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Abstract

In his paper, Särndal is reviewing the scientific aspects of the development of the survey sampling theory. In light of multiple changes in this field, some have called for a new paradigm. Upon careful analysis, Särndal lands on saying that there has been a strong research tradition which is anchored on assumptions about finite populations and feasibility of characterizing them with only a sample. With this framework, there can still be research and change, but the paradigm would essentially remain. In my discussion of this article, after providing precisions on the context of National Statistical Offices (mainly about Statistics Canada), I agree on many points and wonder if it is not a change in methodological paradigm rather than statistical paradigm that we are witnessing and point to some possible ways forward.

Key Words: Admin 1st; Data source; Inference; Non-survey data; Response rate.

1. Introduction

First, I would like to congratulate Professor Carl-Erik Särndal for having written this paper, which in my view, is asking the right questions and is clearly exposing what the actual state of the survey science is and what constitutes its foundation. Very importantly, he approaches the history of this field not only from a statistical viewpoint, but more so and better from a more general scientific perspective. The history of our field and the ebullition of research that has characterized it has been a healthy component of its development and maturing. Further, science evolves through discussion and constructive criticism by peers. This is what happened with debates such as the one on model-based and design-based approaches led in good part by Hansen, Madow and Tepping in the 70s. Reading about this (Hansen, Madow and Tepping, 1978; 1983 – and discussions, in particular by Särndal, 1978), is precisely what attracted me in the 80s into this wonderful scientific field of survey sampling.

As Särndal discusses in the paper (Särndal, 2025), I too would like to touch on the use of the term paradigm and in so doing will attempt to clarify – or at least provide my view – on what the situation is, and on what the goals of a National Statistical Office (NSO) are. Section 2 provides the context of NSOs and points to their need to evolve as well as the opportunities that exist (or appear to) in all types of data other than survey data, whether they be called administrative, alternative, Big or otherwise. Then, Section 3 summarizes my view on whether there is a paradigm shift or not and, in Section 4, I then try to thread on Särndal's two central assumptions and dare point to some possible future at least in the form of questions before concluding with Section 5.

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2. The context of National Statistical Offices

National Statistical Offices have the mandate to produce official information for the country for a variety of units, domains and topics. In achieving these objectives, quality and its many dimensions must be taken into account to produce statistics that can be qualified as valid and that can be trusted. The unique context of Official Statistics is that all populations studied are finite. Hence the usefulness of the current statistical paradigm that enables the drawing of valid conclusions.

Over the years, the context has changed in many ways. We have seen rising costs, declining response rates, more data sources available, and needs for faster results. I will only focus on two changes: 1) It is much more difficult to gather data with a response rate that is moving away from 100% and 2) there are far more data sources than a few decades ago. With response rates being lower than in the past – and significantly in some cases – it has become increasingly costly to finance the needed efforts to reach levels to which we have been accustomed. I would say that the fact that NSOs are not spending more is not due to a lack of willingness to pay for quality. Rather, it is related to the fact that the level of effort needed (and therefore costs) may not even be achievable (even if one were willing to pay) to attain the traditional levels of response. So, NSOs are deploying serious efforts to improve data collection methods and innovate, but it is not sufficient. In terms of new data sources, there are multiple (non-survey) data sets and sources that offer means to produce information. Often, these can complement surveys, and in some cases perhaps replace them.

In my view, the above changes have led to two wrong conclusions:

> Wrong Conclusion #1: Since surveys can no longer achieve their original goals, then other data sources can be used directly to replace them.
>
> Wrong Conclusion #2: One should let the data speak for themselves, and so there is no need for inference, hence no need for surveys.

These (wrong) conclusions and more so the changes that fueled them, indicated that feelings or a strong sense – at least in NSOs – that something (not necessarily clearly identified) needed to change. It is from these "feelings" that discussions emerged about the need for a shift of some sort in the approaches. Unfortunately, difficulties encountered with surveys contributed to some believing that they have now reached the end of their useful life. That could well be for the manner in which they have been implemented, but not necessarily for their underlying statistical foundation.

Now given the amount of data available from third parties, NSOs should (in fact it is their duties!) try to improve the quality of their statistics by using relevant data from other sources as much as possible. This is the reason why there has been multiple attempts to use more administrative and alternative data on the one hand to improve existing programs and on the other hand to start producing new information that would have otherwise not been possible. In doing so, the object has not been to change (for changing) but rather to try to always provide the highest data quality to users, realizing the difficulty in ensuring that quality be improved and in measuring it. To tap into the wealth of available data sources, when Statistics Canada

launched its modernization (Arora, 2018), emphasis was put on the importance of first considering potential non-survey data sources before launching surveys. The initiative became known as Admin 1st and quickly became labelled as a new paradigm (Rancourt, 2018).

3. Paradigm or tradition or model?

Are we witnessing a change in paradigm? I welcome Särndal's distinction between what is a paradigm and what is a research tradition that has contributed to the development of theories in survey sampling. Before leaning towards one side or the other, I would like to consider Kuhn's paradigm cycle (Kuhn, 2012). In this cycle, science gets to a state of *1) Normal science* when there is a generally accepted paradigm. From that point, things evolve and there is a *2) Model drift*. Then people come to question the established state and there is *3) Model crisis* where new context and observation is (or is apparently) increasingly disagreeing with the paradigm in place. Then comes *4) Model revolution* with new developments and arises a *5) Paradigm change* which eventually become the *1) Normal science* of a new cycle.

What has been witnessed in the survey sampling world is a change in context (e.g., Rising costs, declining response rates, more data sources available, need for faster results) that has put to test the normal science and brought many to see in this not only a model drift but also a model crisis. As those issues have apparently been solved (or circumvented) with some quick uses of non-survey data, the idea of a model revolution came up. So, while people feel that something needs to change, it is not always clear what exactly needs to change. In 2018, I tried to clarify how Statistics Canada viewed this change by talking about Admin 1st as a paradigm shift. Hopefully, I have not contributed to the lack of clarity.

What is clear is the need to make better use of various data sources, particularly those that are not issued from a probabilistic setting. Beaumont (2020) presents several ways in which non-probability data can be used. Often, in the development of science, practice is quite ahead of theory, and this is what has been happening in NSOs. Specifically in Canada, the recent context has been to experiment with new methods and approaches to improve things to counter trends such as reducing response rates. Hence the impetus to get out of traditional ways that have been viewed as potentially becoming less effective in producing information that is fit for purpose, and even constraining or putting sustainability at risk. All the resulting changes could well be for a more positive outcome, but one needs to keep in sight what the theoretical anchoring point is.

4. Särndal's foundational assumptions

Instead of referring to a paradigm, Särndal prefers to refer to the research tradition that revolves around two central assumptions. Assumption A1 is about the fact that we are dealing with finite populations and assumption A2 is that a sample will suffice to conclude about the finite population. I think that research tradition is a solid way of representing what is happening in the scientific field of survey sampling. Much of the confusion about the word paradigm might stem from the two wrong conclusions I described in

Section 2. It could well be that someone would be interested in descriptive statistics based on a given data file or even predictions from that file. However, there is a risk that the resulting statistics could be interpreted and used as if they were scientifically representing a population, that is, acting as if A1 and A2 both held while neither was used in the development of the approach retained.

In my view, it is very difficult to imagine our field without A1 when inference is required (the aim of NSOs). The recent challenges have been with A2. How can one draw valid conclusions from samples or files that come from different processes than the survey sampling tradition? In Rancourt (2018), I tried to find ways of providing general conditions for A2 to hold (even outside of survey sampling) but A1 was omnipresent. In this endeavor, I fully agree with Särndal that 1) the sample assumption A2 is flexible enough and does not require probability sampling and that 2) its implementation requires "a scientifically structured sample". So, either A2 is kept, and new designs are developed to include data from various sources, probabilistic or not, or an alternative to A2 is needed.

Now, are probability samples a hindrance to progress? I think this is the wrong question. The question is how to design statistical programs that take into account all the available data in order to enable valid inference. Perhaps further exploration of developments in other sciences, such as in physics could bring ideas to the field of survey sampling. There are other inferential frameworks such as inference to the best explanation that could be explored (Harman, 1965). Further, it could be that quantitative and qualitative methods be considered jointly as in mixed methods approaches (Poth, 2018). There is still a lot of space for further developments of how to implement A2.

5. Conclusion

I find that Särndal's paper is a great paper very worth reading. It is thought-provoking as it generates the right questions. On that note, I would like to go back to the end of his discussion of Hansen, Madow, Tepping (1978)'s paper, where Särndal wrote: "The HMT deserves careful study by anyone interested in the Foundation of Survey Sampling". I think this remains true, but I would add "and this should be accompanied by this paper by Särndal!".

So, are we living a paradigm shift in our domain? I would argue that if there is a paradigm shift, it is a methodological paradigm shift rather than a statistical one. The survey sampling theory and methods will continue to evolve and will be needed for official statistics. It seems to me that as long as inference is required, a statistical structure (be it design-based or model-based) will be needed. However, the strategies to combine the use of survey and non-survey data are beginning to depart from the traditional frame-survey-sample-estimation continuum. Thus far, various forms of administrative data have been added like salt and pepper to a main (survey) course. Nowadays and in the future, the questions are about making non-survey data of all sorts part of the main course and integrate all the information in a scientific way. There is an immense space to re-think methodologies. Perhaps more qualitative studies will be embedded into survey designs or perhaps sample designs could be altered to invest more efforts to understand and characterize

nonrespondents for example. Until there is further statistical development, I believe that the survey sampling theory will remain needed, and the shift will continue to be more methodological.

Once this is in full motion, it may become the new survey science normalcy. Will this be an evolution of the research tradition or a new paradigm? What I know is that society will gain from it and many statisticians will enjoy the journey.

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