

imputations in PEP. Last but not least, Ericksen and Kadane have shown courage and innovation by putting forward a methodology in an area fraught with extreme difficulty.

For a broad range of uses the census data are accurate enough, like Newton's laws prior to the discovery of the theory of relativity. A higher intended standard of accuracy, deriving from one man one vote principles and large fund allocations tied to census results, seem to demand a new level of precision. Yet, we have not evolved the needed "theory of relativity" in the area of census adjustment, nor the statistical measuring instruments which could serve as yardsticks when approaching the speed of light. Parenthetically, given the very high level of intercensal mobility and the

relatively crude methodology available to track it, it is not entirely obvious why the census must have such extraordinary point-in-time precision. Indeed, over a decade the most disadvantaged areas in terms of congressional representation are undoubtedly those having the highest growth rate.

I am not optimistic about the likelihood of overcoming the technical difficulties involved by 1990, but the issue is clearly important enough so that a major effort must be made.

ADDITIONAL REFERENCE

- FELLEGI, I. P. (1981). Should the census be adjusted for allocation purposes? Equity considerations. *Curr. Top. Survey Sampling* 47-76.

Comment

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This paper shows one side of an argument between two sets of statisticians. The argument was a court case between the country's biggest city and the federal government, with many millions of dollars at stake. No wonder it is fascinating reading. Perhaps it is more surprising that upon reflection I find this paper very convincing, even though I have read just this one side.

Convincing and important.

Freedman and Navidi first describe the census, the Post Enumeration Program (PEP) series, and the approach of New York City to estimating census undercounts by regression of PEP estimates on a number of demographic covariates for 66 areas.

Then they lay bare the assumptions on which depends the validity of the analysis offered by New York City. There are seven such assumptions and the authors give us ample reason to doubt each one. Theorems, real-world heuristics, computations, and experimental sampling are all drawn upon, leaving this reader persuaded that New York City had little claim to having shown a way to improve the census figures by means of regression adjustment.

Freedman and Navidi show that some assumptions are implausible on their face (for example, the independence of two kinds of error component, and that variance of one of them could be regarded as known.)

They establish that the model entails the assumption that bias in the PEP figures is *not* related to the very demographic variables that are supposed to account for much of the bias in the census, the variables that are to be used to correct the census bias (undercount). They comment on the implausibility of this assumption, and then construct a second series of PEP adjustments, rather parallel to the series used by New York City and find that the difference between the two adjusted series is highly correlated with the demographic variables, which implies that at least one of the two PEP series must fail the key assumption that bias in PEP be unrelated to the demographic variables. The argument to this point implies that biases (assumed away by New York City) are likely operating, making standard errors inadequate measures of error. Then, by means of bootstrap sampling emerges the empirical information that indeed the New York City standard errors (given by formulas appropriate to the theoretical model) do understate the mean square error obtained by empirical sampling from a model in which many of the assumptions by New York City were made true by construction.

Freedman and Navidi have not attacked a strawman, they have not simply set out to find flaws in an example, they have assumed the burden of showing that New York City has not shown how to use the PEP estimates, plus regression, to give improved census counts. If they have succeeded in this (as I think), why is it important to statisticians?

First, statistical argument is becoming more frequent in litigation, so our profession is learning by doing. This case is an instructive example; it shows

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