Modeling Cancer Progression Events in Genetic Association Studies

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Abstract

Analyses of disease-free survival data in some types of cancer studies indicate that cohorts of patients treated for cancer consist of individuals who are susceptible to experience a cancer related event and individuals who are cured. Cured individuals do not experience any disease related event, and eventually die due to other causes. Individuals who are not cured may die after experiencing a cancer recurrence or may die due to cancer without experiencing recurrence. The cure status is known if a disease related event is observed. However, when time-to-first event is censored or the cause of observed death is masked, the cure status is unknown. Thus, being cured or not is partially latent. To model disease progression events with possibly masked causes of death, we consider a multi-state model including partially latent cured and not cured states. We propose inference methods that allow us to identify genetic markers associated with the risk of experiencing a disease related event and with timing of disease events after the treatment of cancer.