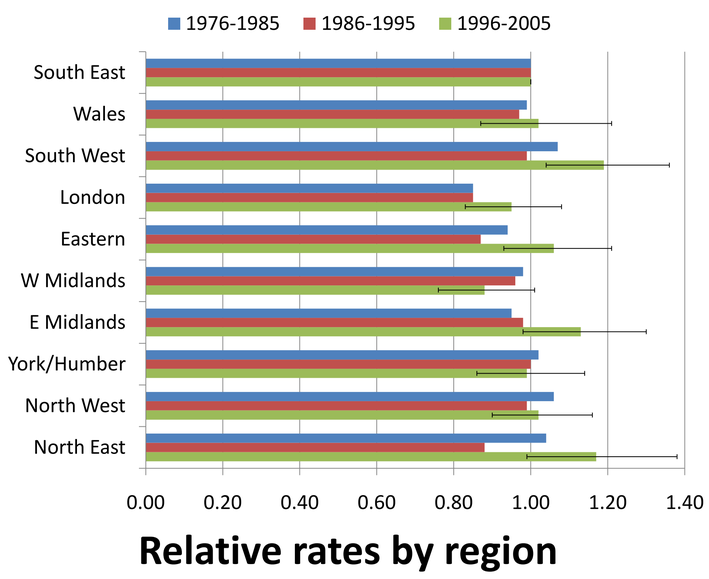
Childhood mortality from infection is relatively high in the most deprived areas of England. Perhaps leukaemic children from these areas are more likely to die from infection without being diagnosed with leukaemia.



Childhood infection mortality England 2001-05

CNS tumours

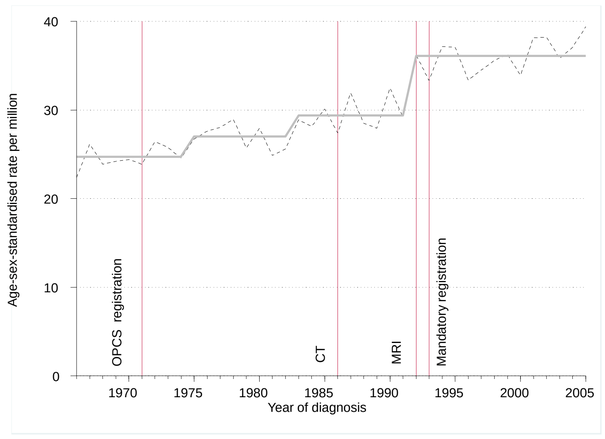
Heterogeneity between regions:
1976-1985 not significant
1986-1995 not significant
1996-2005 p<0.01



Relative rates by region

- During 1996-2005 (but not 1976-1985 or 1986-1995) there was statistically significant regional variation in the recorded incidence of childhood intracranial/intraspinal (CNS) tumours in England and Wales.
- Nationally, there was an increase in annual rates during the early 1990s, i.e. around the time of the introduction of both diagnostic MRI and mandatory cancer registration in Britain. Both these factors could have affected the recorded incidence of childhood CNS tumours.

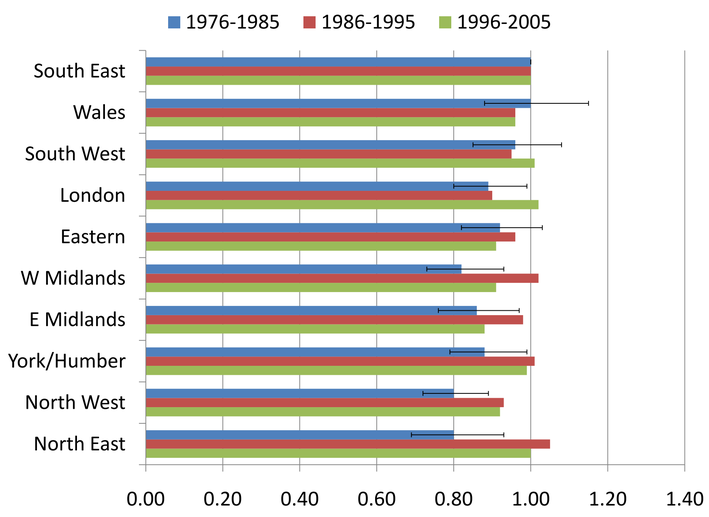
The recent variation may be due to chance, or real causal factors. But regional differences in the use of MRI, or in the implementation of mandatory cancer registration, or both, are possible explanations.



Annual recorded incidence, Britain 1966-2005

Non-CNS solid cancer

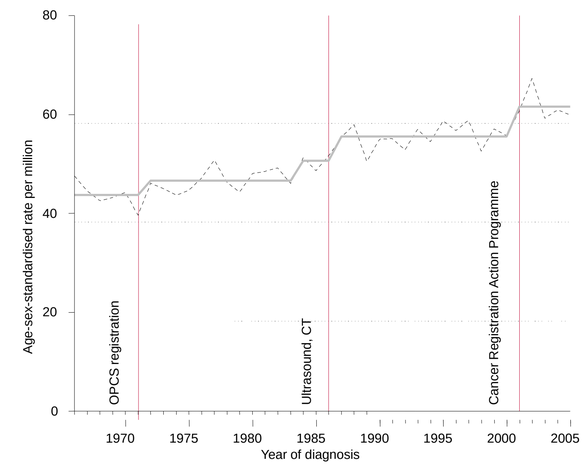
Heterogeneity between regions:
1976-1985 p<0.001
1986-1995 not significant
1996-2005 not significant



Relative rates by region

- During 1976-1985 (but not 1986-1995 or 1996-2005) there was strong statistically significant regional variation in the recorded incidence of childhood non-CNS solid cancer in England and Wales.
- Rates were lower in Northern regions and the Midlands than in South East England.
- Nationally, the rate increased during the mid-1980s, around the time that ultrasound (US) and CT scanning came into routine use for paediatric tumour diagnosis in Britain.

The regional differences during 1976-1985 are probably not due to chance, and artefact seems the most likely explanation. Perhaps variation in efficiency of diagnosis was reduced by the introduction of US and CT.



Annual recorded incidence, Britain 1966-2005

Conclusions Artefacts of diagnosis and registration may well account for some of the geographical variation seen in the recorded incidence of childhood cancer. Similar explanations might account for some of the (much larger) inequalities found in adult cancer rates.