

PARADIGM SHIFTS: ADMINISTRATIVE RECORDS AND CENSUS-TAKING

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INTRODUCTION

At the Council of Professional Associations on Federal Statistics (COPAFS) Seminar on Quality in Federal Data in Washington, DC, May 1990, there was much discussion of the need for possible paradigm shifts to overcome difficult problems facing the Federal statistical system. This paper will look at three areas of data collection— administrative records, census-taking, and surveys — and propose some new paradigms for integrating all three. Among other things, the presentation will focus on the use of rolling samples and administrative registers to improve survey methods.

There is a lot in the news lately about problems with the 1990 decennial census in the United States. Many opinions have already been offered about what went wrong and what should be done. Indeed, a paradigm shift may be needed in census-taking.

This brief note talks about the possible role administrative records might play in a new paradigm. To get things started, the word “paradigm” might deserve some elaboration: a paradigm is a way of thinking and then doing; a pattern of belief and behavior; a way of seeing reality and using that sense to accomplish something. Paradigms are common — the way we get to work would be a humble example. Conventional census-taking, under this definition, could be characterized as a major scientific and technical paradigm.

As long as our paradigms work well for us, we tend not to change them. Occasionally, however, paradigms break down and have to be replaced; e.g., the bridge goes out and we need to find another route to work. As Kuhn pointed out in his seminal book on

the structure of scientific revolutions, paradigms break down in science, as well (Kuhn, 1970). Perhaps the most famous example of this is the revolution in the thinking of astronomers that occurred when the Ptolemaic earth-centered view of the universe was replaced by the Copernican view of an earth that revolved, with the other planets, around the sun.

If we look at the problems the U.S. Census Bureau has encountered with the 1990 decennial census, it can easily be argued that one of the major barriers to overcoming these obstacles is the conventional census-taking paradigm. Kish, in a recent paper he has written for *Survey Methodology* (1990), considers at length some possible alternatives. My objective here will be to focus on two of those areas — rolling censuses and administrative registers — and to explore a new paradigm for the U.S. decennial census.

CONVENTIONAL CENSUS-TAKING

Conventional censuses, like those in Canada and the U.S., continue to do many things very well (e.g., Hammond, 1990). Indeed, at present, we have no adequate substitute for them; nonetheless, the need for at least some change seems compelling. Rising costs are a big factor. There have been many improvements in census-taking in this century; still, in both Canada and the U.S., total costs and even costs per person have risen significantly:

- The 1990 decennial census in the U.S. is budgeted at about \$10 (U.S.) per person. Even adjusting for inflation, this is a four-fold increase over what the per capita expenses were in 1960. Item content differences between the two censuses are small and essentially not a factor in explaining the difference. Both the 1960 and 1990 Census, for example, asked only 7 population questions of everyone (U.S. Bureau of the Census, 1989). The Census long-form sample

in 1960 contained 35 questions and was to be completed by 25% of the population. For 1990, the Census long-form sample was given to 16% of U.S. households and had 33 questions.

- The situation in Canada is similar with regard to the costs of census-taking. For example, the 1991 Canadian Census is budgeted at about \$9.50 (CAN) per person. Like the U.S. Census, there are again just 7, albeit somewhat different, population items that are asked of everyone. Like the 1990 U.S. Census, questions on housing are included for everyone (2 in Canada and 7 in the U.S.). In Canada, a 20% long-form sample will be employed in 1991. The Canadian long-form questionnaire has 45 items for 1991. The 1961 census in Canada was quite different from that planned for 1991 and thus meaningful cost comparisons are hard to make. Nonetheless, looking back 30 years in Canada, the same long-term trend in census-taking costs seems to exist; however, per capita costs have been roughly the same — even declining slightly — in the last two or three censuses.

The U.S. Census Bureau has looked at the growing cost of conventional census-taking and concluded that a major change may be needed (Browne, 1989). Labor costs have grown appreciably in recent decades in both Canada and the U.S. Technological improvements have not been great enough to offset these costs, though some, like TIGER (Topologically Integrated Geographic Encoding and Referencing) and CATI (Computer-Assisted Telephone Interviewing), offer promise. Greater attention in the U.S. to improved population coverage is another important factor (Anderson, 1990). The degree of public cooperation in the census also seems to be dropping, at least as reflected by the poorer than anticipated mail response rate for the 1990 U.S. Census. (It should be noted that this same tendency is not clearly apparent in Canada.)

Increasing cost is not the only major problem facing conventional census-taking. Perhaps of even greater importance is the growing rate of obsolescence of the information collected. The combination of rising costs and growing information obsolescence

has had the effect of reducing the benefit/cost ratio for conventional censuses steadily and dramatically.

To obtain more frequent small area data, some countries have introduced quinquennial censuses. For example, in Canada this was first done nationally in 1956. Budget problems led to the 1986 Canadian Census being cancelled and then reinstated. Indeed, it is unclear whether there will be a Canadian Census in 1996. While a quinquennial census was also legislated in the U.S., funds were never made available.

ROLLING CENSUSES

Conventional census-taking, of necessity, must sacrifice both timeliness and item content (on a 100% basis) to achieve complete spatial detail and high population coverage.

One of the alternatives that Kish asks us to look at is a “rolling census.” His proposal envisions the sampling of a country over a decade in such a way that every area is eventually covered. In its purest form, space and time become a single dimension and content remains fixed, such that, at decade’s end, we have obtained cumulative information on the entire country for a given set of items.

The chief advantage of a rolling census is that it can avoid the problem of information obsolescence at national and major subnational levels. For small geographic areas, though, there would, of course, still be only one observation per decade. Unlike a conventional census, comparisons among small geographic areas would be very difficult to interpret because the data are being collected at different points in time (Fellegi, 1981).

For a rolling census or survey, unit costs could be higher, as Kish notes, than in a more conventional enumeration (indeed, *ceteris paribus*, maybe even higher than the cost of existing survey efforts). In an age of fixed or declining resources, therefore, it might not be possible to do a complete “enumeration” each decade, even if content were significantly scaled back. Rolling samples would seem to have their greatest attractiveness not as a replacement for conventional

censuses, but, say, as part of a strategy to link together census-taking with ongoing surveys and local area population estimates for the intercensal years (Herriot, Bateman and McCarthy, 1989).

Both the United States and Canada employ monthly surveys to estimate the national (and some subnational) labor force characteristics. The Canadian Labor Force Survey (LFS) of 64,500 households covers 0.67% of the total Canadian population each month. "Given the rotation pattern in effect for the LFS, the 0.67% sample per month rolls up into a 6.7% sample of unique households over a 5-year period" (Drew, 1989). In the Canadian context, at least, Kish's proposal may be feasible. A sample survey vehicle could be designed, with some reduction in the month-to-month household overlap, which could achieve many of the benefits he has stated for a rolling sample, while also meeting the information needs currently met by ongoing household surveys (Drew, 1989). This sample would not replace the 100% census count data, itself, but might be a partial substitute for Canada's 20% long-form census sample.

Because the United States has a population about 10 times larger than Canada, the tradeoffs involving rolling samples and overall country coverage are not as favorable as they are in Canada. The U.S. Current Population Survey (CPS), for instance, at about 60,000 households, covers only .06% of the total U.S. population monthly. Even if cumulated over a whole decade (but with no change in its rotation pattern), the CPS would cover just roughly 1% of all U.S. households. This does not compare well in size to the overall 16% long-form sample being conducted as part of the 1990 U.S. Census.

To bring the rolling sample population coverage nearer to the 1990 U.S. decennial sample, major changes in the CPS rotation pattern would be needed. Other U.S. Census Bureau surveys might also have to be redesigned if the objective were to achieve even a partial substitute. Despite these changes, moreover, the resulting decade-long sample would still be only a small percent of the total U.S. population — perhaps, at best, in the 2% to 3% range, assuming resources and other requirements remained essentially fixed.

In both Canada and the U.S., the likely higher unit costs of a rolling sample may need to be addressed by changes in survey procedures: how area segments are listed (Royce and Drew, 1988); how first contact with households is made, etc. Where is it written, for example, that a personal interview contact is needed before using other modes of collection?

It will be no mean challenge to keep effective sample sizes equal for the major level and change components now obtained from ongoing surveys (e.g., Tegels and Cahoon, 1982). Some compromise may be needed, moreover, in the extent to which the basic content of the current long-form census samples can be included. Despite these challenges, or perhaps because of them, rolling samples deserve continued serious attention and should be the focus of extensive practical experimentation.

ADMINISTRATIVE REGISTERS

With the flowering of scientific sample survey methods in the 1940's (Bailar, 1990), the use of administrative records for statistical purposes became relatively less important in many national statistics programs. By the early 1980's, however, at least in the developed countries, the pendulum had begun to swing back. Philip Redfern has been the major chronicler of this phenomenon internationally (Redfern, 1987). While the Danes seem to have gone the farthest (Jensen, 1983 and 1987), major efforts have been made in Canada (e.g., Statistics Canada, 1990) and even some in the U.S. (e.g., Jamerson and Kilss, 1990).

A good summary of most of the key barriers to the greater use of administrative registers for census-taking is found in Redfern (1989), including the extensive discussion published with that paper. Perception barriers by the citizens (e.g., in Germany) are mentioned as problems. Psychological barriers by the national statistical service may, however, be of equal or even greater importance. Major scientific "paradigm shifts" generally have this problem (Kuhn, 1970). Certainly, this seemed to be part of the reason for the reception given to the proposal (made by me in 1980) to explore the feasibility of making administrative records an integral part of the U.S. Census of Population. While a sketch of such a proposal was

eventually given at the 1982 American Statistical Association meetings (Alvey and Scheuren, 1982), it seems, with a few fairly limited exceptions (e.g., Irwin, 1984; Citro and Cohen, 1985), that serious interest at the Census Bureau has been notably lacking.

Suffice it to say that in the U.S. very little of the needed research has been undertaken. This is true, despite continuing efforts to give the proposal prominence (Jabine and Scheuren, 1985 and 1987) and to get it discussed widely (Butz, 1985). Sadly, therefore, it appears that, in the United States, at least for the year 2000, we should not expect administrative registers to replace censuses.

The 1990 U.S. decennial census could have been used as a proving (or disproving) ground for some of the needed research into administrative record alternatives. Why that didn't happen is a matter that can only be speculated about. A contributing factor, quite possibly, is a case of "paradigm paralysis" (Barker, 1988). The literally decades-long controversy about whether to adjust census "counts" seems to have locked the U.S. Bureau of the Census into what some, at least, would call an increasingly sterile intellectual position (Fienberg, 1990). The viewpoint that they have adopted makes it very hard for them to see any alternative, like a (partial) administrative record approach, that starts out with the notion that adjustments would be required.

The situation is different in Canada. Since the late 1970's, Statistics Canada has assembled many of the building blocks needed to conduct an administrative record census (e.g., Drew, 1989; Podoluk, 1987; Verma and Raby, 1989). While much remains to be done, such a change could even happen as early as 1996. For example, the coverage of the Canadian tax return system, alone, is quite high and growing. In 1987, for instance, it has been estimated that the coverage was about 94% — i.e., about 3% less than the 96.8% coverage achieved in the 1986 Canadian Census. By 1991, the tax return coverage, alone, should be up to about 97% or better, with overall administrative record coverage still higher and likely to grow further in the 1990's. (See Table 1 for more details on administrative record coverage in Canada and the U.S.)

One concern often raised is that administrative registers, even after they become adequate in quality and coverage, will be limited to only a few, bare demographic variables: head counts, age, sex and little more. An immediate observation concerning this remark is that conventional censuses do little more than this, themselves, at least for the 100% items. It is also evident that, while the variables on administrative records are not the same as those collected in a traditional census, there is more already available than critics may realize (e.g., Meyer 1990; Alvey and Scheuren, 1982).

More important even than any current item content comparison is the need to emphasize that the proposal to use administrative registers in census-taking does not envision that administrative records have to be used as they are. Administrative records will need to be changed. In my personal opinion, limited optimism about achieving needed changes is justified. However, without a doubt, it is too much to expect of administrative records that they will be able to capture exactly the same concepts now measured in censuses and surveys. Additionally, there almost certainly will need to be special efforts, using existing census-taking techniques, to separately enumerate certain groups. The efforts in the 1990 U.S. Census to count the homeless would be one such example.

Censuses and administrative records each have inherent limitations. Unavoidable conceptual differences will be a major barrier to any shift from one medium to another. Administrative feasibility is another issue; however, some hard-to-duplicate census concepts (e.g., households) may not be as important to the measurement process as formerly.

Shifts in methodology (from conventional census to administrative records) for some uses would potentially be accompanied by a parallel shift in the underlying concepts measured. Some concepts may alter or expand in meaning, including our ability to measure them (e.g., families). We also must ascertain the extent to which respondents answer survey questions the same way they fill out administrative forms that may have real direct impact in their lives.

In recent years, traditional survey methodology

**Table 1.—Estimated Administrative Record Coverage in
Canada and the United States: 1987
(Numbers in Millions)**

| Type of record | Canada | | United States | |
|--|-------------------|------------------|-------------------|------------------|
| | Number of persons | Percent of total | Number of persons | Percent of total |
| Total population | 26.5 | 100.0 | 243.9 | 100.0 |
| Population includable in selected administrative records: | | | | |
| Federal individual income tax records | 24.9 | 94.0 | 217.5 | 89.2 |
| Federal wage records for individuals | 13.6 | 51.3 | 132.9 | 54.5 |
| Social security beneficiaries | 3.0 | 11.3 | 37.7 | 15.5 |
| Individuals not included above: | | | | |
| Welfare records | 0.8 | 3.0 | 3.1 | 1.3 |

Source: Canadian estimates were derived from administrative data at Revenue Canada Taxation and Statistics Canada. U.S. estimates are based on administrative records maintained by the U.S. Department of Treasury and the Department of Health and Human Services.

has been enhanced by new tools from the field of cognitive psychology. These cognitive research tools could be used to understand any conceptual differences between the meaning of terms when they are used in surveys or drawn from administrative records. We may not have what we think we have anyway (Bates and DeMaio, 1989). In any case, there is already an extensive body of cognitive research that can be drawn on (e.g., Diplo, 1987; Fienberg and Tanur, 1989; Jobe and Mingay, 1990).

It should also be pointed out that, most likely, administrative registers will not be able to completely meet the demands of modern society for richer sources of statistics. Such demands, of course, appear to be

insatiable. Even if they were not, administrative records will never have the flexibility and responsiveness of surveys. Registers, however, (including partial ones like those that exist in the U.S.) when linked to survey data, can be extremely important as auxiliary variables in making improved direct national survey — and even subnational survey — estimates. The U.S. Census Bureau's Survey of Income and Program Participation research on the use of Internal Revenue Service data for improving the precision of national survey estimates is a good recent example (Huggins and Fay, 1988). Indirect (e.g., synthetic) estimates for small areas would still be needed for variables not on the administrative registers (Platek, Rao, Sarndal, and Singh, 1987). The registers,

though, might provide a source of valuable symptomatic indicators.

CONCLUDING OBSERVATIONS

The case for considering a “paradigm shift” in census-taking seems compelling, at least in developed countries like Canada and the U.S. The rolling census alternative Kish proposes is probably too expensive to fully implement as a complete substitute for a census. Rolling samples do offer real promise, however, if they can be integrated into the current ongoing survey operations of Canadian and U.S. national statistical programs. Such samples could provide a needed link in addressing small area estimation needs that might otherwise not be met. Less promising, but still possible, is their use as a (partial) substitute for the census long-form samples.

As far as administrative registers are concerned, critics may have been unduly pessimistic. The Canadian situation, however, differs from the United States:

- In Canada, it is already within the realm of feasibility to combine rolling samples with administrative records as an alternative to conventional census-taking. This is not to say that enormous practical challenges don't remain. The 100% count portion of the Canadian census, though, could be done with administrative records as a starting point, augmented by a large-scale survey to measure and potentially adjust for undercoverage. The Canadian 20% census long-form sample might be, at least partially, replaced by a rolling sample. The content of the Census long-form is considerably richer than that of household surveys, but the content differences could be made up through additional questions “piggy-backing” the ongoing surveys at regular intervals. Coverage issues surrounding the use of administrative records could also be addressed directly with rolling samples, especially to calibrate for changes in administrative records between censuses.
- In the United States, the U.S. Census Bureau has begun to look at alternatives other than conventional census-taking (Bounpane, 1988). Unfor-

tunately, the research needed to look at an administrative register alternative has barely begun. Whether the Census Bureau will find a better approach than the use of administrative records and rolling samples remains to be seen. Whatever other alternatives they study, however, the use of administrative registers as a partial replacement for the conventional 100% counts definitely needs to be considered. A preliminary research agenda updating earlier ideas will appear in Scheuren, Alvey and Kilss, 1990.

Naturally, with such radical proposals, the answer is uncertain. Like Kish, I believe that “the balance of variance components” favors a change from conventional census-taking in most cases. However, as Kish states, “theoretical as well as empirical investigations will be needed to decide matters” (Kish, 1990).

In a change as big as the one proposed here, the “balance” that needs to be struck goes, of course, well beyond looking at variance (and bias) components. One issue that needs to be emphasized more is that some aspects, at least, of the paradigm shifts being considered could go to the heart of the social contract that exists between national statistical agencies and the people that those agencies have a mission to serve. For instance, in the U.S. Constitution, there is a requirement that an “enumeration” of the population take place every ten years. Would the use of administrative records or rolling censuses fit within this “Constitutional paradigm?” Perhaps the starting place is to adopt a broader definition of “enumeration.”

Another example where social contract issues arise is the extent to which the greater use of existing (or expanded) administrative data for statistical purposes might be seen as an unwelcome increase in the intrusiveness of the State into the private lives of its citizens (Grace, 1989). As legitimate as concerns about “intrusiveness” might be, though, there is no evidence in a North American context, at least, that they pose an insurmountable barrier. On the contrary, there have been virtually no adverse public reactions to past U.S. additions to administrative records for statistical purposes (e.g., of residential address information in 1972, 1974 and 1980 tax returns). To my knowledge the issue, so far, has not come up directly

yet in Canada, at least at the Federal level.

In summary, to make these kinds of changes there is the need for a lot more scientific research. Studying the implementation technologies will be an even bigger job. Finally, the issues go beyond our profession and may well be settled in other arenas. Wherever they are decided, it is incumbent on us, as statisticians, to frame the debate in terms of feasible options. Hopefully, exchanges such as ours today will help lead the way along that path.

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