integrated to find marginal posterior densities for components of interest, using flat priors for the regression coefficients. (It is not clear to me how one can be sure that anomalies of the type that arise in Mitchell's example cited above do not arise in this model.) The conditional approach, carried out approximately, requires an exercise similar to that outlined above to be recomputed for each component parameter of interest. While this is tiresome, it is not particularly complicated.

Casella, DiCiccio and Wells refer in their Section 3.1 to the saddlepoint alternative. I think it is more accurate to refer to it as a marginal alternative, since, as they acknowledge, Field's saddlepoint approximation for M-estimates is an approximation to the marginal sampling distribution of these estimates. It shares the drawback with other marginal solutions that elimination of nuisance parameters is not achieved in models where nuisance parameters are eliminated by conditioning. The saddlepoint method is a technique of approximation, which can be applied to conditional or unconditional models, but is not an inferential methodology.

5. CONCLUSION

The approach of Liang and Zeger is more directly motivated by particular practical applications, and it presents a quite different method for eliminating or minimizing the effect of nuisance parameters. At first glance our two papers seem quite unrelated, but the discussion of Lindsay and Waterman shows that they are more closely related than might appear. In particular, Lindsay and Li give convincing evidence that projection using Bhattacharyya scores can imitate conditioning. It would be interesting to know if this approach reproduces exact results when they are available, and what the connection might be to approximate ancillarity.

Dawid and Goutis refer to some confusion in my use of the terms sufficiency and ancillarity in the presence of nuisance parameters, and they point out that one aspect of this is the use of the phrase "the nuisance parameter," when in fact this parameter is typically not uniquely defined. Severini provides a more careful, and more helpful, definition of S-ancillarity related to this point. Barndorff-Nielsen and Cox (1994, Chapter 8) emphasize the importance of finding procedures which are invariant to interest-respecting reparametrizations. It is possible that, in particular models, a natural form of the nuisance parameter could be constructed using the estimating equations approach; that is, the nuisance parameter in a fully specified parametric model could be chosen to coincide with the nuisance parameter that would arise in a compatible semiparametric estimating equations approach.

In conclusion I find it heartening to see that discussions of theoretical statistics continue to engender lively debate.

ACKNOWLEDGMENTS

I would like to thank the discussants for their contributions and the Editor, Rob Kass, for his encouragement.

Rejoinder

Kung-Yee Liang and Scott L. Zeger

We would like to thank the discussants for their thoughtful comments. We would also like to add our congratulations to Dr. Reid, for her clear exposition on conditional inferences, a tool for reducing the influence of nuisance parameters in a fully parametric setting.

The two papers by Dr. Reid and ourselves address, in part, the common question of how to draw inferences in the presence of nuisance parameters. As pointed out by the discussants, they also both focus on methods most directly applicable to exponential family models. However, the fundamental distinction between these two papers is the degree to which we specify a probability mechanism for the data. Dr. Reid's paper starts with the assumption that a full probability mechanism can be specified. We begin with the assumption that it is not possible nor perhaps desirable to do so.

Peter McCullagh comments on the role of conditional inference when the likelihood is fully specified. He reflects upon the inherent contradiction in the practice of statistics that conditionality and sufficiency are accepted, while the likelihood principle is not. He raises the important point that the like-