Doctor of Sociology

The Social and Geographic Distribution of Cancer in Belgium. Inequalities in cancer mortality by people and place: the contribution of individual and contextual deprivation.

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Abstract
Increasing ageing of the population and the rise of man-made chronic diseases means that cancer has become one of the largest causes of death worldwide. Besides, the cancer burden is not distributed evenly. There are large global and between-country differences in cancer mortality, as well as geographic differences in cancer mortality within countries. In addition, ample research has shown that there are large socioeconomic (SE) inequalities in overall and site-specific cancer mortality. However, most research into geographic and SE inequalities in cancer mortality has been based on ecological or individual-level studies. Both types of study have a one-dimensional focus, and look either into individual characteristics or aggregated characteristics at area level.

The last two decades, there is an increasing interest in multilevel studies, capable of estimating the contribution of area characteristics to individual health outcomes, net of individual characteristics. This can increase our understanding of how the SE context of our living environment affects health. However, comprehensive multilevel studies on cancer mortality are scarce, especially in a European context. In addition, most research into geographic inequalities in cancer outcomes has been descriptive and provided little insight into underlying factors. Multilevel studies, on the other hand, can provide insight into the extent to which individual and arealevel SE characteristics contribute to geographic variation. To (partly) fill the gap in current knowledge, this thesis aims to provide insight into SE and geographic inequalities in overall and site-specific cancer mortality by using a multilevel framework that includes both individual and area-level SE characteristics.

We have summarized the theoretical framework in a conceptual model of the pathways linking SE characteristics of individuals and areas to cancer mortality. Geographic inequalities in cancer mortality are the result of differences in individual (SE) characteristics of local residents (compositional factors) and the area-level (SE) context (contextual factors). These compositional and contextual factors are again shaped by macro level social, economic, cultural and political determinants. Individual and arealevel SE characteristics have an influence on cancer mortality through proximal factors, including health behaviour, stress, healthcare factors, and exposure to carcinogens.
This thesis uses a unique and exhaustive dataset based on the Belgian census of 2001 linked to population register data on emigration and mortality and cause of death data from death certificates for the period 2001-2011.

Absolute SE and geographic inequalities in cancer mortality are estimated using direct and indirect age standardization. Relative SE inequalities are estimated using multilevel models. Geographic variation, as well as the share accounted for by individual and area level SE characteristics, is estimated using multilevel models as well.

The findings are presented in four empirical studies. The first two studies give an overview of geographic and SE inequalities in overall and site-specific cancer mortality in Belgium among individuals aged 40 years and older. Chapter one looks into geographical inequalities in overall and site-specific cancer mortality in Belgium. The results show significant variations in mortality between municipalities for most cancers among men, and multiple cancers among women. Individual socioeconomic position (SEP) and municipal deprivation contribute to a substantial share of geographic variation. The share explained by either compositional or contextual SE factors differs by cancer site, although individual SEP generally is more important in producing geographic inequalities than municipal SE context.

Yet, not all of the geographic variation is explained by SE inequalities, and the between-area variance in mortality remains significant for multiple cancer sites.

Chapter two gives an overview of SE inequalities in cancer mortality in Belgium by individual SEP and neighbourhood deprivation. The findings point to a social gradient in overall and site-specific cancer mortality by individual SEP. The highest cancer mortality rates are observed among individuals with a low educational attainment, who live in rental and poor quality housing and who are unemployed or non-working. In addition, mortality from several cancers is significantly higher among individuals living in the most deprived neighbourhoods, net of individual SEP. With the exception of female lung cancer, we find little evidence of a confounding effect of population density, nor of an association between population density and cancer mortality.

The other two empirical studies each focus on SE and geographic inequalities in a specific cancer site and age group. In chapter three we study sub-district-level geographic variation in lung cancer mortality among men and women aged 65 years and older, as well as inequalities by individual SEP and sub-district SE and environmental characteristics. The findings indicate that lung cancer mortality is higher among individuals with a low SEP. In addition, lung cancer mortality among women is significantly higher in urban sub-districts, as well as sub districts with a high unemployment rate. Among men, on the other hand, lung cancer mortality is higher in subdistricts with a high percentage employed in mining in the 1980s. Lung cancer mortality varies significantly between sub-districts, with higher lung cancer mortality in the east of Belgium among men, and clustered in urban areas among women. Together individual SEP and sub-district characteristics explain 41% and 63% in geographic variation in lung cancer mortality for men and women respectively.

Chapter four explores cross-level interactions between individual SEP and municipal deprivation for head and neck cancer mortality among Belgian men aged 40-64. The results indicate that there is a substantial SE gradient in head and neck cancer mortality, with
higher mortality among men with a low individual SEP, as well as men living in deprived municipalities. The cross-level interactions indicate that municipal deprivation has less of an effect on men with a low SEP. They experience high levels of head and neck cancer mortality, regardless of the level of deprivation of their municipality of residence. For the other SE groups, head and neck cancer increases with increasing level of municipal deprivation. As a result, SE inequalities between men with a low vs. high SEP are relatively small in the most deprived municipalities. The geographic variation in head and neck cancer mortality between municipalities is partly explained by individual SEP, while municipal deprivation and cross-level interactions contribute little.

The findings of the thesis point to substantial geographic and SE inequalities in overall and site-specific cancer mortality in Belgium. We observe geographic differences in mortality for several cancer sites at various spatial scales. SE characteristics of individuals and areas contribute to a substantial share of these geographic inequalities. Yet, not all geographic variations are explained, warranting additional research. Cancer mortality is generally higher among individuals with a low SEP. In addition, we observe an association between cancer mortality and area-level SE characteristics at sub-district, municipal and neighbourhood level. Although this association is partly mediated by individual SEP, cancer mortality remains significantly higher in deprived areas. This suggests interplay between cancer mortality and SE characteristics at individual and area level, although mediating pathways should be studied further. Our findings suggest that ‘place’ matters in cancer mortality, so policies and interventions should not only focus on individuals, but on areas as well.