ALL-IRELAND CANCER ATLAS 1995-2007

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FOREWORD

I welcome this first All-Ireland Cancer Atlas, which provides a unique insight into geographical variation in cancer on the island of Ireland. I congratulate both Registries on their ongoing collaboration in data harmonisation, analysis and reporting, which has done much to advance our understanding of cancer in Ireland. The continuing partnership between the Registries shows the benefits of the NCI/Ireland/N. Ireland Consortium, a fundamental aim of which is to promote joint research of this kind.

This atlas provides new insights into cancer risk in Ireland and highlights the extent to which effective prevention could reduce the cancer burden in Ireland. It also poses some difficult questions with regard to unexplained variations in incidence and the role of socio-economic status in determining cancer risk. These are matters we need to understand better and the recommendations made for further study must be taken seriously by the Departments of Health in both jurisdictions.

This report shows yet again that improving public health requires high quality information and that, in cancer registries, we have a powerful, and almost unique, mechanism for providing this data both nationally and internationally.

I would like to pay a particular tribute to the Directors of each Registry, Dr Harry Comber and Dr Anna Gavin. This report, and the excellent collaboration upon which it depends, would not have come about without their committed and sustained leadership and vision over many years.

Dr Tony Holohan, Chief Medical Officer, Republic of Ireland.

Cancer poses a significant present and future public health challenge.

In our efforts to control and prevent cancer at a population level it is essential that we continue to develop the evidence, ensuring through research that we continue to strive to understand the variation in cancer incidence, the implications for preventative strategies and the potential to identify new contributory factors.

This report, the latest manifestation of the collaboration between the cancer Registries in Northern Ireland and the Republic of Ireland, provides a most valuable overview of cancer distribution. It describes the geographical distribution of some of the commonest cancers, highlighting the variation in the incidence of a range of cancers. Whilst much of the variation in modifiable cancer burden is already known, this variation poses many questions that both policy makers and researchers alike will need to study and fully consider. I am confident that this report will make a significant contribution to our growing understanding of cancer prevention with the potential to make a real impact in reducing cancer risk. I commend the work of all those who have been involved in contributing to its development and especially recognise the debt of gratitude to all of those who lived and are living with cancer whose data is included in the report.

Dr Michael McBride, Chief Medical Officer, Northern Ireland.

BACKGROUND

The National Cancer Registry and Northern Ireland Cancer Registry have, since the early 1990s collected information on cancers diagnosed on the island of Ireland. The registries have collaborated on three all-Ireland cancer reports and several research projects. This is the first atlas to be produced as a result of this collaboration.

AIMS

The aims of this atlas were:

1. to describe geographical variation in cancer risk on the island of Ireland;
2. to describe socio-economic and demographic effects on cancer risk;
3. to attempt to relate the observed variation to known risk factors;
4. to recommend actions to be taken as a result of the findings.

METHODS

This atlas combines cancer incidence data for the years 1995 to 2007 inclusive, at the smallest geographical level available (ward and electoral division (ED)), for Northern Ireland (NI) and the Republic of Ireland (RoI). This data has been analysed in two ways

- by negative binomial regression of incidence rates, using socio-demographic variables at ward/ED level such as population density, percentage unemployed and degree-level education, to examine the relationship between these variables and cancer risk;
- by mapping smoothed incidence data across the whole island to look for overall geographical patterns in cancer relative risk.

RESULTS

The risk of developing many of the cancers presented here was higher in RoI than in NI. The risk of non-melanoma skin cancer, melanoma, leukaemia, bladder, pancreas and brain/central nervous system cancers was significantly higher for both sexes in RoI. For men, the risk of prostate cancer was higher in RoI and, for women, cancer of the oesophagus and cervix. In NI, the risk of lung cancer was higher for both sexes as was that among women for non-Hodgkin's lymphoma, head and neck cancers and cancer of the uterus. Overall, the relationships between socio-economic variables and cancer risk were similar for men and women. Patterns consistent with known socio-economic gradients were seen—lung, stomach, head and neck and cervical cancers were all more common in areas of higher unemployment and/or lower levels of degree attainment, while non-melanoma skin cancer, female breast cancer, prostate cancer and melanoma were less common. Most cancers were also more frequent in urban areas (as measured by population density); only prostate cancer was more common in rural areas.

Mapping also demonstrated broadly similar geographical patterns for men and women for most cancers. However, apart from this, there was little consistency between different cancer sites in the geographical distribution of risk. There was a marked geographical variation in the risk of some common cancers—non-melanoma skin, lung, prostate and stomach, but very little for others—breast, colorectal, non-Hodgkin's lymphoma. The most consistent geographical distribution of cancer risk was seen for three cancers (pancreas, brain/central nervous system and leukaemia) which showed an increasing gradient of risk from north-east to south-west.

Eighteen cancer sites were studied, and the results are described in more detail below, in order of cancer frequency.

Non melanoma skin cancer

Non-melanoma skin cancer was 18% commoner in women and 15% commoner in men in RoI than in NI. The risk was higher in more affluent areas, in areas with high levels of elderly living alone, in more densely populated districts and in coastal and urban areas.

Breast cancer

There was no statistically significant difference in female breast cancer risk between RoI and NI. Risk increased with increased population density and affluence. Geographical patterns changed over time, reflecting the introduction of breast screening in RoI in 2000. During 2002-2007, higher rates were seen in the east of RoI (where screening had begun) than in the west (where it had not).

Colorectal cancer

There was no statistically significant difference in colorectal cancer risk between RoI and NI. Increased risk was associated with increasing population density for both sexes and with unemployment for men only. There were areas of higher risk around Cork and from Donegal to Down.

Lung cancer

The risk of lung cancer was significantly higher in NI than RoI for both men (by 11%) and women (by 7%). Increased risk was associated with increased population density, unemployment and low levels of education and was highest in urban areas of Belfast, Dublin, Derry and Cork, and also in Louth, Kildare, Carlow and Wicklow.

Prostate cancer

The risk of diagnosis of prostate cancer was 29% lower in NI than RoI. Men in areas with the highest educational attainment had the highest risk. The risk was highest in the south and east of Ireland during 1995-2001 and in the west and north of RoI during 2002-2007.

Non-Hodgkin's lymphoma (NHL)

There was no significant difference in risk between NI and RoI for men but the risk for women was 14% higher in NI. There was no association between NHL risk and population density or socio-economic factors. The highest risk for men was in the north-east, and in Kerry and Galway and in the north-east and Dublin for women.

Stomach cancer

Stomach cancer risk was higher in areas of high population density and in those with high unemployment and lower educational attainment. There was a strong geographical pattern, with higher risk in a band running from Dublin to Donegal, excluding the north-east, but including Belfast.

Melanoma of the skin

Melanoma risk was lower in NI than RoI for both men (by 8%) and women (by 14%). Risk was not associated with population density; but was associated, for both men and women, with low unemployment and high educational attainment, and was highest in coastal areas in the south and east of Ireland.

Bladder cancer

Bladder cancer risk was lower in NI for men (by 8%) and for women (by 14%) than in RoI and increased with population density (for both sexes) and unemployment (men only). Male geographical patterns were distinctive, with increased risks from Louth to Wicklow, including Dublin city, and also in Donegal, North Down and Ards. For women, there was an area of higher risk in the south-west.

Head and neck cancer

The risk of head and neck cancer was greater, by 21%, for women in NI compared to RoI but there was no statistically significant difference for men. The risk increased with increased population density and unemployment but not with educational attainment. There was no clear geographical pattern for men, but for women there was one large area of higher relative risk stretching north-westwards in a line between Dublin and Sligo.

Leukaemia

The risk of leukaemia was lower in NI than in RoI, by 23% for men and 17% for women. There was no association with population density, employment or educational attainment. Mapping showed an increasing gradient of increasing risk from north-east to south-west, more pronounced in men.

Pancreatic cancer

Pancreatic cancer risk was lower in NI than in RoI, by 11% in men and 22% in women. Increased risk was associated with higher unemployment, but only for men. In women the risk increased with decreasing levels of educational attainment. There was a gradient across the island, with increased risk in the south-west and lowest in north-east; this pattern was more marked in women than men.

Kidney cancer

There was no statistically significant difference in risk between NI and RoI and no association with either population density or socio-economic factors. The area of highest risk was mainly in Leinster, with a lower relative risk in the west.

Oesophageal cancer

The risk was 8% lower in NI than RoI for women but there was no statistically significant difference for men. Risk increased with increasing population density for both sexes but there was no association with unemployment or educational attainment. The area of highest risk was south of a line from Dublin to Kerry, with areas of low risk in the north-west.

Ovarian cancer

There was no association with country, population density or socio-economic factors. The areas of highest risk were around Cork city, extending more widely across most of Munster and also in the eastern half of NI, excluding parts of Down and Belfast.

Brain and other central nervous system (CNS) cancers

The risk of brain and other CNS cancer was lower in NI than RoI, by 10% for men and 20% for women. There was a weak positive association with population density for women only, and no association with socio-economic variables for either sex. There was a strong geographical pattern, with the highest risk in the south-west and lowest risk in the north-east.

Cancer of the corpus uteri

The risk of cancer of corpus uteri was higher by 11% in NI than in RoI. There was no significant association with population density or socio-economic variables. Higher risk was noted in Connacht, most of Northern Ireland and parts of Munster.

Cancer of the cervix uteri

The risk of cancer of the cervix was significantly higher, by 11%, in RoI than NI and increased with increasing population density, unemployment and poor educational attainment. The areas of highest risk were around Dublin, extending to Wexford and the midlands. Areas around Cork, Waterford, Belfast and Sligo also had higher risk.

CONCLUSIONS

This atlas shows major variations, sometimes more than two-fold, in the risk of several cancers, across the island. For many cancers, we found a strong relationship between markers of socio-economic status and cancer risk, sometimes positive, sometimes negative. These socio-economic relationships were more consistent than the broad geographical patterns identified by mapping. Few of the geographical patterns could be satisfactorily explained by the available data on risk factors, although we did see some correlations between smoking prevalence and smoking-related cancers.

Some differences in relative risk appeared to be attributable to health service provision—higher levels of breast screening in NI in the 1990s; more prostate specific antigen testing in RoI. For a few cancers, the more demand-led service in RoI may lead to more case-finding and an apparently higher overall cancer risk, as seen in its most extreme form for prostate cancer.

We were struck by the relative paucity of comparable information on established cancer risk factors at individual, small area or national level in both countries. Sources of data are fragmented and often either unavailable or not published. Understanding the reasons for geographical variation, and taking appropriate action, would reduce the cancer burden significantly in Ireland. We hope that this atlas will serve as a stimulus and raw material for detailed studies which will explore and answer some of the questions it poses.

RECOMMENDATIONS

RESEARCH

1. Areas with unexplained higher than average risk should be studied in detail. Some findings here are of major public health importance:
   a. The largely unexplained geographical patterns for some of the more common cancers: colorectal, melanoma and stomach cancer;
   b. The role of *H pylori* infection, an easily diagnosed and treatable risk factor, in the high rates of stomach cancer in the east and north-west.
2. A comprehensive programme of research into already known determinants of cancer risk in Ireland is needed to inform cancer control. Information on modifiable risk factors such as smoking, diet, exercise, alcohol use, medication use, reproductive history and infection, their population prevalence and variation by age, sex, socio-economic status, area of residence, and over time, is essential for an understanding of the cancer burden.
3. The aetiology of cancers where risk factors are uncertain requires further investigation, ideally through international collaborations.
4. Patterns of healthcare access and utilisation in Ireland, north and south, and how these affect cancer risk, need to be understood.

RISK REDUCTION

5. Research is needed into levels of awareness and knowledge of cancer risk factors among the population in Ireland, and how these vary by age, sex, socio-economic status and geographical area.
6. Action should be taken to reduce the prevalence of important modifiable risk factors such as tobacco, alcohol, overweight and UV exposure.
7. Campaigns and initiatives to help raise awareness of "healthy" lifestyle behaviours (e.g. physical activity) among the public should emphasise the links between lifestyle and cancer.

DATA AND LINKAGE

8. Collection of information on determinants of health (including socio-economic data collected as part of the census) in the population of both countries should be consistent, integrated, systematic and regular.
9. Efforts should be made to increase the compatibility of health, risk factor, census and health service utilisation data between NI and RoI.
10. Both countries should run regular, comparable, population-based health surveys and make the data available for research. Linkage of this data with other routinely collected data should not be unnecessarily restricted.
11. Public health data which is collected with the support of public funding should be made readily available to researchers, with appropriate safeguards.
12. Custodians of data relevant to health should be encouraged to clarify the potential for data linkage and the use of this data for the public good should be encouraged by Government policy.