

sus never intended such an interpretation. In the 1970 Swedish census, Statistics Sweden presented two numbers: one regular set of estimates with missing data and one with imputed values added. Surprisingly, many users (but perhaps not so surprising after all) knew exactly which estimate to use. In the 1975 census, imputation was not performed, which made comparison to the 1970 census awkward.

We find it both reasonable and natural to use auxiliary information to improve an estimate. After all, this is what survey design is all about. Various model assumptions are made in every design step, but the final result should be expressed as a single count or estimate. We sympathize with Belin and

Rolph regarding their general conclusion about the protracted controversy on the undercount problem. An impressive amount of work has been done, but it appears as if we have reached the point where further methodological resources, time and money would be a waste.

Most U.S. statistical agencies have committed themselves to modern quality thinking, that is, various forms of total quality management. It seems as if it would be better to use the "debate resources" to improve the regular census count procedures, thus decreasing the need for extensive and expensive evaluation procedures. This is especially true for the U.S. undercount, where the discussion fails to result in a consensus.

## Comment

David Steel

Evaluating and possibly adjusting the census for undercount raises a lot of difficult statistical and general issues. The papers here consider several of these and add to the already large literature on the subject. While the basic questions are now clear, the answers are not. To enable readers to make a judgement about any prejudices I might have on these issues, I should point out that as a former officer of the Australian Bureau of Statistics (ABS) I was involved in the evaluation of the 1981 and 1986 censuses. While the views I have are entirely my own, they are influenced by this past involvement. In terms of my prejudices this could work either way: having been involved in adjustment, I may have a bias to that view to justify my past work; alternatively, detailed knowledge of the many problems involved could lead me to be against adjustment.

In Australia, population estimates based on census counts adjusted for undercount have been released as the official population estimates since 1976. The estimates are produced for states and territories and local government areas. Population estimates are used to determine the number of seats each state has in the federal House of Representatives and the allocation of funds to states and local government areas. The decision to adjust was prompted by the high undercount rate showed by the 1976 Post Enumeration

Survey (PES) and the fact that the 1976 census count fell considerably below the population estimates for 1976, which were based on updated 1971 census results. There has been general acceptance and remarkably little controversy surrounding the adjustment. A clear distinction is made between census counts and population estimates. Census counts are produced without any adjustment. There are similarities to the situation in the United States. The level of undercount is basically estimated from a PES which involves an independent household survey and matching between the census and the survey to determine missed people and some categories of erroneous enumerations. Dual system estimates (DSE's) are calculated. The results of the PES are compared with demographic analysis and other population indicators such as school enrolments and Medicare enrolments (Medicare applies to all age groups), primarily at the national level, but with some analysis below this. Synthetic estimation is used to obtain population estimates for local government areas. The procedures for the PES and census evaluation are decided in advance. The view is that quality must be designed into the census and the PES. The estimated level of net undercount is remarkably similar to the United States: 1.9% in 1986 and 1.8% in 1991. In 1991 the state undercount rates ranged from 1.2 to 4.1%. The ranking of the states in terms of undercount has been consistent over time. Further details are given in Choi, Steel and Skinner (1988), Trickett (1992) and Australian Bureau of Statistics (1990).

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