A RANDOM TIME INTERVAL APPROACH FOR ANALYSING THE IMPACT OF A POSSIBLE INTERMEDIATE ON A TERMINAL EVENT

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The impact of a possible intermediate on a terminal event is of interest in various situations: Does a complication prolong hospital stay? Does a training program shorten time of unemployment? Does pregnancy lead to earlier marriage? In all these situations, the time when the intermediate event occurs is crucial, since it cannot have an effect before. However, it is not immediately clear how to describe time to complication, say, because one may be discharged from hospital without experiencing one. We suggest to write the observable data as a pair of waiting times, one in an initial state and the other in the sub-state space of initial and intermediate state. The two waiting times denote a random time interval, its length equal to the time spent in the intermediate state. We base estimation of the bivariate survival function on the Aalen-Johansen estimator of the transition matrix. The estimator can be shown to be asymptotically equivalent to an efficient estimator of the bivariate survival function under univariate censoring suggested by Tsai and Crowley (1998), using the inverse probability of censoring weighting technique (IPCW). Unlike IPCW, however, the terms contributing to the estimation based on the Aalen-Johansen estimator are of interest in their own right. We illustrate the approach analysing change in length of hospital stay following hospital-acquired infection.