

**THE IMPACT OF DIETARY FAT ON BLOOD LIPIDS:  
HIERARCHICAL MODELS FOR META-ANALYSIS OF DIETARY TRIALS**

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Meta-analyses of dietary trials that assess the effects of alternative dietary fat sources on blood levels of total cholesterol and cholesterol fractions have guided diet-based public health strategies. However, recent large-scale studies have demonstrated that the ratio of total to HDL cholesterol has greater predictive value for the risk of ischaemic heart disease than individual cholesterol fractions alone. Consequently, there is a need to update previous meta-analyses to assess the relevance of replacing saturated or trans fat by unsaturated fat or complex carbohydrates on a wider range of blood lipid measurements.

Dietary studies commonly report coefficients from multiple regression analyses without any reference to estimates of variance. This makes a meta-analysis of these studies problematic. The implementation of hierarchical models using MLn to address this problem has previously been suggested<sup>1</sup>. Unfortunately, the ability to reliably implement such models has been limited due to computational difficulties. Consequently, recent meta-analyses of dietary trials have combined estimates using multiple regression techniques. However, since design aspects vary widely across contributing studies the use of random effects to quantify within and between study variability would be particularly advantageous.

The current study describes the application of a four-level hierarchical model for estimating the effects of dietary fats on a variety of lipid measurements. Models are implemented using SAS, giving a more efficient and less labour intensive approach than MLn and thereby ensuring greater ease of use. An initial analysis comparing SAS and previously published MLn results is presented and comparisons made with multiple regression results. In addition, estimates from a novel updated meta-analysis of over sixty diet related controlled trials are discussed. In studies where information is available, the effect of replacing trans fats with alternative sources is considered and the impact of dietary fats on apolipoproteins and C-reactive protein examined. It is concluded that hierarchical models may now be considered an accessible and flexible analysis tool for meta-analysis of dietary studies and should be regarded as a valuable alternative to multiple regression.

<sup>1</sup>Frost, C., Clarke, R., Beacon, H. Use of hierarchical models for meta-analysis: Experience in the metabolic ward studies of diet and blood cholesterol. *Statistics in Medicine* 1999; 18: 1657-1676.