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# Investigating the influence functions of Cumulative Hazard and Kaplan-Meier estimators for survival data

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In this study, we considered the right-censored data $\{(Z_1, \delta_1), (Z_2, \delta_2), \ldots, (Z_n, \delta_n)\}$, where $Z_i = min(X_i, Y_i)$ and $\delta_i = I(Z_i = X_i)$. Let $X_1, X_2, \ldots, X_n$ be a random sample from an absolutely parametric continuous distribution $\{F(t, \theta), \theta \in \Theta\}$, and these are the actual failure times of the objects being observed. Additionally, let $Y_1, Y_2, \ldots, Y_n$ be a random sample from an absolutely continuous distribution $\{G(t)\}$. It is assumed that $X_i$ and $Y_i$ are independent. Here we considered the nonparametric maximum likelihood estimator, the Kaplan-Meier estimator, of the survival distribution $\bar{F}(t, \theta) = 1 - F(t, \theta)$. The influence curve is an effort to offer empirical understanding of the "influence". The problem we are interested in here is to derive the influence functions of the cumulative hazard function and survival function of the failure data. We obtained above two influence functions by considering the sub-survival functions of $Z_i$s. In simulation study, we considered two distributions, Exponential distribution and Weibull distribution. All simulation studies were carried out in R software. Influence functions for the cumulative hazard function and survival function were obtained for both distributions, and their application was extended to a discrete data case.

**Keywords**: Cumulative hazard, Influence function, Kaplan-Meier, Right-censored

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