

中央研究院統計科學研究所

博士後演講

講 題 : Unified semicompeting risks analysis of hepatitis natural history through mediation modeling

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地 點 : 中央研究院統計科學研究所 B1F 演講廳

※茶會 : 下午 15 : 00 開始

※實體與線上直播同步進行

Abstract

Natural history of hepatitis B or C is comprised of multiple milestones such as liver cirrhosis and liver cancer. To fully characterize its natural course, semicompeting risks represent a common problem where liver cirrhosis and liver cancer are both of interest, but only the former may be censored by the latter. Copula, frailty and multistate models serve as well-established analytics for semicompeting risks. Here, we cast the semicompeting risks in a mediation framework, with liver cirrhosis as a mediator and liver cancer as an outcome. We define the indirect and direct effects as the effects of an exposure on the liver cancer incidence mediated and not mediated through liver cirrhosis, respectively. We derive respective expressions of estimands for mediation analysis under the copula, frailty and multistate models. Next, we propose estimators based on nonparametric maximum likelihood or U-statistics and establish their asymptotic results. Numerical studies demonstrate that the efficiency of copula models leads to potential bias due to model misspecification. Moreover, the robustness of frailty models is accompanied by a loss in efficiency, and multistate models balance the efficiency and robustness. We demonstrate the utility of the proposed methods by a hepatitis study, showing that hepatitis B and C lead to a higher incidence of liver cancer by increasing liver cirrhosis incidence. Thus, mediation modeling provides a unified framework that accommodates various semicompeting risks models.

Keywords and phrases: copula model, frailty model, mediation model, multistate model, semicompeting risks.

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