

Nonsampling Error in Sample Surveys

by Clyde Tucker

I would like to thank the editors of the SRMS Newsletter for inviting me to contribute this article. What I have to say on this subject may not always agree with others. These are my own thoughts about nonsampling error, and I bear the sole responsibility for any misinterpretations.

The estimation of sampling error in a survey is relatively straightforward even in the case of a complex design. Nonsampling error is more difficult to measure because of the multitude of factors that can produce it, an underdeveloped theory, and the absence of knowledge about true values (either at the population or the individual level). Sampling error and nonsampling error are the two components of mean squared error (MSE), or the total error in the estimate of a parameter. Variance is the measure of sampling error, and nonsampling error produces the bias.

(See Nonsampling Error on p. 2)

Message from Past Chair

by Daniel Kasprzyk

One year as chair of the section passes very quickly. A number of ideas in January 2001 that had plenty of time to be more clearly defined and implemented still remain in the formulation stage. There is always too much to do and not enough time to get it all done. There is always next year! Fortunately, the section does quite well in its transition of officers from one year to the next. Our officers are active and place a premium on communicating with each other. I suspect our section does better than most as new officers become part of the SRMS Executive Committee each January.

As you know, the section is in good shape financially, largely due to the enormously successful conferences the section has sponsored over the last fifteen years. The SRMS Executive Committee has spent a great deal of time this year discussing ways in which our resources can best serve the membership. Out of these discussions, guidelines were developed to ensure that SRMS funds would be used to benefit our members and the profession. You can find these guidelines on Page 4 in this newsletter.

During the last several years, the Executive Committee has given high priority in helping assist statistics students to become active in the profession. In several instances funds have been allocated specifically to sponsor students' attendance either at the annual meeting or at special topic conferences. I am quite sure the emphasis on student support will remain important in the future.

The section has provided financial support to three conferences that will be held this year: 1) International Conference on Improving Surveys, August 25-28, 2002 (<http://www.icis.dk>); 2) International Conference on Questionnaire Development, Evaluation, and Testing Methods, November 14-17, 2002 (<http://www.jpsm.umd.edu/qdet>); and 3) International Conference on Recent Advances in Survey Sampling: a celebration of the work of J.N.K. Rao, July 10-13, 2002

(See Message from Past Chair p. 3)

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(Nonsampling Error from p. 1)

From my perspective, nonsampling errors are classified into one of three categories—**systematic measurement error**, **measurement fluctuation**, and **representation error**. The first two are measurement errors that result from giving either an incorrect response or no response at all, or from recording a correct response incorrectly. Systematic error is that part of nonsampling error that remains the same over time for an individual respondent. Measurement fluctuation refers to nonsampling errors that vary from one time to another. Representation error (only discussed here in passing) is not a function of the behaviors of either the respondents or the interviewers but, instead, occurs when units in the population are assigned incorrect sampling rates or incorrect weights. Unlike sampling error, all three categories of nonsampling error can be associated the individual sample units. This is an important distinction, because while increasing the sample size will reduce sampling error, it has no effect on nonsampling error. Thus, for large sample surveys, nonsampling error is likely to be the major component of MSE.

Associated error is that part of systematic error that is correlated with the true value. The remaining portion of systematic error, what I call **differential error**, is associated with other enduring characteristics of the respondent or the survey procedures. One particular form of associated error is referred to by Hansen, Hurwitz, and Pritzker (1967) as **relevancy error**. It is sometimes called specification error. This error occurs when a theoretical concept and its operationalization are not isomorphic. For example, a researcher might want to measure total hours worked but asks for only hours paid.

When measurement fluctuations appear completely at random, they are what Hansen, Hurwitz, and Madow (1953) refer to as **compensating errors**. They show that compensating errors do not affect the population estimate and are properly accounted for in the variance term of MSE. When these errors do not occur at random, such as when they are associated with the particular interviewer, they are termed **noncompensating errors**. When noncompensating errors are present, errors are correlated across individuals, and sampling error is underestimated. For a single administration of a survey, these errors could contribute to bias.

I now turn to nonsampling errors arising from nonresponse. These errors could contribute either to systematic error or measurement fluctuation. To understand the contribution of nonresponse to nonsampling error we must focus on nonresponse at the item level. Of course, unit nonresponse results in nonresponse for all items in a specific record. For situations in which a respondent answers some items but not

all, the item nonresponse can come in two forms—**intermittent nonresponse and partial nonresponse**. In the first case, nonresponse is scattered throughout the interview. In the second, the interview is terminated prematurely, and no further questions are answered. All three forms of nonresponse (unit, intermittent and partial) are likely to have different causes, and their contributions to nonsampling error in a particular item can be different. When unit nonresponse is present, the pattern of errors could be different for refusals and noncontacts (See Groves and Couper 1998.)

In order to link nonresponse to the nonsampling error in a given variable, I make the following assertions:

1. When nonresponse appears in an item, measurement error obtained from the use of any nonresponse adjustment technique is likely to be greater than it would be if the response had been present.
2. Measurement error (whether from response or nonresponse) will be most serious for difficult or sensitive items. When nonresponse occurs in these items, it is likely to be correlated error and, thus, nonignorable.
3. The amount of nonsampling error resulting from imputation will be directly related to the range of possible values and the frequency of their occurrence.

First, it is reasonable to assume that the error in an actual response usually will be less than one produced by some adjustment technique. By the way, the nonsampling error is likely to be greater when the respondent has answered few or no questions, because there is little information upon which to condition. In the case of difficult or sensitive items, respondents will be more likely to make mistakes or give false answers. These items also will be subject to more item nonresponse, adding to the measurement error problems.

More measurement error will occur in items with a wide range of values, especially when the frequencies are relatively uniform. This situation is most likely to arise when the item has little relationship to the characteristics used in models for imputation. It also is probably true that in data adjustment cells with the largest number of missing values, the distribution of values for the nonrespondents are not likely to correspond to the respondents' distribution, because the respondents have a greater chance of being unrepresentative. Thus, nonresponse in this case could be nonignorable.

The first challenge in the study of nonsampling errors is to develop ways of measuring the different types of errors (as described above) that result either from response or

nonresponse. This will require a great deal of creativity from survey methodologists. Without these measures, the causes of the errors cannot be determined. These causes consist of either enduring or transient characteristics arising from the physical, social, and psychological dynamics of the survey situation. The importance of each of the causal variables can be determined using models that estimate the amount of variance in the nonsampling errors explained by each cause.

References

Groves, R.M. and Couper, M.P. (1998). *Nonresponse in Household Interview Surveys*, New York: John Wiley.

Hansen, M.H., Hurwitz, W.N., and Madow, W.G. (1953). *Sample Survey Methods and Theory*, Vol. II, New York: John Wiley.

Hansen, M.H., Hurwitz, W.N., and Pritzker, I. (1967). "Standardization Procedures for the Evaluation of Data: Measurement Errors and Statistical Standards in the Bureau of the Census," *Proceedings of the 36th Session of the International Statistical Institute*, 13, Book I, 46-66.*



(Message from Past Chair from p. 1)

(<http://lrsp.carleton.ca/conferences/icrass-rao/>). Take some time and find out more about each conference as each promises to have a very good program.

Thanks to the members of the SRMS Executive Committee for the good work and good counsel offered this year. In particular for our membership, I thank Jim Lepkowski, who organized the 2001 SRMS program, and Pat Cantwell, who organized the SRMS luncheon round tables. Thank you for the privilege of serving as chair of the section. As many of you know, one of the benefits of working for the section is the good fortune of getting to know colleagues whom you might never have had a chance to meet through your own day-to-day work. I wish Lars Lyberg, the next SRMS Chair, well in next year's program and activities.*



Section News



Education Officer

At its meeting on August 5, 2001, the Executive Committee of the Section on Survey Research Methods agreed to draft a change in the charter to allow an additional member of the Executive Committee, an Education Officer, whose term of office would be two years.

The SRMS Board felt that Continuing Education is an important aspect of the mission of the Section and that it was very important to have a formal link between the Section and the ASA education program staff and that link be represented by a member of the SRMS Executive Committee. An amendment to the charter will be put forth for a vote in the 2002 election.

The duties of the education officer include the following:

- ◆ Serves as a member of the SRMS Executive Committee.
- ◆ Attends the SRMS Executive Committee meetings and the section's annual business meeting.
- ◆ Serves as SRMS liaison to the ASA Advisory Committee on Continuing Education, the center for continuing education, including the K-12 curriculum initiative, the statistics teacher network, the undergraduate statistics education initiative, and careers in statistics activities.
- ◆ On behalf of SRMS, solicits instructors for short courses and introductory lectures, national speakers for the ASA national speakers program, and instructors for LEARNSTAT continuing education programs.
- ◆ Coordinates short course and introductory lecture schedules at the annual meeting with the SRMS program chair.
- ◆ Sends copies of all section-related correspondence to the section secretary.
- ◆ Serves as the section's representative on association committees concerned with education.
- ◆ Transmits to the incoming officer any material that will ensure an orderly transition and provide assistance as needed.
- ◆ Updates this description of duties as needed.*

SRMS's Policy for Funding

by Lars Lyberg

The SRMS Board should use the following criteria for spending initiatives. To be eligible for funding, a spending initiative should satisfy at least two of the criteria. It should be pointed out that eligibility is a necessary but not sufficient condition for actual spending.

Criterion 1: Spending initiative generates a product that provides tangible benefits to SRMS members. Examples of benefits are consolidation or expansion of the survey research literature, revenues, materials, or discounts.

Criterion 2: Spending initiative provides substantive (positive) visibility for SRMS in the U.S. or abroad.

Criterion 3: Spending initiative promotes increased participation of survey professionals and/or provides encouragement for a non-survey professional to enter into the profession of survey research.*

Changes to the Section Officers

The following reflects the changes to the Section Officers:

A warm welcome to new officers: S. Lynne Stokes (Chair-Elect), Howard R. Hogan (Program Chair-Elect), Leyla Mohadjer (Secretary), and Anthony An (Assistant Editor Amstat Online).

A big thank you to the following past-officers for their contributions to SRMS: Dan Kasprzyk (Chair), Brenda G. Cox (Past Chair), James M. Lepkowski (Program Chair), Elizabeth Zell (Secretary), and Sharon Lohr (Assistant Editor Amstat Online).

Good luck to the current officers in their new positions: Lars Lyberg (Chair) and Patrick J. Cantwell (Program Chair).*

AmStat Online

by Sharon Lohr, Assistant Editor, AmStat Online

My term as Assistant Editor ends in December 2001. In January 2002, the new Assistant Editor who will be in charge of the SRMS web page (<http://www.amstat.org/sections/srms/>) is Dr. Anthony An from the SAS Institute. His e-mail address is Anthony.An@sas.com; please send

your future news items, comments, and suggestions for the web site to him.

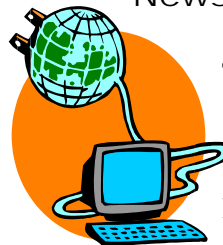
Thank you to all the SRMS members who contributed to the web page and gave helpful suggestions and moral support during the last three years. The web site is an important outreach of SRMS, and its success is largely due to your contributions.*

Domain Name Not Renewed

For several years discussions have taken place concerning the domain name Surveyresearchmethods.org and the feeling is that: 1) the domain name is too long and is not easy to use, remember, or advertise; and 2) the ASA web site has been improving access to the section's pages.

The original reason for having another domain name was that it was hard to find our section through the ASA page. The reorganization of Amstat Online has taken care of this problem. So the domain name we have been holding for a few years has been abandoned.*

Newsletter on the Web



This newsletter and past SRMS newsletters can be read on the web. The address for the Survey Research Methods Section web site is <http://www.amstat.org/sections/srms/>.*

SRMSNET News

The SRMSNET Listserv list has been moved. All postings should now be sent to:

SRMSNET@listserv.umd.edu
(NOT SRMSNET@umdd.umd.edu)

To subscribe to SRMSNET, send a message to listserv@listserv.umd.edu and in the body of the message, type 'subscribe SRMSNET *your name*'. Please remember that if you click on 'reply', your answer will go out to everyone on the SRMSNET, so be sure to direct personal replies to the sender's own e-mail address.

To unsubscribe, in your message to listserv@listserv.umd.edu, type in the body of the message 'unsubscribe SRMSNET'.

SRMSNET offers people the chance to ask questions or submit announcements relating to survey methods to a group of users through the use of e-mail. Some recent messages included an announcement for the International Conference on Improving Surveys—ICIS 2002 Copenhagen, August 25-28, 2002; a discussion of a model to explain/predict use of health services; and a general request for good examples of some bad surveys.*

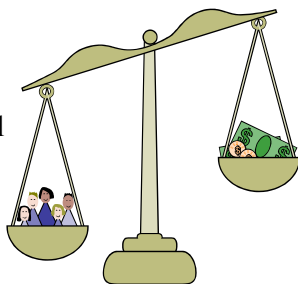


Executive Committee Reports

Treasurer's Report

by Sarah Nusser

The Executive Committee met in August at the Joint Statistical Meetings to consider several spending requests. In response to the increased volume of such requests to the Section, we decided to establish screening criteria for evaluating each request. This fall the Executive Committee evaluated the initiatives using the new criteria (printed on Page 4 of the newsletter).



Three requests were funded. The Executive Committee approved a request from Hans Bay to provide funding for the International Conference on Improving Surveys (ICIS), being held in Copenhagen in August 2002. We agreed to contribute \$2,500 in general support and \$1,500 in student travel support for the conference.

The Executive Committee voted in favor of supporting the International Association for Survey Statisticians (IASS) Jubilee Volume, a request proposed by IASS President Kirk Wolter. We agreed to provide \$2,000 in support of the IASS volume, with the understanding that SRMS members would receive a discount of 50% on the price of the volume for up to 200 volumes.

Finally, travel support was approved for survey professionals to attend the 2002 Joint Statistical Meetings, proposed by SRMS Program Chair Pat Cantwell. This will be dealt with on a case-by-case basis, and represents a first step in

developing a travel support program for resource-limited students, faculty and professionals in survey sampling from the U.S. and abroad.

One of the topics that will be discussed at the winter Executive Committee meeting is the archiving of past SRMS proceedings onto CDs or other media. Strong support for this initiative was expressed at the open meeting in August. Bill Kalsbeek and Al Tupek are researching options and there is some indication that the project will require a substantial expenditure. This may help us spend down our current balance of \$125,000 in a manner that serves to benefit our membership and the survey profession as a whole.*

Publications Officer's Report

by Al Tupek

Consider purchasing a copy of the 2001 JSM proceedings on CD-ROM that will include the excellent papers sponsored by the Survey Research Methods Section. The Section's proceedings will also include some excellent survey methodology papers presented at the JSM that we did not sponsor but agreed to include. These papers were sponsored by committees and other organizations that do not have their own proceedings. We also accepted a number of survey methodology papers presented at the 2001 meetings of the Association of Public Opinion Research.

I want to thank Sharon Lohr for serving as editor of the Section's web site and for doing an excellent job in developing, maintaining, and enhancing the site. Tony An has agreed to take over that role in January 2002. I know that Tony has some ideas to make the site even more useful to the Section members. I'm sure he would welcome your suggestions. Please E-mail him at anthony.an@sas.com.

The Section has submitted a couple of articles that were included in *Amstat News* this year. I would like to see more next year. If you have ideas for articles that are related to the Survey Research Methods Section that would be of interest to the broader ASA audience please let me know. The best way to reach me is by E-mail at atupek@bellatlantic.net.

At the business meeting in August the Section made a commitment to provide electronic SRMS proceedings for previous JSM meetings. Most other sections aren't providing this service so we'll be doing it on our own. We plan to provide access to the proceedings on the Section's web site www.amstat.org/sections/srms, most likely through Adobe Acrobat. We are still working on this, so let me know if you know of any economical approaches to getting this accomplished.*

Report from Program Chair

by Pat Cantwell

Does it seem as if we just left Atlanta? Well, it's time to start thinking about the upcoming Joint Statistical Meetings in New York City, August 11-15, 2002. In the Survey Research Methods Section, we have already put together an interesting program of invited paper sessions. The sessions will cover such diverse topics as:

- ◆ Mobile computing for survey data collection;
- ◆ Alternatives to ordinary sampling weights in survey sampling practice;
- ◆ Applications of psychometric methods for survey data analysis;
- ◆ Research findings from the Centers for Excellence in Health Statistics; and
- ◆ The decision on census adjustment: one year later.

Howard Hogan, the SRMS Program Chair for the 2003 JSM, is busy assembling a well-balanced slate of roundtable luncheons for New York. You'll find more information about the 2002 SRMS program and roundtables in the *Amstat News* in coming months.

Meanwhile, I encourage you to plan ahead for the meetings. In the November issue of *Amstat News*, Nat Schenker, the JSM 2002 Program Chair, provided guidelines for Topic Contributed and Regular Contributed paper sessions. Most important is the deadline for submitting abstracts, February 1, 2002.

Anyone can organize a Topic Contributed paper session or panel. Such a paper session has five 20-minute presentations (paper presentations or discussions) on a topic specified by the organizer. A Topic Contributed panel has three to five panelists speaking on a specific topic. The advantages of a Topic Contributed paper session, compared to a Regular Contributed paper session, are i) typically, a more cohesive session; and ii) the increased presentation time (20 minutes, rather than 15, per speaker).

Please note that the JSM participation rules limit each participant to only *one* of the following activities: presenting an invited paper; presenting a Regular or Topic Contributed paper; presenting a contributed poster; or serving as a discussant, panelist, or other type of presenter in an Invited or Topic Contributed session. In addition, the participant may chair a session, present an Invited Technical Exhibit, present an Introductory Overview Lecture, teach a short

course or workshop for the Continuing Education Program, lead a roundtable luncheon, speak at a speaker luncheon, and/or be a presenter in a first-time invited memorial session.

* If you're interested in organizing a Topic Contributed session in survey research methods, please contact me at patrick.j.cantwell@census.gov. Instructions and abstract forms can be found on the ASA web site at <http://www.amstat.org/meetings/jsm/2002>.

* I am also developing a list of people who plan to attend the JSM and would like to chair a session. This will help us prepare the overall program of SRMS sessions. Of course, I will avoid conflicts with your participation in other sessions. If you can help, please send me a message as soon as possible. Thanks.

We're looking forward to a great time and a strong program in New York City. We hope to see you there as an active participant.*

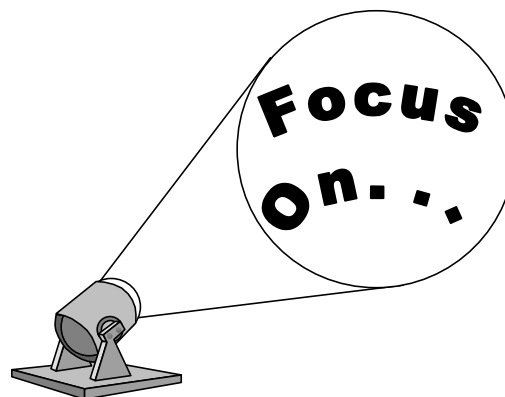
Summary Notes from the SRMS Executive Committee Meeting

The Survey Research Method Section (SRMS) met at 11:35 a.m. on Sunday, August 5, 2001 at the Joint Statistical Meetings in Atlanta, Georgia. The minutes taken by Elizabeth Zell (SRMS secretary) were summarized by the editors for the newsletter. Items discussed elsewhere in the newsletter are not mentioned below.

- ◆ **New Officers and Appointments.** Dan Kasprzyk reported that Pat Dean Brick will work with Irene Hess as the section historians.
- ◆ **Treasurer's Report.** Sarah Nusser provided a report on the current fiscal status of the SRM section. There was a large increase in our balance sheet due to the proceeds from the International Conference on Establishment Surveys-II (ICES II). There is concern on ASA's part about the size of the budget. ASA would like for sections to keep the balance to two times operating costs.
- ◆ **Each February the program chairs from the different sections meet in Washington to pull together the final agenda for the JSM.** The Biometrics Section and SRMS are the largest sections which include the largest number of sessions to organize. ASA has suggested and offered financial support for two members from SRMS to participate in this activity. Dan Kasprzyk requested that

Howard Hogan attend as the second person in his role as Program Chair-Elect.

- ◆ SRMS will sponsor in 2002 a one-day Introduction to Sampling course offered by Sharon Lohr based upon her book.
- ◆ The poor showing SRMS has in the continuing education area given the size of our section was discussed.
- ◆ Funding Requests. SRMS has received a number of requests for funds. Before moving forward with approval or disapproval, it was felt that uniform criteria consistent with the mission of the section needed to be established for awarding funds. It was felt that the criteria needed to reflect the SRMS mission and the SRMS Charter would be consulted in developing the criteria. (See Page 4 of this newsletter for the new funding criteria.)
- ◆ Service Oriented Activities. Sarah Nusser, Pat Cantwell, and Dan Kasprzyk have put together some possible service oriented activities for consideration. Funds and committees would be needed to move forward with these activities.
- ◆ Innovation in Survey Research Award. A previous SRMS board under the leadership of Bob Groves voted to establish this award. It is to recognize an individual for innovative work in survey methods. A plaque and \$200 (subject to modification) will be awarded to the individual. This committee is in need of a chair and committee members. The award should be made annually, when appropriate.
- ◆ Updated SRMS Activities Flier. Wendy Alvey has once again updated our activities flier. She has done this annually since its creation. The SRMS board wishes to extend a thank you to Wendy for a job well done.
- ◆ Creation of an SRMS Chair's Award. The SRMS board felt that often individuals provide service to our section. It was felt that these individuals should be awarded an acknowledgement of the SRMS board's appreciation. Beginning in 2002, the SRMS Chair's Award will be given at the Chair's discretion to one or more persons for outstanding service to the section.*



Standing Committee Report

SRMS Fellows Committee Report

by Mary Mulry

The SRMS Fellows Committee is pursuing its charter of identifying SRMS members who deserve to be nominated for ASA Fellow and finding nominators for them. The goal of the Committee is to assure that outstanding members of SRMS are not somehow overlooked. Most years there are four or five nominations that the SRMS Committee initiates. Often nominations of SRMS members come from sources other than the SRMS Committee.

This year's SRMS Committee met at the Joint Statistical Meetings and is continuing to deliberate by E-mail. The Committee members are Paul Biemer, Don Dillman, Mary Mulry (chair), Chris Skinner, Lynne Stokes, and Clyde Tucker.

The deadline for submitting nomination packages to the ASA Fellows Committee, who selects the new ASA Fellows, is March 1, 2002. The guidelines and procedures for ASA Fellow nominations may be found on the ASA web site at www.amstat.org/fellows.*





2001 JSM Program Notes

by Jim Lepkowski, Program Chair

The 2001 program wrapped up in August, and already the 2002 program is taking shape. As is the case in every meeting, there were many excellent presentations and well organized sessions throughout the meeting. The SRMS members themselves are responsible for the quality of the presentations and sessions.

The 2001 sessions went, for the most part, relatively smoothly, with a few problems in some sessions.

A couple of sessions had inadequate seating. There is little historical information available on session attendance, which makes it difficult for program chairs to specify room size in advance. Every seat was taken in one session on web survey design, and the overflow crowd stood in the hallway trying to hear the presentations from outside the room. In order to collect more complete data on attendance, I visited almost every session and counted attendees during the first or second paper. I'm passing these counts on to Pat Cantwell, our Program Chair-Elect responsible for the 2002 program in New York, and hope we can predict session size better for the New York meeting.

We had a few other problems that we've asked the Association staff to prevent at future meetings. Doors were propped open between sessions to allow easy access, but once a session began doors were typically closed. Unfortunately, at several sessions the outside door handles were locked. The rooms had to be opened from the inside by those attending the session when others tried to enter the room. Hotel staff eventually came and unlocked door handles.

A problem of increasing frequency was discussed at the Executive Committee meeting at Atlanta: how to handle computer-based presentations, such as those that used

PowerPoint. There were a few sessions where several speakers had laptops and presentations stored on the hard drives of their laptops. The rooms were equipped with only one projector. It was time consuming to disconnect a laptop and connect another between papers.

Session chairs for New York will be asked to add an item to their session preparation checklist: ask all speakers if they plan a computer-based presentation. If so, the chair will be sure that one of the speakers brings a laptop to connect to a projector in the room, and that speakers send presentation materials in advance by E-mail or bring them to the session on diskette to be loaded onto the laptop to be used in the session.

We look forward to seeing you in New York in August, where we hope to continue to make improvements in SRMS sessions.*

Statistics Canada's Quality Conference

October 16-19, 2001

by Stuart Pursey

Statistics Canada held its 18th International Symposium on Methodological Issues on October 16-19, 2001: Symposium 2001: Achieving Data Quality in a Statistical Organization - a Methodological Perspective. The symposium was held in Canada's national capital, nestled from the north by the spectacular fall colors of the Gatineau Hills.

There were 562 people that attended the symposium from 21 countries stretching from Taiwan, New Zealand and Australia in the Southeast to Finland, Scotland, and Sweden in the Northwest. Sixty-two organizations were represented including many statistical agencies from around the world.

On Tuesday the symposium began with three workshops: "Nonsampling Errors" by Clyde Tucker of the Bureau of Labor Statistics, "An Overview of Statistical Quality Control used in a Statistical Agency" by Walter Mudryk of Statistics Canada, and "Continuous Quality Improvement in a Statistical Organization" by David Marker and David Morganstein of Westat. All the three workshops were filled to capacity.

Then on Wednesday morning David Binder of Statistics Canada opened formally the Symposium 2001. Dennis Trewin, Chief Statistician of the Australian Bureau of Statistics presented the Key Note Address: "The Importance of a Quality Culture."

Over the three days, there were 83 presentations covering many data quality issues. Examples included: large and complex surveys, electronic data reporting, small area data, administrative data, generalized methods, census methods, quality of hospital morbidity data, business surveys, building quality, correcting for nonresponse, statistical disclosure control, and communicating quality. Of particular interest to many of the participants were two sessions: "Remembering Leslie Kish" and "In Honor of Jon N. K. Rao." The excellent presentations in these sessions provided an invaluable opportunity for younger statisticians to become familiar with the contributions of these two statisticians and as well to hear many enjoyable anecdotes about their lives and careers.

On Wednesday evening there was a wine and cheese get-together with music provided by a musical quartet from the local l'École secondaire de La Salle. On Thursday evening there were tours of the National Gallery of Canada, the Canadian Parliament, and the Museum of Civilization. Many of the international visitors attended these tours while others gravitated toward the Ottawa Senators' NHL hockey game against the Pittsburgh Penguins.

The symposium came to a close on Friday with a Panel Discussion: "How Important is Accuracy" by Gordon Brackstone, Statistics Canada; Graham Kalton of Westat; and Fritz Scheuren of NORC followed by a spirited question, answer and comment period.

The Organizing Committee—Simon Cheung (Chair), Denis Lemire, Guy Laflamme, Jacky Mayda, Stuart Pursey, Martin Renaud of Statistics Canada—wishes to thank the many people who helped during the organization of the symposium and most especially the participants who came to Ottawa during a period of uncertainty and difficulty for traveling.*

FCSM Research Conference

Arlington, Virginia, November 14-16, 2001

by Steve Cohen

The Federal Committee on Statistical Methodology (FCSM) Research Conference was held on November 14-16, 2001 at the Key Bridge Marriott in Arlington, Virginia. The conference featured addresses by Stephen Fienberg of Carnegie Mellon University on "The Interplay Between Research Innovation and Federal Statistical Practice," and Kenneth Prewitt of The New School on "Federal Statistics: The 'Right' Balance Between Accountability and Autonomy."

There were 61 technical papers covering a wide range of statistical and cognitive issues. Contributed papers and technical demonstration sessions provided platforms for discussion and exchange of a wide range of current research and methodological topics relevant to Federal government statistical programs. In addition to the Federal statistical agencies, papers were presented by researchers from universities, research firms and four foreign statistical agencies.

The conference papers can be found under Events and Activities at www.fesm.gov.*



We welcome announcements from SRMS members that are of general interest to survey research professionals. Contact the editors at LeslieWallace@Westat.com or TomKrenzke@Westat.com.

This newsletter was formatted by Angelia Murphy and printed by Laurie Logan. The editors wish to thank Angelia and Laurie for their contributions to the newsletter.*



International Conference on Recent Advances in Survey Sampling

Carleton University in Ottawa, Ontario, Canada

July 10 to 13, 2002

Sponsored by the Laboratory for Research in Statistics and Probability of Carleton University, and supported in part by grants from the Survey Research Methods Section, The Fields Institute for Research in Mathematical Sciences, and Statistics Canada. The conference is in honor of the work of Professor J.N.K. Rao and will celebrate Professor Rao's 65th birthday, which falls on May 16 of that year. The conference

will cover topics related to Professor Rao's wide-ranging research interests, particularly his interest in a broad spectrum of sampling topics. The sessions scheduled to date include sample surveys, biostatistics, time series, and statistical inference.

For a brief biography on Professor Rao, please see the July 2001 newsletter. The current list of speakers is as follows:

| | |
|------------------------|--------------------------|
| M. Alvo (Canada) | D. Pfeffermann (Israel) |
| M. Bankier (Canada) | N.G.N. Prasad (Canada) |
| D. Bellhouse (Canada) | D. Raghavarao (USA) |
| D. Binder (Canada) | J.S. Rao (USA) |
| D. Brillinger (USA) | P.S.R.S. Rao (USA) |
| Y.P. Chaubey (Canada) | L.-P. Rivest (Canada) |
| G. Datta (USA) | G. Roberts (Canada) |
| D.A. Dawson (Canada) | A.K.Md.E. Saleh (Canada) |
| J. Eltinge (USA) | A.J. Scott (New Zealand) |
| R. Fay (USA) | J. Sedransk (USA) |
| W. Fuller (USA) | J. Shao (USA) |
| J.L. Gastwirth (USA) | A.C. Singh (USA) |
| M. Ghosh (USA) | M.P. Singh (Canada) |
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For further information on the conference, please visit our web page: <http://www.lrsp.carleton.ca/conferences/icrass-rao/> or contact:

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International Conference on Improving Surveys

Copenhagen, Denmark

August 25-28, 2002

The International Conference on Improving Surveys (ICIS) has four main themes: the effect of new technologies on surveys, improving quality of surveys, improving international comparisons, and combining surveys and administrative registers. Keynote speakers will be Mick Couper, University of Michigan; David Marker, Westat; Vijay Verma, ORC Macro; and Eva Elvers, Statistics Sweden. Bob Groves, University of Michigan, will provide concluding remarks.

Anticipated topics include the effect of mobile phones on telephone surveys; web and E-mail surveys; collecting sensitive data; efficient survey designs; effects of nonresponse; developing international standards; lessons learned from recent international assessments; standardizing concepts versus questionnaire wording; requirements for metadata; and recent harmonization efforts. The conference is co-sponsored by SFI-Survey (Denmark), ASA/SRMS, IASS, Eurostat, SAS Institute, and the Danish Society for Theoretical Statistics. For more information contact Hans Bay, Director SFI-Survey, at hb@sfi.dk or check the conference web site at www.icis.dk. A number of full-day and half-day short courses will be presented before and after the ICIS.

International Conference on Questionnaire Development, Evaluation, and Testing Methods (QDET)

Radisson Hotel Charleston, Charleston, South Carolina

November 14-17, 2002

The goals of the first international conference devoted to the methods used for questionnaire development, evaluation, and testing are to bring together researchers and survey practitioners working in this area, to stimulate research papers that contribute to the science of reducing measurement error through questionnaire evaluation, to provide documentation of the current practices, and to stimulate new ideas for future practices. Both invited and contributed sessions are planned. An integrated volume representing the theoretical, methodological, and statistical contributions to the field will be produced after the conference. This conference is sponsored by ASA/SRM, AAPOR, IASS, CASRO, and CMOR. Conference

preregistration will open in Spring 2002. For more information please visit the conference web site at: www.jpsm.umd.edu/qdet or contact Jennifer Rothgeb, Organizing Committee Chair, U.S. Census Bureau, FB4-Rm. 3125, Washington, D.C. 20233; E-mail: jennifer.m.rothgeb@census.gov.*



Awards



2001 Bryant Scholarship Award Winner

New Applicants Sought for 2002

Congratulations to Amang S. Sukasih, from Texas A&M University, the recipient of the 2001 Edward C. Bryant Scholarship Award.

Each year an outstanding graduate student in Survey Statistics is awarded the Edward C. Bryant Scholarship to help support the student's graduate education. Applications for the 2002 award are now being accepted.

Westat established the Edward C. Bryant Scholarship Trust Fund in 1995 to honor its co-founder and long-time leader. Under Dr. Bryant's leadership, Westat, an employee-owned statistical firm established in 1961, grew into what is now one of the world's leading statistical research firms with a full-time permanent staff of 1,200. Selection of the scholarship recipient is made by the ASA Bryant Scholarship Award Committee. The selection criteria includes potential to contribute to survey statistics, applied experience in survey statistics, and performance in graduate school. The award consists of a certificate and a \$1,500.00 cash prize.

The 2002 winner will be presented at the Presidential Address at the JSM in New York. For more information about the 2002 scholarship including an application, see www.amstat.org/awards/bryant.html. An additional contact is Jean Opsomer, the Committee Chair at jopsomer@iastate.edu or (515) 294-0212. Applications and letters of recommendation must be received by April 30, 2002 for consideration.*

Waksberg Invited Paper Series

Survey Methodology has established an annual invited paper series in honor of Joseph Waksberg, who has made many important contributions to survey methodology. Each year, as part of the Waksberg Invited Paper Series, a prominent survey researcher will be chosen to author a paper that will review the development and current state of a significant topic within the field of survey methodology, and will reflect the mixture of theory and practice that characterizes Waksberg's work. The author receives a cash award made possible by a grant from Westat, in recognition of Joe Waksberg's contributions during his many years of association with Westat. The grant is administered financially by the American Statistical Association. The author is selected by a four-person committee appointed by *Survey Methodology* and the American Statistical Association.

The author of the second paper in the series is Wayne Fuller, Emeritus Distinguished Professor at Iowa State University. His paper, "Regression Estimation for Survey Samples" will appear in the June 2002 issue of *Survey Methodology*.

The author of the first paper in the series was Gad Nathan, whose paper "Telesurvey Methodologies for Household Surveys—A Review and Some Thoughts for the Future" appeared in the June 2001 issue of *Survey Methodology*.*



Statistical Policy Working Papers

There are two new reports issued by the Federal Committee on Statistical Methodology through the Office of Management and Budget's Statistical Policy Office:

- ◆ Statistical Policy Working Paper 31: Measuring and Reporting Sources of Error in Surveys; and

- ◆ Statistical Policy Working Paper 32: Seminar on the Funding Opportunity in Survey Research.

These are available through the Statistical Policy Office, Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Room 10201, Washington, DC 20503.

Past issues of the Statistical Policy Working Paper Series are available on the web—<http://www.fcsm.gov>.*

Electronic Access to ASA Journals Now Available

The ASA is pleased to announce the offering of Electronic Access to six of its most popular journals: *Journal of the American Statistical Association* (JASA), *The American Statistician* (TAS), *Journal of Business and Economic Statistics* (JBES), *Journal of Computational and Graphical Statistics* (JCGS), *Journal of Agricultural, Biological, and Environmental Statistics* (JABES), and *Technometrics*.

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The Fascinating Story of PPS Sampling

by Sameena Salvucci and Dhiren Ghosh,
Synectics for Management Decisions, Inc.

The stability of the relative frequency of chance events has been well recognized for a long time as demonstrated by the classical definition of probability. In estimating demographic populations the stability of population based ratios was recognized by Laplace at the end of the 18th century.

In sampling for estimating the total crop yield in the 1930's, Mahalanobis used the size of a farm as an auxiliary variable in developing a ratio estimate. He recognized the possibility of bias in the ratio estimate if the crop yield per unit area was different for smaller farms compared to larger farms. This prompted him to suggest the use of sampling the farms with probability proportional to size to eliminate bias. Intuitively, this is equivalent to viewing each farm as consisting of a number of subunits of equal size from which a subunit is selected at random from the population of all subunits.

Hansen and Hurwitz worked out the theory of *sampling with probability proportional to size (pps)* in the early 1940's. However, their theory worked well if the selection of units was with replacement or only one unit was selected in a stratum. In the fifties, several authors (Yates, Des Raj, Brewer, and Sen) worked out the theory of sampling without replacement but the computation was really messy when the sample size was 3 or more.

Around the same time, Horvitz and Thompson demonstrated that the inclusion probability of any unit in the sample is the key element rather than the selection probability and this inclusion probability was represented by π and this gave rise to π ps sampling theory.

The pps selection schemes in the 1940's involved accumulating the sizes of the units and even with primitive computers, the workload was heavy and prone to errors. In the early 1950's, Lahiri recognized that pps selection really amounted to selecting a point at random from a series of bars in a histogram each of which represent a unit with size equal to the height of the bar. This selection would involve a two step process. The first step would be to select a bar randomly from the histogram and the second step would be to select a number at random less than or equal to the height of the tallest bar in the histogram. If this second number is smaller than or equal to the height of the bar selected in the first step then that unit is selected. Otherwise, repeat the two step process. In other words, this process is like throwing a dart at a shaded area on a board and can be used to select more than

one unit. Waksberg's method of selecting telephone households by random digit dialing uses the same principle.

Lahiri, however, was trying to solve the problem of developing an unbiased ratio estimate. If the total size of the selected units is proportional to the probability of inclusion of the units, he argued, the regular ratio estimate would be unbiased (You guessed it right! He worked in Mahalanobis' Institute). However, he could not solve the problem. Soon Midzuno solved this problem with a nifty approach, i.e. to select the first unit with pps and the remaining units with simple random sampling.

In the early 60's, Rao, Hartley, and Cochran extended the sampling without replacement theory further by forming random groups and selecting one unit from each group. Brewer & Hanif list more than 30 pps and π ps sampling techniques. Madow's earlier suggestion of marrying systematic sampling with pps methods was also implemented in the 1960's.

Poisson sampling, a generalization of Bernoulli sampling, provides a simple solution to the complex problem of deriving estimates of population parameters and their variances for large sample sizes using pps sampling. Poisson sampling involves drawing each unit with the desired probability of inclusion independently resulting in simplified computations for estimates of population parameters and their variances. The fly in the ointment is that this form of sampling can result in a sample of any size ranging from 0 to the size of the whole population. This lack of control of the size of the sample selected is a major drawback. Hajek's *rejective sampling* theory produces a sample using Poisson sampling but rejects it if the sample size is different from the desired sample size. This process is repeated until a sample of the desired size is selected.

With current day computing power this approach is feasible for small frames, but the simple theory of Poisson sampling no longer applies since the units are no longer selected independently. Presently, there is renewed interest in this approach.

References

Brewer, K.W.R. (1963). "A model of systematic sampling with unequal probabilities." *Austral. Jour. Stat.* 5, pp. 5-13.

Brewer, K.R.W. & Hanif, M. (1983). *Sampling with unequal probabilities*. Lecture notes in Statistics, No. 15, Springer Verlag, New York.

Des Raj (1954). "On sampling probabilities proportional to size." *Ganita* 52, pp. 175-182.

Hájek, J. (1964). "Asymptotic theory of rejective sampling with varying probabilities from a finite population." *Ann. Math. Stat.* 35, pp. 1491-1523.

Hansen, M.H. and Hurwitz, W.N. (1943). "On the theory of sampling from finite populations." *Ann. Math. Stat* 14, pp. 333-382.

Horvitz, D.G. and Thompson, D.J. (1952). "A generalization of sampling without replacement from a finite universe." *Jour. Amer. Stat. Assoc.* 47, pp. 663-685.

Lahiri, D.B. (1951). "A method of sample selection providing unbiased ratio estimate." *Bull. Int. Stat. Inst.* 33, pp. 133-140.

Madow, W.G. (1949). "On the theory of systematic sampling II." *Ann. Math. Stat.* 20, pp. 333-354.

Mahalanobis, P.C. (1940). "A sample survey of the acreage under Jute in Bengal." *Sankhya* 4, pp. 511-530.

Midzuno, H. (1952). "On the sampling systems with probabilities proportional to sums of sizes." *Ann. Inst. Stat. Math.* 3, pp. 99-107.

Rao, J.N.K., Hartley, H.O., and Cochran W.G. (1962). "A simple procedure of unequal probability sampling without replacement." *Jour. Roy. Stat. Soc. B24*, pp. 482-491.

Sen, A.R. (1953). "On the estimate of variance in sampling with varying probabilities." *Jour. Ind. Soc. Agric. Stat* 5, pp. 119-127.

Waksberg, J. (1978). "Sampling methods for random digit dialing." *Jour. Amer. Stat. Assoc.* 73, pp. 40-46.

Yates, F. and Grundy, P.M. (1953). "Selection without replacement from within strata with probability proportional to size." *Jour. Roy. Stat. Soc. B15*, pp. 253-266.*



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Anthony An is a Senior Research Statistician in the Linear Models Research Department at SAS Institute and is the author of several SAS procedures for survey data analysis. He received a Ph.D. in statistics from Iowa State University. His areas of interest include survey data analysis, nonresponse in survey sampling, regression analysis, statistical computing, and genetic statistics.

Howard Hogan is Chief of the Decennial Statistical Studies Division at the U.S. Census Bureau. He has been responsible for the statistical design of the 2000 census including statistical quality control, coverage improvement and content sampling. He has been responsible for the undercount adjustment survey known as the Accuracy and Coverage Evaluation. He worked on the 1980, 1990 and 2000 U.S. Censuses and has worked with the Census in England, India, Morocco, and Tanzania. He was Assistant

(See Executive Committee Bios on p. 15)

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(*Executive Committee Bios from p. 14*)
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Leyla Mohadjer, Secretary, is an Associate Director, and Senior Statistician at Westat. She is responsible for statistical activities of a number of major multi-purpose

large-scale national surveys such as the National Health and Nutrition Examination Surveys and the National and International Adult Literacy Surveys. She has presented and published papers in a variety of survey subject areas such as sampling of rare populations, incentives in surveys, composite estimation, imputation, analysis of data from complex samples, and development of quality assurance procedures. She was a WSS chapter board member, and was a referee for the *International Statistical Review* journal, the *Journal of Official Statistics*, and the *American Journal of Epidemiology*. She is currently the editor of the International Association of Survey Statisticians' newsletter (*The Survey Statistician*). She has a Ph.D. in Mathematical Statistics, and an M.S. in Applied Statistics from George Washington University.*



Mission Statement

The mission of the Section on Survey Research Methods is to promote the improvement of survey practice and the understanding of survey methods by encouraging both theoretical and applied research on survey-related topics and by disseminating information on survey methods.

Areas of interest for the Section include all that employ survey methodology as a focus or as a prime tool of investigation. Of special interest are:

- ◆ Theoretical foundations of sampling;
- ◆ Sample design and estimation;
- ◆ Nonsampling errors and data collection methods;
- ◆ Analysis and presentation of survey data;
- ◆ Education of the public and students on the importance of scientific survey research;
- ◆ Publication and dissemination of survey research findings; and
- ◆ Ethics related to survey conduct and standards for survey practice.

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