University of York Department of Health Sciences

M.Sc. Module: Systematic Reviews

Exercise: Bias in meta-analysis

In a study of the possible effects of passive smoking on birthweight (Peacock *et al*., 1998), the findings were combined with those of other studies in a meta-analysis. Wherever possible the difference was adjusted for other factors which might influence birthweight. The following table shows the estimated differences between the mean birthweights for non-smoking mothers not exposed to the cigarette smoke of others, and the mean birthweights for mothers who were passive smokers.

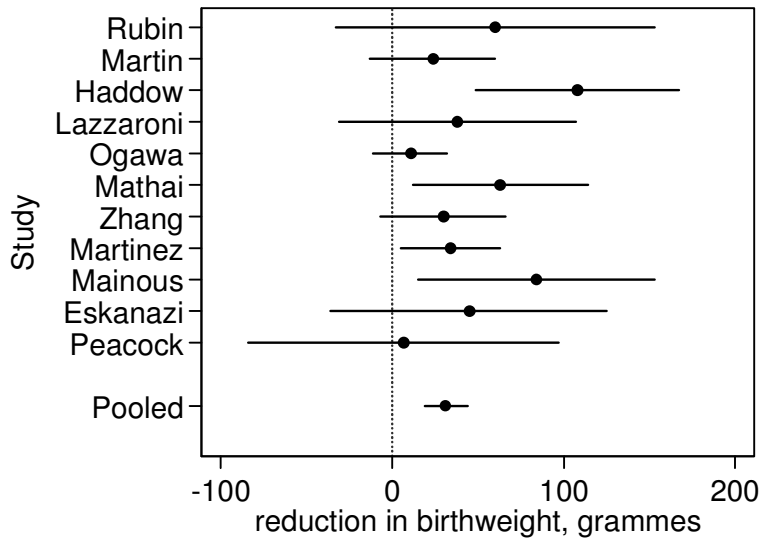
Study	n	Difference	(95% CI)
Rubin *et al.* (1986)	500	120g per 20 cigs/day	
Martin and Bracken (1986)	2473	24g	(−13 to 60)
Haddow *et al.* (1988)	1231	108g	
Lazzaroni *et al.* (1990)	647	38g	(−31 to 107)
Ogawa *et al.* (1991)	5336	11g	(−11 to 32)
Mathai *et al.* (1992)	994	63g	(12 to 114)
Zhang and Radcliffe (1993)	1785	30g	(−7 to 66)
Martinez *et al.* (1994)	907	34g per 10 cigs/day	(5 to 63)
Mainous and Hueston (1994)	1173	84g	(15 to 153)
Eskenazi *et al.* (1995)	2243	45g	(−36 to 125)
Peacock *et al.* (1998)	818	6.7g	(−84 to 97)

For the meta-analysis, confidence intervals and standard errors for the studies of Rubin *et al.* and Haddow *et al.* were estimated from other data.

Most studies estimated the difference between non-smokers exposed and non-smokers unexposed to passive smoke. Two gave the difference per 10 or 20 cigarettes per day smoked passively.

a) What could the authors of the meta-analysis do about this?

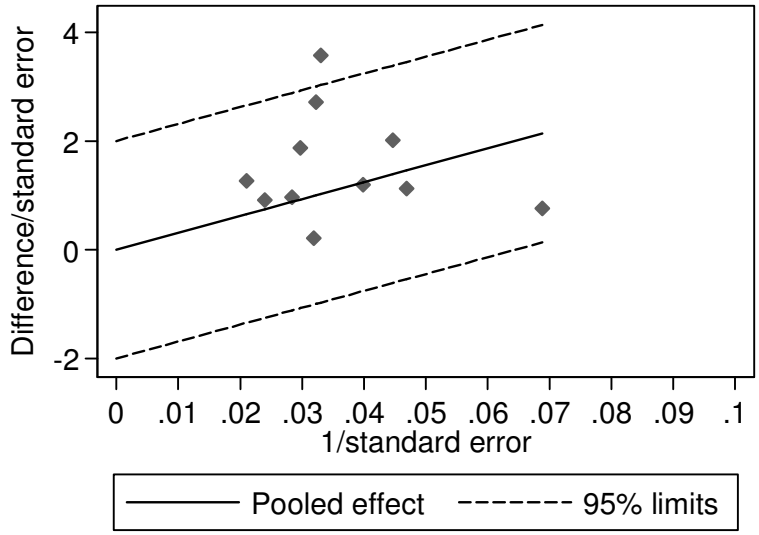
The paper included a figure similar to the one below:

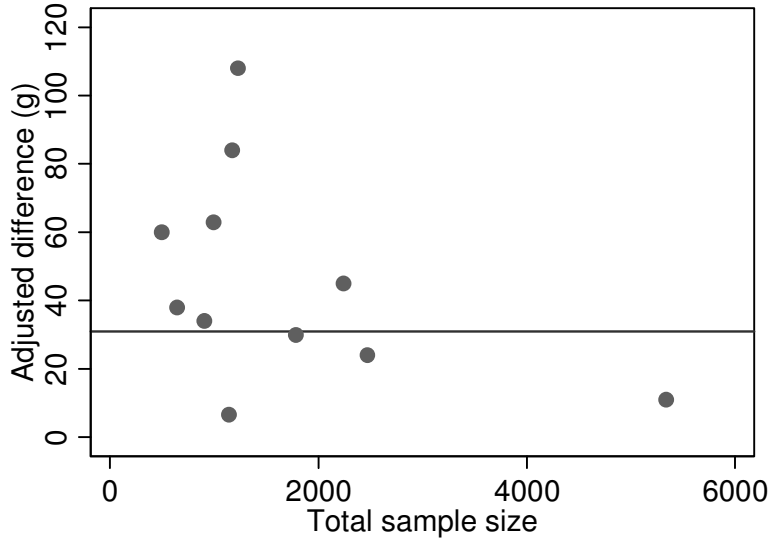


b) How might this figure be improved to better represent the data?

c) Why can publication bias be a problem in meta-analysis?

The following graphs were produced:





d) What kind of graphs are these and for what is each used?

e) Is publication bias likely to be a problem in this study?

The Begg test produced P=0.3 and the Eggar test produced P=0.07 (unweighted) and P=0.01 (weighted).

f) What do these tests do and what conclusions would we draw?

The authors reported that one study has shown large effects that remained after adjustment for age, education, height, parity, sex and weight, although gestational age was not controlled for (Haddow *et al.* 1988). Otherwise, most of the studies have shown relatively small effects after adjusting for confounders. There was no evidence for statistical heterogeneity (chi-squared=12.9, 10 d.f., P=0.23).

g) What is the purpose of this test and what does the result encourage us to do?

The pooled estimate of difference in mean birthweight between the unexposed and exposed women across 11 studies was 31g (95% CI 19 to 44).

h) What can we conclude from this?

i) How does the possible publication bias influence our conclusions?

The authors concluded that 'Our data provide no support for a substantial effect of maternal passive smoking on birthweight . . . . The pooled estimate suggests that the effect of maternal passive smoking on birthweight is small . . .'.

j) Do you agree with this conclusion?

Reference

Peacock, J.L., Cook, D.G., Carey, I.M., Jarvis, M.J., Bryant, A.E., Anderson, H.R., and Bland, J.M. (1998) Maternal cotinine level during pregnancy and birthweight for gestational age. *International Journal of Epidemiology* **27**, 647-656.

Questions based on Martin Bland and Janet Peacock: *Statistical Questions in Evidence-based Medicine*, Oxford University Press, Oxford, 2000.