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| Background | Kent developed a life expectancy model using life insurance data and published a validation of the model (<https://doi.org/10.1186/s12916-016-0572-z>). The model predicts death from causes other than prostate cancer. We would like to work out risk of death from prostate cancer taking into account risk of death from other causes using risk of dying first from disease. |
| Dataset | We will validate the updated model likely on the Prostate Cancer Outcomes Study, the same validation cohort from the Kent manuscript. |
| Proposed analyses | The analyses will be broken into two parts: 1. A simulation portion to assess the best way to incorporate risk of PCa death into an established model, and 2. Updating the Kent model and validating the update.   1. Simulation Study    1. Simulate competing risks data (guide for simulating this data <https://doi.org/10.1002/sim.3516>)    2. Build model to predict death from other causes    3. Build model to predict death from PCa    4. How to combine the data into a single model?       1. Emulate a competing risks regression model       2. Treat the two endpoints as independent, and calculate joint probabilities.       3. Treat the problem as a multistate model rather than competing risks. This has benefits over competing risks as outline by Therneau in “Multi-state models and competing risks” 2. Validation Study    1. Update the Kent model using method decided upon in the first part of the study    2. Report on the calibration and discrimination of the original model and the updated model.    3. Report on the clinical utility of using the updated model.   The Kent model was estimated on a population with negligible risk of PCa death. The risk of PCa death was estimated (maybe using competing risks) using oncologic factors only (no comorbidity data). The idea is that two patients who both have a 10% risk of PCa death within 10 years based on their disease profile. If one of those patients is vastly comorbid and the other healthy, the actual risk of PCa death is likely different, as the unhealthy patient will likely die from something else first. We need to try various methods for combining these risk estimates to report a true risk of PCa death. AV thinks the risk is modified using {PCa risk}\* = ( 1 – {OC death}) \* { PCa risk } |
| Outstanding issues |  |