

Microsimulation Models in Medical Decision Making – Calibration and Predictive Accuracy

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Micro-Simulation Models (MSMs) are predicted models designed to describe complex processes and simulate unit level data. In Medical Decision Making MSMs are used to assess the effect of risk factors, and interventions on the course of a disease, and thus to inform health policy decisions. Applications of MSMs can be found in several research domains, including HIV/AIDS and other infectious diseases (agent-based models), cancer, Alzheimer's disease and related dementias research, etc. We intend to provide a brief overview, discuss some idiosyncratic characteristics of this type of models, and evaluate statistical techniques for the development of valid and useful MSMs.

To this end we have created the MICrosimulation Lung Cancer (MILC) model, a streamlined, dynamic, continuous time MSM that describes the natural history of lung cancer and simulates individual trajectories given age, sex and smoking history. We use the MILC model as a tool for a comparative analysis of two general calibration approaches of MSMs, a Bayesian and an Empirical method. We also use MILC to evaluate techniques for assessing the predictive accuracy of MSMs in the context of survival data analysis.