The gap between development of time-to-event methods and their application in epidemiology

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In epidemiological practice, there is often the tendency to use rather simplistic statistical tools that can potentially ignore more complex structure. In such cases, it can be unclear whether the use of these tools is nevertheless reasonable as the resulting bias is negligible, or whether the bias is potentially severe. To illustrate this problem and demonstrate the application of more complex (and more valid) statistical tools, we consider an example of time-to-event data with missing disease information due to death (MDID) (Binder and Schumacher 2014). Specifically, we investigate a highly influential NEJM analysis of the Framingham Heart Study data (Satizabal et al. 2016) which reported a significant linear decline in the incidence of dementia over the last 30-40 years. Missing disease information due to death in this context means that incidence of dementia was determined only at certain follow-up timepoints, and therefore is unknown for subjects who died between visits (unless it could be retrieved from medical records). Censoring these death cases at time of death or at the last visit observed disease-free yields an underestimated disease incidence, a bias which is likely to increase in magnitude as the cohort ages and death becomes more prevalent. MDID bias can be avoided, however, via the use of suitable statistical methods. We illustrate the shortcomings of the analysis strategy used in this paper as an example of the discrepancy between straightforward statistics in epidemiology and more sophisticated statistical techniques designed to reduce or eliminate bias, which provides a strong justification for their use. We conclude by discussing implications for the methods development community, including the role it can play in changing current practice in applied statistics in epidemiology.

References:
