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Censored quantile regression

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Dear Editor,

Time to event occurrence as a response variable in survival studies has two characteristics: the existence of censored survival time information and its Skewed distribution (1). To determine prognostic factors in relation to treatment response, survival, or to compare two treatment groups in terms of the time from the start of treatment to the patient's recovery, the Cox proportional hazards model is a popular method. The reason for the generality of this model is its semi-parametric property due to the lack of need to estimate the basic hazard function to estimate the relative risk, its suitability for simultaneously examining the effects of several explanatory variables with the relative risk ratio, and the possibility of using time-dependent explanatory variables in the model (2).

Among the limitations of this model, it is worth mentioning its important assumption that the hazard rate is proportional, which if not established will lead to complex or erroneous interpretation (1). Alternative models include the accelerated failure model (3) and the quantile regression model (4). The accelerated failure model provides a straightforward interpretation of the explanatory variables, but it assumes that the effects of these variables are uniform across the entire survival distribution. This assumption may not be true in many real-world scenarios, particularly when the effects of risk factors vary over time. Unlike the two conventional models for analyzing survival data, the quantile regression model does not have any specific assumptions (3).

The use of quantile regression models in survival studies allows the distribution of the conditional response variable to be studied at different points in time, providing a more comprehensive picture of the shape of the distribution, and explanatory variables can have different effects at different quantiles of the time-to-event variable, thus providing a flexible model for controlling for heterogeneity in the effects of explanatory variables (4).

Unlike traditional regression methods, quantile regression models do not rely on strict assumptions such as proportional hazards, normality of error terms, or homogeneity (constant variance of error terms) (5,6).This flexibility makes quantile regression models an effective and powerful tool for analyzing survival data. By focusing on specific quantiles, quantile regression models enable researchers to examine how prognostic factors affect short-, medium-, and long-term survival outcomes, providing a comprehensive and nuanced understanding of survival dynamics (6).

Keywords: Survival Data, Skewed Distribution, Quantle Regression

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