DISCUSSION

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The need for small area estimates is well established. In the past ten years many studies have been conducted for the purpose of evaluating small area estimators and, in particular, synthetic estimators. The study described in this paper is perhaps the largest single empirical effort to date. This study provides useful information for those interested in small area estimation in general, and, in particular, for those interested in small area estimates for limitation of activity and utilization of health services variables. The main conclusion of this paper is that "there is considerable variation in the quality of the estimates among the health related items studied, and for many of the items neither synthetic nor regression estimates produce very reliable data for areas of the size of typical HSA's." This conclusion is similar to those of several other studies investigating synthetic estimates. However, the performance of the synthetic estimator is variable dependent and the large number of new variables considered makes this paper of special interest.

Other studies have used census values or direct survey estimates as comparison values for synthetic estimates. This paper, in addition to the direct survey estimates for the Health Interview Survey (HIS), uses direct estimates from a telephone survey. The differences in these estimates lead to some interesting questions concerning possible nonsampling errors. However, this study was not designed to evaluate nonsampling error and provides limited information for this purpose. Nevertheless, in the discussion of direct estimates for the 20 largest Primary Sampling Units (PSU's), the authors conclude "that the dramatic nature of these differences suggests that there may be problems in the ability of HIS to enforce uniform standards of interviewing." This conclusion is based on the assumption that the population values of the variables considered are stable across PSU's so that differences not explained by sampling error must be due to interviewer error. This assumption does not seem to be consistant with the available evidence. Estimates at the regional level based on large samples and large numbers of interviewers display considerable variability, suggesting that there is population variability between regions. For example, in the four major regions of the U.S. restricted activity days per person per year varied from 14.5 to 18.6 and bed disability days from 5.9 to 7.5 (NCHS, 1977). If this variation in population values occurs in the four major regions it is likely that more extreme variation occurs in the 20 large PSU's. Given this level of variation rather than the assumed little or no variation, it is unclear what part of the variability displayed by the PSU estimates is due to sampling error, what part is due to actual differences in population values and what part, if any, is due to interviewer error. The question of possible interviewer error is an important one, but one which can be better addressed from other data sources or by studies specifically designed for this purpose.

My remaining three comments are concerned with ways in which certain aspects of this study might have been either approached differently or extended to provide additional information.

The synthetic estimator considered in this paper used national rates within 16 age-race-sex classes. Synthetic estimators investigated in some other studies have also used national rates but have added a ratio adjustment to a regional estimate of known reliability. This particular technique does not seem applicable here. However, since there are regional differences which are not fully explained by differing age-race-sex distributions, it seems that an estimator that allows for the use of regional information should have a smaller mean square error than one which does not. More specifically, it would be of interest to know if the use of regional rather than national age-race-sex rates would produce improvements in average mean square errors.

One of the differences in telephone and HIS methodologies listed early in the paper is that non-telephone households are naturally excluded from a telephone survey. The effect of this difference is not discussed but could be evaluated by using existing HIS data. A paper by Thornberry and Massey (1978) compares limitation of activity and utilization of health services variables for telephone and non-telephone HIS households and provides evidence as to the practical importance of this difference in methodology.

In the final section of this paper additional areas of study which warrant investigation are listed. One area mentioned is "the construction of composite estimators consisting of a weighted average of a synthetic (or regression) estimator and a direct estimator". I agree with the authors that composite estimators should be considered for the production of HSA estimates. In fact, it seems that some type of composite estimator could have been among the first investigated. The idea of using a composite estimator for small area estimates is not new. As a discussant for the session on small area estimation at the 1973 ASA meetings, Richard Royall commented, "The choice between direct estimation and synthetic estimation is really the choice between a high-variance estimate of a directly relevant parameter and a low-variance estimate of a different quantity. The choice need not be made - surely a combination of the two is better than either taken alone." The use of a composite estimator was also mentioned in the technical appendix of the first NCHS publication of State estimates for limitation of activity and utilization of medical services variables in 1968. However, a synthetic rather than a composite estimator was used in this and a subsequent publication of State estimates. After additional developmental work, a composite estimator was used in NCHS's most recent publication of State estimates .

The composite estimator has several desirable characteristics (see for example, Schaible, 1978). Whenever the composite estimator weight is restricted to be between zero and one this estimator has a mean square error that is smaller than the larger of the mean square errors of the two component estimators. However, it is interesting to note that this restriction is not necessary and, in fact, is undesirable under certain conditions on the mean square errors of the component estimators and the correlation between them. The mean square error of the composite estimator will be smaller than that of either component estimator when any one of an appropriate range of weights is used. The reduction in mean square error that can be achieved by use of a composite estimator varies with the relative sizes of the component estimator mean square errors and the size and sign of the correlation between them. Maximum reductions can be large in certain situations, but also can be insignificant in others, so that caution in the use of composite estimators is indicated. Achievement of the maximum reduction depends on the accurate estimation of the minimum mean square error weight for the composite estimator, a task that is not always straightforward. However, areas of the mean square error curve that seem to be of practical interest are relatively flat in the vicinity of the optimum weight so that the composite estimator mean square error is somewhat insensitive to poor estimates of this weight.

Methods for estimating the optimum weight and for providing measures of error of the composite estimator need to be investigated further. Nevertheless, the composite estimator, in addition to its demonstrated usefulness, seems to have potential for a variety of applications including the production of small area estimates.

References

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