Deprivation and Survival from Liver Cancer in Scotland

February 2017

Introduction

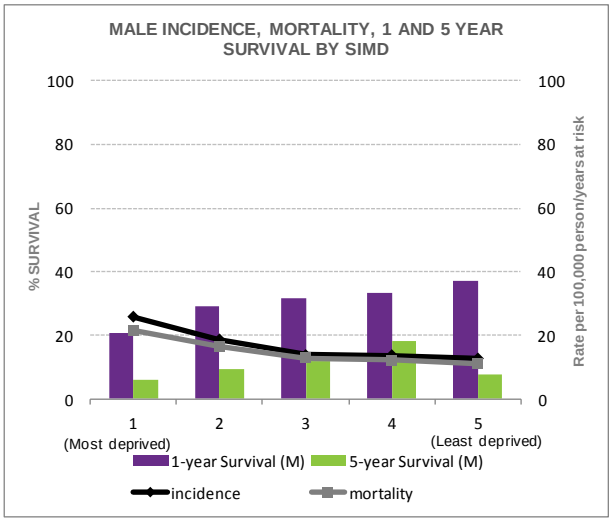
Addressing health inequalities is a priority across Scotland's health and social care agenda. The impact of deprivation on people's survival of cancer is complex. This can make it difficult to understand the relationships between socio-economic factors and how they relate to patient and tumour characteristics at the time of diagnosis.

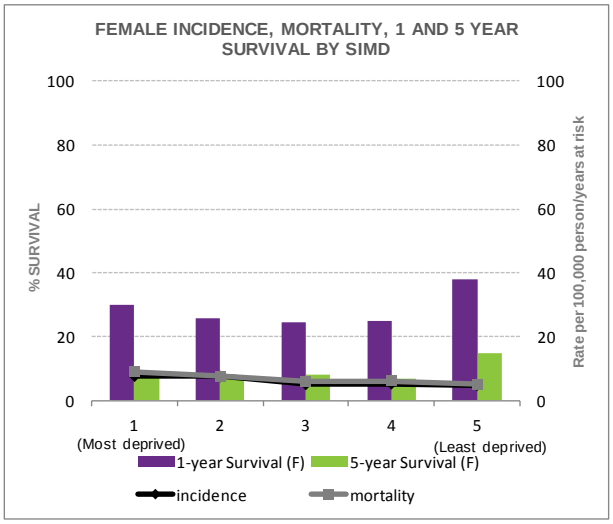
The Scottish Cancer Pathways partnership between Macmillan Cancer Support and NHS Scotland's Information Services Division (ISD) investigated the relationship between net survival and deprivation in the twenty most common cancers in Scotland. Cancer types were identified for further investigation due to significant variation in survival between people living in the most deprived areas (Scottish Index of Multiple Deprivation (SIMD) 1) and those living in the least deprived areas (SIMD 5)[1].

Liver cancer is defined as cancer of the liver and intrahepatic bile ducts (ICD-10 C22). Incidence is higher in men than women. It accounts for 2.5% of all cancers[2] diagnosed in men, and 1.2% of all cancers diagnosed in women.

Based on current rates of disease, an estimated **1 in 93 men** and **1 in 226 women** develop liver cancer during their lifetime. Of these, approximately **1 in 4** (26%) are from the most deprived quintile (20% of the population).

Results





Survival for those diagnosed in 2004-2008 followed up to 2013, Incidence: combined period 2010-2014; mortality: 2011-2015. *Macmillan Cancer Support and ISD, NHS Scotland: February 2017*.

The figures above show rates of liver cancer by deprivation quintile. The charts include bars for 1-year survival (purple) and 5-year survival (green), with lines for incidence (black) and mortality (grey) overlaid. These figures demonstrate the trends in the relationship between survival, incidence,

mortality, and deprivation. Incidence[3,4] and mortality in men increase with levels of deprivation. We see a similar pattern for women, but the association is less pronounced.

Looking at net survival[5] **21%** of men from the most deprived group are estimated to be alive one year after diagnosis compared with **37%** of men in the least deprived group (a difference of 16%). At five years, this difference in net survival decreases to 2% (**6% in the most deprived group vs 8% in the least deprived group**).

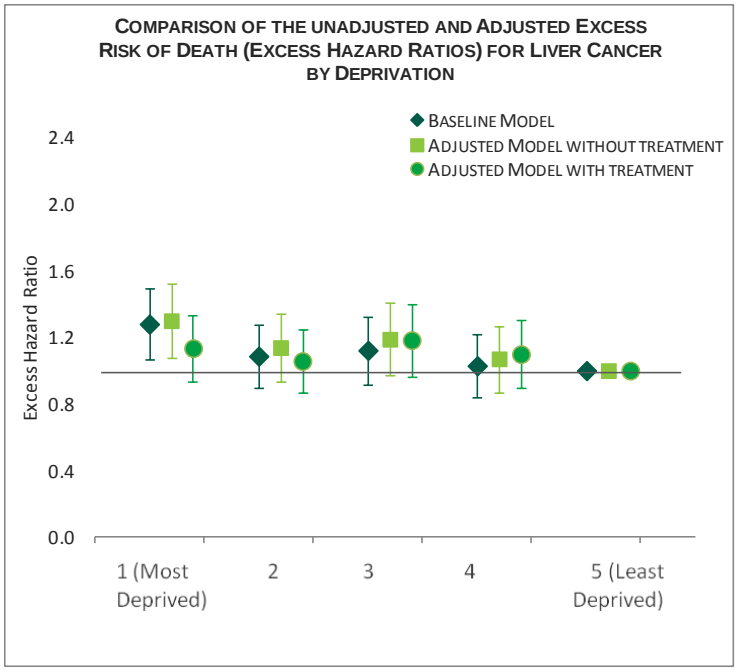
For women at one year, there is an 8% difference in net survival between those in the most and least deprived groups (**30% vs 38%**), which is smaller than that seen among men. However, at five years, there is a 7% difference between those in the most and least deprived groups (**8% vs 15%**).

Fitting a baseline model[6], we can say that the excess risk of death[7] from liver cancer in the most deprived group is **28%** higher than those in the least deprived group. The model indicates that, at best, the difference in excess mortality between the most and least deprived is 6%, and at worst, it could be as much as 50% (confidence interval (CI) is 1.06 – 1.50[8]).

To explore why the most deprived group had a higher risk of death from liver cancer, other factors such as patient characteristics, tumour and health service factors were added to this model[9]. The addition of these factors, including sex, age, co-morbidities, histology and metastases within 4 months from diagnosis did little to explain the higher risk of death individually. When grade at diagnosis is added to the model, the excess risk of death amongst those in the most deprived group fell slightly. This provides some explanation for the variation.

When treatments (Surgery – Yes/No, Radiotherapy –Yes/No and Chemotherapy – Yes/No) are added to the model to determine their impact on survival, surgery has the greatest effect of the treatments on reducing the excess risk of death across all groups. Chemotherapy reduces the overall risk slightly.

The final model (adjusted model with treatment) in the chart below includes all the factors included in this analysis, and shows an excess risk of death of **1.13** (CI 0.94 -1.33), which is no longer statistically significant. This suggests that the excess risk of death from liver cancer in the most deprived group is explained by the factors in the final model.



Macmillan Cancer Support and ISD, NHS Scotland: February 2017

Implications and next steps

Lower survival for cancer patients living in the most deprived compared with the least deprived areas is often linked to multiple factors. Use of surgery seemed to explain some of the deprivation-associated survival gap in liver cancer, but a major limitation of this analysis was the absence of full staging information. In the baseline model (with no explanatory factors added), those living in the most deprived areas were found to have a 28% higher risk of death from liver cancer than those in the least deprived areas.

However, further analysis showed that when all potential explanatory factors (see the Methods brief for further details) were added to the model, the difference in survival between deprivation categories was no longer statistically significant. It is possible that some other factors might contribute to residual variation across the deprivation groups in survival from liver cancer.

These might include factors not accounted for in the model (such as smoking status), measurement error, and a range of other issues, such as differing expectations of health services and support.

Further work across health and social care partners is warranted to:

- investigate other factors, such as smoking, that may also contribute to the gap in survival between the least and most deprived

- widen the reach and action on public health messages

Through partnership-working and engagement, evidence-based action can help to influence policies that reduce health inequalities and improve equity and access of services and support for people living with cancer.

Notes

[1] Scottish Index of Multiple Deprivation 2009.

[2] In calculating all cancers in Scotland, non-melanoma skin cancer has been excluded.

[3] Linear test for trend (Poisson regression) for both incidence and mortality rates by deprivation – source ISD website (http://www.isdscotland.org/Health-Topics/Cancer/Cancer-Statistics/Liver/).

[4] Incidence and mortality rates presented are age-standardised.

[5] Considered as a person's survival from the cancer of interest (eg liver cancer) after adjustment for other causes of death. This is age-standardised to allow comparisons across different populations which may have differing population structures.

[6] A baseline model compares the excess risk of death by deprivation groups only with no other factors included. The adjusted model has the other factors added in (as detailed in the table) so the effects of these other factors can be compared relative to the baseline. For more details about the models, please consult the Methods and Technical Reports links to be included).

[7] Excess risk of death (excess mortality) is a way of measuring how many deaths are caused by a specific disease within a given population. It shows the number of extra deaths which occurred over and above the number that would be predicted in the absence of that disease.

[8] A Confidence Interval (CI) gives an indication of the amount of variability around the estimate. The wider the CI, the less robust the estimate. On the risk of death chart shown above, if the CI lines cross the horizontal line at 1.0 then this suggests that the result is not statistically significant in comparison with the least deprived group.

[9] For more details, please consult the Methods Briefing and Full Technical Report.

To access the Technical Report and other cancer site and Methods briefs, please follow this link: http://www.macmillan.org.uk/about-us/what-we-do/evidence/research-funding/our-partnerships/information-services-division-scotland.html#271894

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