Background

Socioeconomic position (SEP) has been consistently associated with certain health outcomes, the general pattern being that individuals with lower SEP have poorer health. One study estimated that 28% of all premature deaths in Belgium were the result of socioeconomic position. Overall, premature mortality declined, but the inequality (between lower and higher SEP) in premature mortality increased between 1998 and 2019 in Belgium (Otavova et al., .

Theoretical frameworks have been developed to explain why the role of SEP is so persistent in many health outcomes. One such theory is the Fundamental Cause Theory (FCT) which argues that individuals of higher SEP are more likely to leverage their 'means' (financial, knowledge, social, etc.) to obtain better health outcomes. (Clouston & Link, 2021; Link,

For cancer, however, the association with SEP is more complex. The specific cancer indicator, geographic region, gender and cancer type all influence the observed associations (Mihor et al., 2020; Vaccarella et al., 2023). Post-diagnosis survival and cancer incidence together constitute overall cancer mortality. Results appear heterogeneous, partly because studies typically focus on only one of these three indicators. Patterns tend to be most apparent when all three indicators are considered simultaneously. In Belgium, lower educated women tend to have lower breast cancer incidence, yet poorer post-diagnosis survival results in no significant difference in overall cancer mortality compared to higher educated women.

Our study therefore focused on all three indicators for multiple cancer sites in Belgium between 2004 and 2013. In doing so, we aim to contribute to the literature in two ways. First, we quantify socioeconomic differences in cancer mortality, incidence, and survival during this time period. Second, we decompose cancer mortality differences into components driven by incidence versus survival, providing insights for targeted public health policy. This decomposition provides key insights for targeted, specific public health policy.

Data and population

For this study, several datasets were linked at the individual level. First, we derived socioeconomic and sociodemographic information from the 2001 Belgian census. These data were linked to incidence data from the Belgian Cancer Registry (BCR) and to vital status and, if relevant, cause of death provided by the Belgian National Registry and death certificates (ICD-10 classification). The BCR registers all new primary cancer diagnoses since 2004. We therefore chose 2004–2013 as our follow-up period.

We used educational attainment as our main indicator of SEP for several reasons. First, educational level is 'completed' relatively early in life. Therefore the chance of reverse causation is relatively limited. Second, contrary to many other indicators of SEP, educational level remains fairly stable throughout the life course. And finally, since we obtained this data from the Belgian census the high response rate for the question on educational level was another key advantage. However, to avoid measuring SEP too one-dimensional we included house ownership (as a proxy for financial means), living arrangement, and country of birth as control variables.

We included all new, first cancer diagnoses between 2004 and 2013 for female breast, cervix, colon, Hodgkin lymphoma, head and neck, liver, lung, stomach, melanoma, pancreas, rectum and thyroid cancer. In situ and subsequent cancers were not included in our analysis, since treatment of a primary cancer could influence the risk of a subsequent cancer.

Our population consists of all individuals officially residing in Belgium at the time of the 2001 census. We then excluded all individuals younger than 30 and older than 80. We set a lower age limit of 30, as

SE indicators may be incomplete for younger individuals. The exclusion of individuals older than 80 is made to reduce the potential impact of selective survival on our study. Additionally, some indicators become less meaningful at older ages. A clear example is house ownership (and living arrangement), where nursing homes become more common.

Methods

Analyses were performed separately for men and women, and stratified by age (30–49 and 50–79 years). For each individual, we calculated the time at risk from baseline until the outcome of interest, death, emigration, or end of follow-up. Person-years were then summed within 5-year age categories.

Poisson regression models, offset by person-years lived, were used to conduct the analysis. The first statistical measure we calculated was the Relative Index of Inequality (RII) (Vanthomme et al., . The RII was calculated for incidence and mortality of all selected cancer types. We focused on incidence and mortality because these are population-level indicators, whereas survival is only relevant for diagnosed individuals. This provides a clear, interpretable measure to showcase potential disparities. We calculated these RIIs using two models: a basic model including only educational attainment, and an adjusted model including socioeconomic and sociodemographic control variables.

Secondly, we utilized the decomposition method proposed by Bryère et al. (2019) to decompose inequalities in cancer mortality in an incidence and survival component (Bryere et al., 2019) . This methodology allows us to compare groups at opposite ends of the educational spectrum, with individuals with primary or lower education compared to those with higher education.

Results and interpretation

As a manuscript detailing this study and its results is currently under review, we cannot present numerical or detailed results here to avoid issues of confidentiality and duplicate publication. For the purpose of this extended abstract, we therefore discuss the results only in broad terms, focusing on the main patterns observed.

When interpreting the RIIs for both cancer mortality and incidence we find that for the majority of cancers the typical social gradient is found. In other words, individuals with lower education generally have higher cancer incidence and mortality. Exceptions are female breast cancer and melanoma where the higher educated have a higher cancer incidence risk. Few cancers (most notably colon cancer) showed little differences between educational groups for both incidence and mortality. Strikingly, results show little difference between the basic model and the adjusted model, reaffirming that educational level is a solid measure to capture individual-level SEP.

The observed strong differences in cancer mortality between educational groups further highlight the relevance of applying the proposed decomposition method. When doing so, we found that results clearly differed between men and women and the age groups. In general there is a pattern that in the older age group (50-79) survival tends to be more important than in the younger age group (30-49). Lung cancer stands out as consistently incidence-driven across sexes and age groups.

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