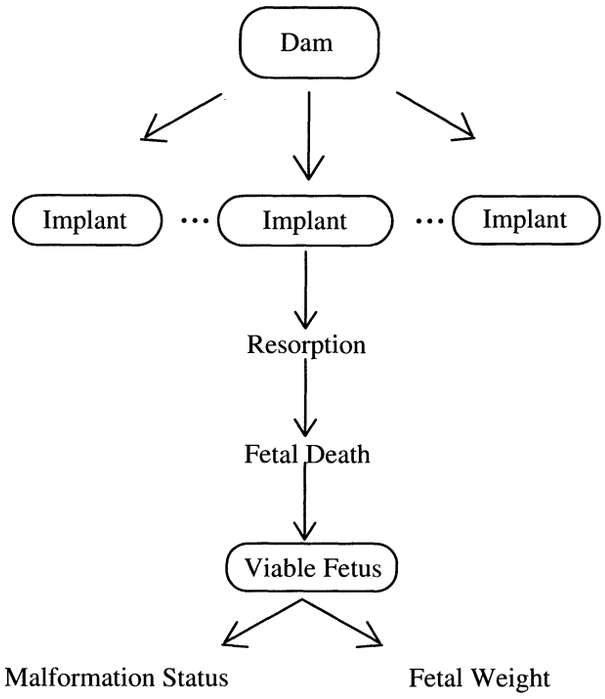

FIG. 3. *Fetal outcomes in developmental toxicity studies*

gested formulating the problem in terms of a trinomial outcome (dead, malformed, normal). Chen, Kodell, Howe and Gaylor (1991) suggest a parametric approach based on a Dirichlet trinomial distribution. Ryan (1992b), Catalano, Scharfstein and Ryan (1994), Zhu, Krewski and Ross (1994) and Krewski and Zhu (1994) use estimating equations. In general, the best approach for the analysis of correlated multinomial data is not well established. There are several different ways to set up either parametric approaches or estimating equations, but there has not been any systematic study or comparison of the various approaches. Finding ways to analyze dose effects on fetal weight and malformation status is another interesting challenge. In general, there are few methods available for the analysis of multivariate data involving a mixture of discrete and continuous outcomes. Methods for clustered data of this kind are virtually nonexistent, although Catalano and Ryan (1992) and Catalano et al. (1993) suggest one approach based on conditional estimating equations. Theoretically, there is no reason why marginal estimating equations could not be constructed for such data. However, there has been little work on this topic.

ACKNOWLEDGMENTS

The author thanks Nick Lange and Paige Williams for help with the figures, as well as Paul Catalano and Ralph Kodell for helpful comments on the manuscript.

Rejoinder

N. Reid

1. INTRODUCTION

Criticisms of non-Bayesian conditional inference fall roughly into one of two categories: foundational and practical. The foundational criticisms of conditioning revolve around whether or not conditioning should be a basic statistical principle, on a similar footing to, for example, sufficiency. Practical criticism of conditioning tends to concentrate more on the fact that models arising in applications tend to be complex and not often readily amenable to a textbook treatment of conditioning or marginalizing. As well, in many practical settings questions about modelling or sampling, such as whether or not observations are independent, are more crucial than questions of whether to use a first-order or higher-order approximation.

A third aspect of the discussion, closely related to these, is the claim that a Bayesian approach addresses both these criticisms, by being logically coherent as well as practically straightforward. In addition, it automatically conditions on all the data; what could be more conditional than that? A related, somewhat more technical, part of this debate is the extent to which Bayesian and non-Bayesian solutions to a problem can be made to agree.

In this paper I tried to emphasize techniques of conditional inference, rather than the philosophy of conditional inference. However, this is a paper on conditional inference in the theory of statistics, not in the practice of statistics. A paper which explored to what extent conditional ideas could be used in "real" applications would have a very different focus. It might perhaps come to a negative