Supplementary Files

Supplementary Information (SI): Competing risk modelling

The hazard function, which is a function of time, describes the instantaneous rate of occurrence of the event of interest in subjects who are still at risk of the event.[1] In the absence of competing risks, the hazard function is defined as:

$$\lambda(\mathrm{t}) = \lim_{\Delta t \to 0} \frac{Prob(t \leq T < t + \Delta t | T \geq t)}{\Delta t}$$

where T is the time from baseline time until the occurrence of the event of interest.

In the presence of competing risks, the cause-specific hazard function and the subdistribution hazard function are of importance.

The CSHR denotes the instantaneous rate of occurrence of the k^{th} event in subjects who are currently event free (the subject is removed from the risk set the moment they experience the competing event or are censored). The CSHR function [2] is defined as:

$$\lambda_k^{cs}(t) = \lim_{\Delta t \to 0} \frac{Prob(t \leq T < t + \Delta t, D = k | T \geq t)}{\Delta t}$$

where D is a variable denoting the type of event that occurred and the function

The SDHR denotes the instantaneous risk of failure from the k^{th} event in subjects who have not yet experienced an event of type k. The subjects who experience the competing event still remain in the risk set. In this study it means the risk set has both the discharged patients and those who have died from suspected severe malaria. Fine and Gray recommended modeling the effects of covariates on a subdistribution hazard function [2] defined as:

$$\lambda_k^{sd}(t) = \lim_{\Delta t \to 0} \frac{Prob(t < T \leq t + \Delta t, D = k | T > t \cup (T < t \cap K \neq k))}{\Delta t}$$

Both models account for competing risks by modeling the effect of covariates on different hazard functions. There is a distinct cause-specific hazard function for each of the distinct types of events and a distinct subdistribution hazard function for each of the distinct types of events.[3] The SDHR model is considered the right model for prediction research as it allows one to estimate the effect of covariates on the cumulative incidence function for the event of interest[4] defined as:

$$CIF_k\ (t) = 1 - exp\{\ \hat{\mathrm{H}}_k(t)\}$$

where $\hat{\mathrm{H}}_k(t) = \int_0^t \hat{\mathrm{h}}_k(t)dt$ is a cumulative subhazard as $\hat{\mathrm{h}}_k(t) = \lambda_k^{sd}(t)$

The CIF allows for estimation of the incidence of the occurrence of an event while taking competing risk into account. In the competing risks setting, only one event type can occur, such that the occurrence of one event precludes the subsequent occurrence of other event types. The cumulative incidence function for the k^{th} cause is defined as:

$$CIF_k\ (t) = \Pr(T \leq t, D = K)$$

where D is a variable denoting the type of event that occurred and the function $CIF_k\ (t)$ denotes the probability of experiencing the k^{th} event before time t and before the occurrence of a different type of event.

REFERENCES

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