

Can Misclassification of Disease Change the Conclusion of Significant Dose-Response Associations?

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Objective: Misclassification of causes of death on death certificates can occur. This study aims to quantify the probability of death certificate misclassification errors changing the conclusion of dose-response associations.

Methods: This study utilizes a real dose distribution from Rocky Flats nuclear workers. A logistic function was used to generate outcome probabilities for each dose record, assuming an odds ratio of 1.85 with a baseline cancer rate of 26%. Health outcomes corresponding to each case were then generated based on these probabilities. This process was repeated 1,000 times to create 1,000 datasets. From these, a statistically non-significant dataset with a p-value slightly exceeding 0.05 was selected. Over- and under-misclassification rates of 30% were randomly applied to this initially selected dataset to simulate a real-world misclassified dataset. This process was repeated 20,000 times. Subsequently, odds ratios and p-values of the misclassified datasets were calculated to evaluate the effect of misclassification.

Results: There is a 10.0% chance that misclassification errors cause the association to become statistically significant between the radiation dose and the outcome.

Conclusion: In general, it is believed that if misclassification of disease had been incorporated into epidemiological studies with significant dose-response associations, it would have resulted in findings that were more significant. However, these findings demonstrated that in a notable percentage of the time this belief is incorrect.

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