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Quantifying cancer patient survival; extensions and applications of cure models and life expectancy estimation

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ABSTRACT

Quantifying cancer patient survival; extensions and applications of cure models and life expectancy estimation

Cancer patient survival is the single most important measure of cancer patient care. By quantifying cancer patient survival in different ways further insights can be gained in terms of temporal trends and differences in cancer patient survival between groups. The objective of this thesis is to develop and apply methods for estimating the cure proportion and loss in expectation of life for cancer patients.

In paper I, a cure model was used to study temporal trends in survival of patients with acute myeloid leukaemia in Sweden. Cancer patient survival was estimated in a relative survival setting and quantified as the proportion cured and the median survival time of uncured for different age groups and by calendar time of diagnosis. We found a dramatic increase in the cure proportion for the age group 19-40, although almost no improvement was seen for patients aged 70-79 at diagnosis.

In paper II, a flexible parametric cure model was developed to overcome some limitations with standard parametric cure models. This model is a special case of a non-mixture cure model, using splines instead of a parametric distribution for the modeling. The fit of the flexible parametric cure model was compared to the fit of a Weibull non-mixture cure model, and shown to be superior in cases when the standard non-mixture cure model did not give a good fit or did not converge. Software was developed to enable use of the method.

In paper III, the possibility of using a flexible parametric relative survival model for estimating life expectancy and loss in expectation of life was evaluated. Extrapolation of the survival function is generally needed, and the flexible parametric relative survival model was shown to extrapolate the survival very well. The method was evaluated by comparing survival functions extrapolated from 10 years past diagnosis to observed survival by the use of data with 40 years of follow-up. Software was developed to enable use of the method.

In paper IV, the life expectancy and loss in expectation of life was estimated for colon cancer patients in Sweden. Even though relative survival was similar across age for colon cancer patients, the loss in expectation of life varied greatly by age, since young patients have more years to lose. We also found that the life expectancy of colon cancer patients improved over time. However, the improvement has to a large extent mimicked the improvement seen in the general population, and therefore there were no large changes in the loss in expectation of life.

In conclusion, the methods presented in this thesis are additional tools for estimating and quantifying population-based cancer patient survival, that can lead to an improved understanding of different aspects of the prognosis of cancer patients.

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