CONFIDENCE INTERVALS AND P-VALUES FOR META ANALYSIS WITH PUBLICATION BIAS

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We study publication bias in meta analysis by supposing there is a population (y, σ) of studies which give treatment effect estimates $y \sim N(\theta, \sigma^2)$. A selection function describes the probability that each study is selected for review. The overall estimate of θ depends on the studies selected, and hence on the (unknown) selection function. Our previous paper, Copas and Jackson (Biometrics, 2004), studied the maximum bias over all possible selection functions which satisfy the weak condition that large studies (small σ) are as likely, or more likely, to be selected than small studies (large σ). This led to a worst-case sensitivity analysis, controlling for the overall fraction of studies selected. However, no account was taken of the effect of selection on the uncertainty in estimation. This paper extends the previous work by finding corresponding confidence intervals and P-values, and hence a new sensitivity analysis for publication bias. Using our method, we re-analyze the data used in the meta analysis of Hackshaw *et al.* (BMJ, 1997) on the lung cancer risk of passive smoking, which is a topic of much current debate. Our analysis shows that although study selection would imply that the relative risk has been exaggerated, it is unlikely to be sufficient to negate the main conclusion in Hackshaw *et al.* (1997) that passive smoking does pose a health risk, albeit at a more modest level than has been claimed.