(January 15, 2007.)

Discussion of the read paper by Peter McCullagh
"Sampling bias and logistic models"
(to appear in *Journal of Royal Statistical Society Series B.*)

Professor Jesper Møller, Aalborg University.

I welcome this stimulating paper, with its use of point process models for discussing sampling bias in regression models. The central model is a Cox process model evolving in time t and with marks (y, x), where y is a response taking values in a finite set and x is a spatial location. It is driven by an intensity of the form $\lambda_y(x)\nu(dx)dt$, with a particular focus on log Gaussian models or gamma models for the random functions $\lambda_y(x)$. Note that the marks (y_i, x_i) are independent of the times t_i. As discussed below, other point process models could be of relevance.

Could other types of Cox models be included? Shot noise Cox processes (e.g. Møller, 2003) are in contrast to log Gaussian models (section 5.2) closed under aggregation, while moment expressions are less simple (e.g. Møller and Waagepetersen, 2003). Furthermore, McCullagh's random intensity may be extended to the time-inhomogenous case $\lambda_y(x)\nu(dx)\kappa(dt)$, say, so that e.g. quota sampling remains unbiased.

Another important class of point process models with marks is based on modelling the conditional intensity, i.e. when we at time t condition on the history of the evolving process (e.g. Daley and Vere-Jones, 2003). For example, expressions for the unconditional and conditional distributions considered under the various sampling protocols in section 3.2 and the limit distribution in section 4 will be of a similar form as in McCullagh's paper. In particular, if the marks (y_i, x_i) are independent of the times t_i and distributed as in McCullagh's Cox model, we again obtain equation (6), and hence quota sampling is unbiased under the log Gaussian model specified a few lines after equation (6), and we still obtain the limiting low-intensity conditional distribution in equation (11), and so the theory in section 5 applies.

For spatial point process modelling, the analogy with generalized linear models and random effects models is to some extent discussed in Møller and Waagepetersen (2007).

References

Daley, D.J. and Vere-Jones, D. (2003). *An Introduction to the Theory of Point Processes. Volume I: Elementary Theory and Methods* (second edi-

tion). Springer-Verlag, New York.
Møller, J. (2003). Shot noise Cox processes. *Advances in Applied Probability*, **35**, 614-640.
Møller, J. and Waagepetersen, R.P. (2003). *Statistical Inference and Simulation for Spatial Point Processes*. Chapman and Hall/CRC, Boca Raton.
Møller, J. and Waagepetersen, R.P. (2007). Modern spatial point process modelling and inference (with discussion). *Scandinavian Journal of Statistics*, **34**, 643-711.

Jesper Møller, Department of Mathematical Sciences, Aalborg University, Fredrik Bajers Vej 7G, DK-9220 Aalborg East, Denmark. Email: jm@math.aau.dk.