

## Bayesian modeling of the association between mammographic breast density and breast cancer risk.

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Breast density (BD) is a characteristic of the breast tissue reflected in mammograms and usually measured by means of the BI-RADS scale, an ordinal scale with categories 1 (entirely fatty) to 4 (extremely dense). Several studies have shown that high BD is associated with an increased breast cancer (BC) risk, and some of them concluded that longitudinal measurement of mammographic density might be used to improve BC risk assessment and therefore, BC screening and treatment strategies. Our goal is to analyze the longitudinal trajectories of BD in women attending a screening program, to assess the relationship between mammographic BD and BC risk, and to obtain cancer risk profiles based on longitudinal BD measurements.

Data come from an observational prospective study including 13,760 women aged 50-69 years with no personal history of BC who participated in the BC early-detection program in the Vallès Occidental Est area in Catalonia (Spain), between October 1995 and June 1998. Women were followed for vital status or possible diagnosis of BC until December 2013. Longitudinal measurements of BD for each woman, and time to BC are studied through a joint model consisting of two processes: a proportional-odds cumulative logit model for the longitudinal ordinal measurements of BD based on a continuous latent process, and a left-truncated Cox proportional-hazards model for the time to diagnosis of BC, which incorporates information from the longitudinal process. Inferences were obtained under the Bayesian approach using Markov Chain Monte Carlo methods.

**Keywords:** Latent longitudinal process. Left-truncated Cox proportional-hazards model. Proportional-odds cumulative logit model.