

**Title:** Cumulative distribution function and sum of bivariate right and left censored data

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**Abstract:**

The purpose of this work is the estimation of the bivariate cumulative distribution function (CDF) when one variable is left-censored and the other one is right-censored. This issue does not seem to be studied in the literature while several studies deal with the case where the two variables are right-censored. The representation of the bivariate survival function as a product integral of the cumulative hazard function, obtained in the right censoring case, is generalized to left and right censoring case using Doléans equation. A nonparametric estimator of CDF is obtained and the strong consistency of the estimator is investigated. Moreover, the properties of the sum of the two censored variables are studied. Simulations and application to HIV data are presented to illustrate the methodology.