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Socio-economic inequalities in the incidence of four common cancers: a population-based registry study

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ABSTRACT

Objectives: To investigate the relationship between socio-economic circumstances and cancer incidence in Scotland in recent years.
Study design: Population-based study using cancer registry data.
Methods: Data on incident cases of colorectal, lung, female breast, and prostate cancer diagnosed between 2001 and 2012 were obtained from a population-based cancer registry covering a population of approximately 2.5 million people in the West of Scotland. Socio-economic circumstances were assessed based on postcode of residence at diagnosis, using the Scottish Index of Multiple Deprivation (SIMD). For each cancer, crude and age-standardised incidence rates were calculated by quintile of SIMD score, and the number of excess cases associated with socio-economic deprivation was estimated.
Results: 93,866 cases met inclusion criteria, comprising 21,114 colorectal, 31,761 lung, 23,757 female breast, and 15,314 prostate cancers. Between 2001 and 2006, there was no consistent association between socio-economic circumstances and colorectal cancer incidence, but 2006–2012 saw an emerging deprivation gradient in both sexes. The incidence rate ratio (IRR) for colorectal cancer between most deprived and least deprived increased from 1.03 (95% confidence interval [CI] 0.91–1.16) to 1.24 (95% CI 1.11–1.39) during the study period. The incidence of lung cancer showed the strongest relationship with socio-economic circumstances, with inequalities widening across the study period among women from IRR 2.66 (95% CI 2.33–3.05) to 2.91 (95% CI 2.54–3.33) in 2001–03 and 2010–12, respectively. Breast and prostate cancer showed an inverse relationship with socio-economic circumstances, with lower incidence among people living in more deprived areas.
Conclusion: Significant socio-economic inequalities remain in cancer incidence in the West of Scotland, and in some cases are increasing. In particular, this study has identified an emerging, previously unreported, socio-economic gradient in colorectal cancer incidence

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among women as well as men. Actions to prevent, mitigate, and undo health inequalities should be a public health priority.

Introduction

Cancer is the most common cause of death, and of premature death, in Scotland, with four sites, lung, breast, prostate, and colorectal, accounting for approximately half of all cases and deaths.[1–3] Scotland experiences higher rates of cancer incidence and mortality than the rest of the UK, with the burden particularly high in the West of Scotland.[4]

Socio-economic inequalities in incidence have been described for a range of cancers worldwide, across various measures of socio-economic circumstances.[5] Global trends toward population ageing and a growing burden of non-communicable disease suggest that in coming years, cancer will become an increasingly important proximal cause of health inequalities. Since exposure to modifiable factors is a key determinant of cancer risk,[6] studying inequalities in incidence may identify opportunities to improve the reach and effectiveness of health improvement activities.

Although previous studies have documented the existence of such inequalities, there is a lack of up-to-date analyses from high-income countries, particularly in relation to trends over time. Recent years have seen changes in the distribution of risk factors (such as tobacco use), in primary and secondary prevention efforts (such as screening), and in the economic and political forces that drive the social determinants of health.[7–9] There is thus a need to update our understanding of socio-economic inequalities in cancer incidence.

We investigated the relationship between socio-economic circumstances and incidence of the four most common cancers in the West of Scotland between 2001 and 2012, using data from a population-based registry.

Methods

Study population

For the purpose of this study, the West of Scotland region was defined as comprising the Health Board areas of Ayrshire and Arran, Dumfries and Galloway, Forth Valley, Greater Glasgow and Clyde, and Lanarkshire. Together, these areas have a resident population of approximately 2.5 million people; around half of the total Scottish population.

Data on cases were obtained from the West of Scotland Cancer Surveillance Unit, which holds regional data from the Scottish Cancer Registry.[10] Inclusion criteria were incident case of colorectal, lung, prostate, or female breast cancer; aged ≥15 years; date of incidence between 2001 and 2012; resident at diagnosis in any one of the following Health Boards, Ayrshire and Arran, Dumfries and Galloway, Forth Valley, Greater Glasgow and Clyde, and Lanarkshire. Exclusion criteria were inability to ascertain deprivation status due to missing postcode or residence in a postcode with no SIMD score assigned; multiple registrations for cancers of the same site in the same individual (only the earliest registration for each site in each individual was included); cases with a negative survival time or recorded as having a hospital admission after death (assumed to represent linkage errors resulting from probabilistic matching).

The date of incidence for each case was defined in the registry as the first outpatient consultation, hospital admission, pathology report, or treatment for that cancer; or, if none of the aforementioned criteria could be established, as the date of diagnosis or best estimate. Year of incidence was classified into four 3-year periods to facilitate analysis. These were chosen to correspond with an extension of the upper age limit for breast cancer screening (between 2004 and 2006) and the introduction of a national screening programme for colorectal cancer (between 2007 and 2009).

Like most other population-based cancer registries, the Scottish Cancer Registry does not collect individual-level socio-economic indicators, such as income or occupation. An area-level proxy indicator, the Scottish Index of Multiple Deprivation (SIMD), was therefore used, based on the postcode of each case at diagnosis. The SIMD is based on a relative ranking of 6505 small areas ('datazones'), according to the weighted sum of scores from seven domains (income, employment, crime, education, health, housing and access to amenities and services). Datazones have a mean population of 800 individuals; their boundaries remained stable throughout the study period of 2001–2012. There have been multiple releases of SIMD over the years: for this analysis, SIMD 2006 was chosen as the release closest to the midpoint of the study period. Cases were classified on the basis of population-weighted quintiles of SIMD score, with one representing the least deprived and five the most deprived sectors of the population.

Midyear population estimates, adjusted for the results of the 2011 census, were obtained from National Records for Scotland for each datazone, by age, sex and year.

Analysis

All analyses were undertaken using Stata, version 12 (Statacorp, College Station, TX).

Crude incidence rates, in cases per 100,000 person-years, were calculated for each 3-year period and for the study period as a whole by dividing the cumulative number of incident cases occurring during that period by the cumulative population for each year of that period.

In order to adjust for the local age profile and enable comparison with published studies from other regions and