

Using incomplete electronic health record data to inform decision making in HIV/AIDS

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To coordinate the international response to the HIV/AIDS epidemic, the Joint United Nations Programme on HIV/AIDS (UNAIDS) has undertaken an extensive effort to generate projections of key HIV outcomes in adults and children worldwide to inform decision and policy-making and allocate human and financial resources to combat HIV/AIDS. At the core of this effort is the SPECTRUM model, which utilizes as inputs estimates of HIV outcomes, such as mortality, based on electronic health record (EHR) data worldwide. However, mortality is incompletely recorded in EHR data from resource-limited settings, such as those found in sub-Saharan Africa. Therefore, estimates from these data are expected to be biased and make the validity of the projections from the SPECTRUM model questionable. For such EHR data, we propose pseudolikelihood-based semiparametric estimators of the probabilities of key HIV outcomes after antiretroviral treatment initiation. These estimators are shown to provide valid estimates of the HIV outcome probabilities under incomplete death recording, based on certain realistic assumptions. Variability estimation is based on the empirical versions of the influence functions, and correctly reflects all the sources of uncertainty including missing information and potential model misspecification. The methodology is applied to EHR data from Kenya, and we show that naive estimates can be severely biased.