Nonparametric Estimation of Quality Adjusted Lifetime (QAL) Distribution in Illness-death Models

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Abstract: In this work, we consider the nonparametric estimation of quality adjusted lifetime (QAL) distribution in illness-death models. We first derive the expression of QAL distribution in terms of the distribution of sojourn time in each health state. Next we substitute the estimate of sojourn time distributions in the expression of QAL distribution to obtain its estimate. Consistency and asymptotic normality of the proposed nonparametric estimator are established. Estimation in the presence of some missing data on the transition time to illness is also discussed. We conduct a simulation study to investigate the performance of the proposed estimator. Two data sets, one from the Stanford Heart Transplant program and another from International Breast Cancer Study Group (IBCSG) Trial V, are analyzed for illustration.

Key Words: Consistency, EM algorithm, Gaussian process, Quality adjusted lifetime, Illness-death model, Kaplan-Meier estimate, Weak convergence.