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Cannot see the wood for the trees: Survivorship bias in CMR models

`Survivorship bias' is a common error where conclusions are made based upon those who have survived while ignoring those that did not. This issue has been studied in the fields of economy, construction, forestry, health, etc. (Czeisler et al., 2021; Cooke et al., 2003). However, the exploration of this issue in the context of capture-mark-recapture (CMR) models has been very limited. In particular, this bias can be immediately observed within CMR models in the presence of individual (random) effects which subsequently induces a form of age dependence (or time-in-study dependence) on the survival probabilities, i.e. the weaker individuals are more likely to die earlier, while stronger ones are commonly alive later in the study.

In this study we investigate the issues that arises within individual heterogeneity models, particularly in terms of the interpretation of the model parameters. To illustrate this, we explore several CMR models, from the simplest case with only individual random effects to models that include additional age and/or time dependencies. We highlight the necessity in the careful interpretation of the model parameters when individual random effects are included in the context of CMR models.