adjustment. The paper by Freedman and Navidi provides valuable early discussion on this important topic and contributes importantly to the continuing debate about census coverage error and the wisdom of census

adjustment. Most statisticians should find their discussions informative, amusing, and provocative. I certainly did.

# Comment

## Albert Madansky

My comments on the Freedman–Navidi paper are of two sorts, one directed specifically to the content of the paper and the other a set of general remarks directed at the common theme of Freedman's recent papers (Freedman, 1981, 1985, Freedman et al., 1983, as well as this one), critiqueing the use of statistics in modeling.

## 1. COMMENTS ON THE FREEDMAN–NAVIDI PAPER

They describe the Post Enumeration Program (PEP) studies (Section 3) and point out that "about two dozen different series of PEP estimates were developed," each based on a different set of imputation rules for treating the missing data. They claim that the Bureau of the Census "was unwilling to use PEP to adjust the population counts" because 1) there was considerable variation across the series, 2) the probabilistic basis for the estimate was open to serious question, and 3) the standard errors of the estimate turned out to be quite large.

To impute these as the reasons for the "unwillingness" of the Bureau of the Census to use PEP to adjust the population counts lends a greater aura of ratiocinativity to that decision than actually was the case. In truth, the Bureau of the Census was unwilling *by any means* to adjust the population count, and never considered in a constructive way how one might use PEP to adjust the population counts. The Bureau of Census stance was more in the nature of "we don't want to adjust the raw census counts" and "even if we wanted to adjust, we don't know *how* to adjust using PEP data" than in the nature of the authors' imputed scenario, namely an implied willingness to adjust, recognition that methodology was available for effecting that adjustment, but, taking the view that "the PEP data are so problematical that we don't want to use them to adjust the raw census," and rationally

deciding not to embark on an adjustment program. Indeed, Mitroff et al. (1982, 1983; see also Kadane, 1984) indicate that the principal motivating factor for the Bureau of the Census decision not to adjust was that the Bureau has historically been "nonpolitical and objective" and that use of any adjustment procedure would be in violation of that standard of Bureau behavior.

The positive contribution made by Ericksen and Kadane was to set forth an approach by which the PEP data could be used to adjust the census. Their paper merely suggested an approach toward adjustment; the work they did to implement their approach was in the nature of a constructive proof of an "existence theorem," used in an advocacy proceeding partially for the numbers it produced but primarily to make the point that indeed adjustment was feasible with the data at hand.

But let us get to the substance of the Freedman–Navidi paper. What should one make of the three "warts" in the PEP data? That the standard error of the PEP estimates turned out to be high is no reason not to use them if, in combination with the raw census data, one can produce demonstrably better estimates of the population counts than those achievable by using merely the raw census data. Let us see by a quick calculation whether this is in fact potentially the case.

The essence of the procedure for estimating the population count using the results of a postcensus sample (e.g., PEP) can be seen from a consideration of the following:

|                | Census | Sample |
|----------------|--------|--------|
| Respondents    | $n$    | $n'$   |
| Nonrespondents | $m$    | $m'$   |
| Total          | $N$    | $N'$   |

Here $N$ is the true census count, $n$ is the observed census count, $N'$ is the postcensus sample size, $n'$ is the number in the postcensus sample who were also in the census, and $m' = N' - n'$ is the number in the postcensus sample who were not counted in the census. Now let $\theta = m/N$, the fraction undercount in the

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