# ON THE SIGNIFICANCE OF A SURVEY DESIGN INFORMATION SYSTEM

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## 1.0 Introduction

### 1.1 Art v. Science in Survey Design

Is the design of social surveys an art or a science? I suspect that most survey practitioners would answer that survey design requires both art and science. I certainly cannot deny that art has had, and undoubtedly will continue to have, a significant role in survey design. On the other hand, while survey research has made considerable progress in the past 30 years, it is my opinion that inadequate attention has been given to the role of science in survey design. This view is supported in part by my observation that many social surveys are designed and undertaken by individuals with no previous background or training in survey research or survey methods. This behavior suggests that the world at large does not view survey design as particularly scientific. I have emphasized this point from time to time by pointing out that many individuals behave rationally by seeking medical care or legal advice or building design or construction supervision from medical doctors, lawyers, architects and engineers respectively, but if they need to design and carry out a sample survey, they do it themselves.

While survey statisticians should be alert to the status of their profession in the minds of the general public, I am more concerned that greater recognition of the scientific aspects of survey design be achieved within the profession. I refer specifically to the need to accumulate knowledge of the factors which influence the quality of surveys much more systematically than has been true to date. We need a basis or common frame of reference for what we already know and what we need to know to improve the quality of social surveys.

Certainly there has been considerable growth in our knowledge of sampling errors and of parameter values related to sample design. Still, much of this knowledge is scattered throughout a rather diverse body of survey reports and journal literature. An interesting and important example of what can be done to produce information somewhat more systematically about sampling errors is the report on "Sampling Errors in Fertility Surveys" by Kish, Groves and Krotki. They investigated eight fertility surveys from five countries and produced estimates of means, standard errors, defts (i.e., square root of the design effect) and intracluster correlation coefficients for upwards of 25 variables for each survey for the total sample and for selected subclasses or domains.

Somewhat less is known about nonsampling errors, particularly systematic errors or sources of bias, although Technical Paper 34 of the U.S. Bureau of Census (Index to Survey Methodology Literature, 1974) provides an extensive bibliography of the nonsampling error literature. The recently published Total Survey Error by Andersen, Kasper, Frankel and Associates provides excellent data on systematic and variable nonsampling errors which occurred in a survey of health care. The survey error profiles being developed under the auspices of the Office of Federal Statistical Policy and Standards are quite useful. A significant amount of data on nonsampling errors quite likely can also be found in reports of specific surveys or of methodological studies.

To some extent, research results on nonsampling errors have been somewhat restricted or conditional in the sense that the population groups to which they apply are highly selective or the survey conditions under which they were generated tend to be different than those which usually prevail in survey practice. The latter situation occurs in part because the designs of many survey methodological studies have not been based on a total survey error model.

Total survey error models provide the necessary basis referred to above for evaluating the gaps in what is known and what needs to be known about survey errors. Survey strategies involve specification of the measurement process or design as well as the sample design. Alternate strategies should be evaluated in terms of the total error of estimate achievable at a specified level of cost. Appropriate evaluation of alternative combinations of sample designs and measurement designs requires knowledge of the different components of error in the total survey error model. Thus, knowledge of error model parameters within the context of the error and cost models appropriate to a given survey strategy provides the information essential to rational choices of future survey strategies and, hence, to improving the quality of future surveys.

If the design of social surveys is to become more scientific, then a major effort is needed, at least in my opinion, to classify and bring together systematically what is known about errors in surveys, their magnitude and how to control them in specific applications. I have recommended on several previous occasions that a Survey Design Information System (SDIS) be established to integrate what is already known about errors in survey variables and to provide guidance and direction for the systematic accumulation of the information needed to fill the gaps in our knowledge about errors in survey variables. The primary purpose of this paper is to discuss the significance of a SDIS toward improving the quality of social surveys in general and social research in particular. It is also intended to provide an introduction and justification for other papers in this session.

### 1.2 A Survey Design Information System

Briefly, a SDIS would, of necessity, be based on appropriate total survey error models and on a standardized set of definitions and terms used by social scientists and statisticians in their discussion of survey measurements, survey errors and measures of survey errors. Initially, the SDIS would contain estimates of error parameters for survey variables reported in the literature. Once established, the SDIS would be available to the survey research community in general, which in turn would contribute new data on error components and costs from

future surveys and methodological studies.

The SDIS would store information about specific variables measured in social surveys. The stored data would include (i) descriptive information about the specific survey design such as the context of the survey, the survey conditions and the type of population; (ii) details about the sample design such as the stratification, size of clusters and sample sizes; (iii) details about the measurement design such as the mode of measurement and the exact wording of questions, (iv) details about the specific error component parameters such as the sample design effect, simple response variance, response and nonresponse biases and (v) details about costs. It should be recognized that cost data require standardization if they are to be useful for choosing between alternate strategies in future surveys. It is not essential that monetary terms be used, provided a useful and complete set of inputs can be defined such as man-hours required for each type of staff.

2.0 Significance of a SDIS

2.1 Standardization of Survey Definitions

As stated earlier, a SDIS would require classification and standardization of definitions and terms used by social scientists and statisticians in the context of social surveys. Such a process can only have salutary effects on the usefulness of future survey methodological research through the common focus achieved and by easing the process whereby information, which would ordinarily have remained scattered and ineffective, can be integrated.

2.2 Standardization of Survey Measures

Various measures used in social surveys are often dictated by tradition rather than by rational choices based on measures of reliability and validity within the context of specific types of surveys, sample designs and measurement designs. The significance of a SDIS is that it would eventually provide a mass of systematically accumulated information upon which to base the choice of standardized measures. Whether standardized or not, researchers could use the SDIS to choose measures for particular surveys with some assurance that their performance would be predictable.

2.3 Integrate Knowledge of Survey Error Components

A SDIS would systematically integrate current knowledge of the different error components for particular survey measures of specific variables. The process of collecting what is currently known would eventually reveal the significant knowledge gaps about biases and other survey errors.

2.4 Improved Survey Design

A SDIS would enable the survey research community to make more rational choices among alternative survey strategies, thereby raising the overall quality of social survey data. It will be possible to compare the magnitudes of errors of estimate and components of error for specific social variables measured in a specific manner with a specific population group and sample design with those already in the SDIS. The values already in the information system serve as standards, so to speak, and hence also exert a positive influence on the quality of future surveys. Finally, a SDIS through comparison of levels of errors of estimate and of error components can reflect whether current and future theoretical developments do or do not have an effect on the quality of surveys.

2.5 Methodological Research

As suggested earlier, a considerable amount of survey methods research conducted in the past, particularly that on nonsampling errors, may not be as useful as we would like because of restrictive designs and lack of any unifying basis. A SDIS, based on total survey error models, should exert a positive influence on the design and conduct of methodological studies in the direction of a more systematic accumulation of knowledge about the magnitude of errors in social surveys.

3.0 Taxonomy Project

The Research Triangle Institute (RTI) is currently conducting a project, with National Science Foundation support, to produce a taxonomy of survey errors. The project is viewed as an intermediate step to the development of a SDIS. One of the criticisms of an early proposal to develop a SDIS was that an adequate foundation was lacking for the collection of information on survey errors and to know what the information meant. Variations in methods, terminology, and gaps in knowledge were all cited as barriers to the development of a SDIS.

The taxonomy project aims to remove some of these barriers. Specific goals of the taxonomy project are:

1. To develop a structure for the collection of data on survey errors. This would be in terms of a classification system for (1) types of survey errors, (2) measures of extent and impact of various errors, and (3) procedures for accommodating or adjusting for the errors.
2. To examine models for total survey error answering questions, such as: What types of error can be measured independently but not integrated into total error models? What types of error do overall error models treat? How can they be used in the context of total survey design?
3. To provide an assessment of the feasibility of continuing research with the aim of actually establishing the SDIS.

There are certain features of the taxonomy, in and of itself, that will make it useful whether or not a SDIS is actually established. They are:

1. At the minimum the taxonomy will be a compendium of the terminology used to describe survey errors, the models for survey error, and the major techniques for measuring these errors.
2. It will result in an evaluation of how certain techniques, terms, and models are alike and different. The evaluation of similarity is inherent in the process of classification.
3. The taxonomy will be structured so that it is useful for evaluating a survey protocol or report from a survey.

The taxonomy is only partially complete. The study was begun by dividing the body of

material to be studied in terms of four major sources of error in surveys:

1. Errors that arise from the frame
2. Errors due to sampling
3. Errors due to nonresponse
4. Errors in measurement or observation.

The work on frame errors, nonresponse errors, and measurement errors is reviewed during this session. All of the present papers are part of a first phase of review that essentially covers the major work of the past. The second phase of the work is to incorporate more recent developments and work missed in the first phase. I would like to take this opportunity to ask any person who is doing work in this area or knows of work being done to provide information about the work to RTI so that it can be included in the taxonomy.

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