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Temperature-based death time estimation in near equilibrium: Asymptotic confidence interval estimation

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Highlights

- In homicide cases: Temperature based death time estimation: method of Marshal & Hoare and Henßge (MHH)
- Method VBT of Potente et al. gives confidence intervals (CI) near temperature equilibrium using MHH
- We show: VBT has an upper applicability limit in time since death
- Beyond the limit CI-probabilities can be dramatically underestimated by VBT
- Reason VBT missed the limit: conventional CI-interpretation instead of frequentist interpretation

Abstract

Temperature based death time estimation (TDE) is severely limited in situations where body core temperature has almost decreased to ambient temperature. The TDE method of Marshall/Hoare and Henßge (MHH) defines a lower bound T_K for body core temperature below which the time p.m. should be stated to be > 10 h only.

A recent study [10] established a new method, called variance-bias-tradeoff (VBT) complementing MHH in constructing a right-side-half-infinite 97.5%-confidence interval for such 'near equilibrium'-situations. It seemingly proved the validity for all body core temperatures $T < T_K$.

The present study investigates VBT further and discovers that VBT-applicability has an upper limit in time since death. We show how to compute this upper limit explicitly in forensic casework and explain by the frequentist confidence interval probability interpretation why the former study [10] missed this upper limit.

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