PostScript

LETTERS

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Social epidemiology, intra-neighbourhood correlation, and generalised estimating equations

The recent editorial by Merlo[1] offers an interesting critique of the generalised estimating equations (GEE) analysis of a paper published in the same issue of the journal. In the editorial, the author notes that the paper's GEE analysis treats ''the intra-neighbourhood correlation as a 'nuisance' that needs to be adjusted in the analysis but not explicity investigated'' (page 550).

The editorial then becomes a call for an alternative, more innovative approach in social epidemiology: ''Estimation of the extent to which individuals within a given neighbourhood are correlated with one another in relation to health (that is, the concept of intra-neighbourhood correlation) has value in the context of ideas about the efficacy of focusing intervention on places instead of people'' (page 551). The finale is a logical conclusion that studies of intra-neighbourhood correlation may ''...present themselves as a new epidemiological approach that may prove very useful in social epidemiology'' (page 551).

The author is appartently speaking of first order GEEs but the *JECH* readership may not appreciate that second order GEEs (GEE2) treat the intra-neighbourhood and inter-neighbourhood correlations into deliberate objects of study and estimation.[2] Although we ourselves deserve absolutely no credit for biostatistical innovations, the ''alternating logistic regressions'' (ALR) approach[3] we use in our forthcoming article in this journal[4] is a computationally efficient alternative to GEE2 in the case of a binary outcome. As such, it estimates the pairwise odds ratio, which quantifies the degree to which health conditions, behaviours, or perceptions might cluster within neighbourhoods (or other nested structures of community life) to a degree other than one might expect if these health conditions, behaviours, or perceptions were distributed at random across neighbourhoods.

Because we believe our work is responsive to the author's call for a new approach in social epidemiology that measures intra-neighbourhood correlation, we would welcome an editorial comment on the potential value (and possible shortcomings) of the GEE/ALR approach we used in our forthcoming article in *JECH* on clustering of cocaine incidence in the United States. We hope you will concur that our application of the ALR approach is a step in the right direction for research on contextual influences and health.

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3 **Carey V**, Zeger SL, Diggle P. Modelling multivariate binary data with alternating logistic regressions. *Biometrika* 1993;**80**:517–26.
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Author's reply

I have read with great interest the comments made by Petronis and Anthony on my editorial.[1] I have also read their forthcoming article,[2] and I believe they apply an analytical approach that seems to be, in my opinion, a step in the right direction for research on contextual influences and health that focus on investigation of clustering. I will be very pleased to write a more extensive comment and send it for consideration and possible publication in the journal.

Measuring clustering with the aim of obtaining substantive scientific information is so far an uncommon approach in social epidemiology and most multilevel analyses have in fact been plain ''contextual analysis''[3] focused on measures of association. This seems to be true not only for studies using GGE techniques but also for studies using multilevel hierarchical regression. However, the original standpoint of multilevel hierarchical regression analyses is the investigation of complex patterns of variation[4] rather than dealing with residual correlation.

Regarding the use of ''GEE2'' and measurement of clustering, the comment of Petronis and Anthony is certainly right.

From an epidemiological point of view the most interesting question is the conceptual rather than the mathematical approach used. I agree with Petronis and Anthony in their conceptual approach and I believe that they put context back in epidemiology using ''GEE2'' techniques.[5] The pairwise odds ratio and other techniques for measuring neighbourhood heterogeneity and clustering like the median odds ratio and the interval odds ratio[6 7] deserve more development and spreading.

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CORRECTION

An editorial error occurred in this article by Kuh and colleagues (2003;**57**:778–83). In figure 1 the top of the figure should read Time [not Time (min)].