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Newsletter

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Quantifying the natural history of breast cancer*

The paper "Quantifying the natural history of breast cancer" uses modelling to understand the time course of breast cancer before it is diagnosed. Such models allow for the possibility of evaluating screening programmes and identifying optimal screening scenarios. The paper aims to formulate a detailed Markov model that characterises breast cancer tumour progression, and evaluate the effects of different screening strategies on tumour sizes at detection, and hence, the start of treatment.

The paper uses an early randomized controlled trial in Östergötland, Sweden, among 38,496 women who, because of the time of the study, had never previously received mammographic breast screenings. The trial had two screens: one at the beginning of the study, allowing for the prevalence of undiagnosed tumours to be determined, and another after two years, allowing for measurement of the incidence and growth rates of newly developed cancers.

The data were fed into a 13-state continuous-time Markov model with 10 transition parameters to differentiate indolent and aggressive tumours of different sizes. This model used Bayesian methods to estimate parameters using a Markov chain Monte Carlo approach.

The results revealed an incidence rate in Östergötland of 21 per 10,000 women years, with 91% of the breast cancer estimated to be aggressive. Additionally, the findings showed that larger tumours were relatively slower, taking 6 years on average to grow from 20 to 50mm, but only around 10 months to grow from 0 to 10mm. Annual frequent screenings could increase by about threefold, the proportion of cancers being detected before they had grown to 10mm.

Differences between this study and other studies include the higher incidence rate. For example, the incidence rate was higher than the empirical rate of breast cancer incidence, in part due to different definitions (disease vs cancer). There was also a difference from a previous paper using the same data, in the calculated risk of breast cancers being aggressive. However, the discrepancy could be attributed to the previous paper not accounting for length-biased sampling.

The study is important because knowing tumour progression rates will facilitate future research developing screening strategies to optimise cost effectiveness.

The full paper is available at http://www.nature.com/bjc/journal/v109/n8/full/bjc2013471a.html.

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* K H X Tan, L Simonella, H L Wee, A Roellin, Y-W Lim, W-Y Lim, K S Chia, M Hartman and A R Cook (2013): Quantifying the natural history of breast cancer" *British Journal of Cancer*. DOI:10.1038/bjc2013.471