

## **Buckley–James-type of estimators under the classical case cohort design**

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**Abstract** We consider the estimation problem with classical case-cohort data. The case-cohort design was first proposed by Prentice (Biometrics 73:1–11, 1986). Most studies focus on the Cox regression model. In this paper, we consider the linear regression model. We propose an estimator which extends the Buckley–James estimator to the classical case-cohort design. In order to derive the BJE, there is an additional problem of finding the generalized maximum likelihood estimator (GMLE) of the underlying distribution functions. We propose a self-consistent algorithm for the GMLE. We also justify that the GMLE is consistent and asymptotically normally distributed under certain regularity conditions. We further present some simulation results on the asymptotic properties of the BJE and apply our procedure to a data set used in the literature.

**Keywords** Case-cohort study · Buckley–James estimator · Right-censorship · Linear regression model · Self-consistent algorithm · Survival data