Impact of Death Certificate Misclassifications on Radiation Cancer Risk Estimates

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A prior US Transuranium and Uranium Registries (USTUR) study explored misclassification of underlying causes of death (UCODs) on death certificates by comparing UCODs on death certificates to those on autopsy reports. It found a false-positive (over-classification) rate of 4.2%and a false-negative (under-classification) rate of 14%. The current study evaluates the impact of misclassification errors such as these on radiation cancer risk estimates. Autopsy reports, death certificates, and external radiation doses were available for 243 USTUR Registrants. The average cumulative external radiation dose was used to divide cases into high and low dose groups. The true odds ratio for cancer deaths – 0.679 ($p=0.185 > 0.05$) – was calculated from the UCODs on the autopsy reports while the odds ratio according to the death certificates was 0.828 ($p=0.517 > 0.05$). This represented a shift in the odds ratio toward one due to death certificate misclassifications; however, neither of the odds ratios was statistically significant. This scenario represents the impact of one possible combination of over- and under-misclassification errors on the odds ratio. Of the 243 cases in this study, 81 died of cancer and 162 died of non-cancer. The over-misclassification rate of 4.2% identified in the previous study was used to evaluate how false positives on death certificates could impact the statistical significance of the odds ratio. Seven non-cancer cases (162×4.2%) were selected at random and changed to cancer cases. The odds ratio and p-value for the resulting dataset were calculated and saved. When this process was repeated 20,000 times, 3.1% of the p-values were less than 0.05 (two-sided), meaning that there was a 3.1% probability that over-misclassification errors would result in a statistically significantly odds ratio, even though the true odds ratio was not significant. Similarly, when the under-misclassification rate of 14% was applied, 12 cases (81×14%) were randomly misclassified from non-cancer to cancer, resulting in a 2.5% probability that under-misclassification errors would lead to the erroneous conclusion that the odds ratio was statistically significant. When the over-classification rate of 4.2% and the under-classification rate of 14% were simulated simultaneously, the p-value was significant 8.6% of the time.

USTUR-0645-23A