This diploma thesis is denoted to application of continuous time multiple state Markov models in respect to the Alzheimer's disease in critical illness insurance, long-term care insurance and life insurance. It solves the impact of insurer's access to applicant's genetic information, the possibility of misusage of this information and the questions of fairness in insurance. It defines some mathematical methods, basic definitions of genetics, it describes the Alzheimer's disease and its forms. It shows model's using during determining cost of adverse selection and the impact of Alzheimer's disease in long-term care insurance. On the basis of model there are estimated the transition intensities among states. We use this intensities to estimate the mortality of lives with Alzheimer's disease and the cost in long-term care insurance. The models show dividing the population into more risk groups and it is possible to model the risk of adverse selection caused by asymmetric information about genetic test result.