In survival analysis, data on the time until a specific criterion event occurs are analyzed, often with regard to the effects of various predictors. In the classic applications, the criterion event is in some sense a terminal event, e.g., death of a person or failure of a machine or machine component. In these situations, the analysis requires assumptions only about the distribution of waiting times until the criterion event occurs and the nature of the effects of the predictors on that distribution.

Suppose that the criterion event isn’t a terminal event that can only occur once, but is a repeatable event. The sequence of events forms a stochastic point process. Further suppose that only some of the events are detected (observed); the detected events form a thinned point process. Any failure time model based on the data will be based not on the time until the first occurrence, but on the time until the first detected occurrence of the event. I will consider the implications of this for survival regression models. Such models will have little meaning unless the regression parameters are independent of the detection probability, or, more generally, the thinning mechanism.

I will show that the effect of thinning on regression parameters depends on the combination of the type of regression model and the type of point process that generates the events. For some combinations, the effect of a predictor will be the same for time to the first event and the time to the first detected event. For other combinations, the regression effect will be changed as a result of the incomplete detection.