the Survey Statistician

The Newsletter of the International Association of Survey Statisticians

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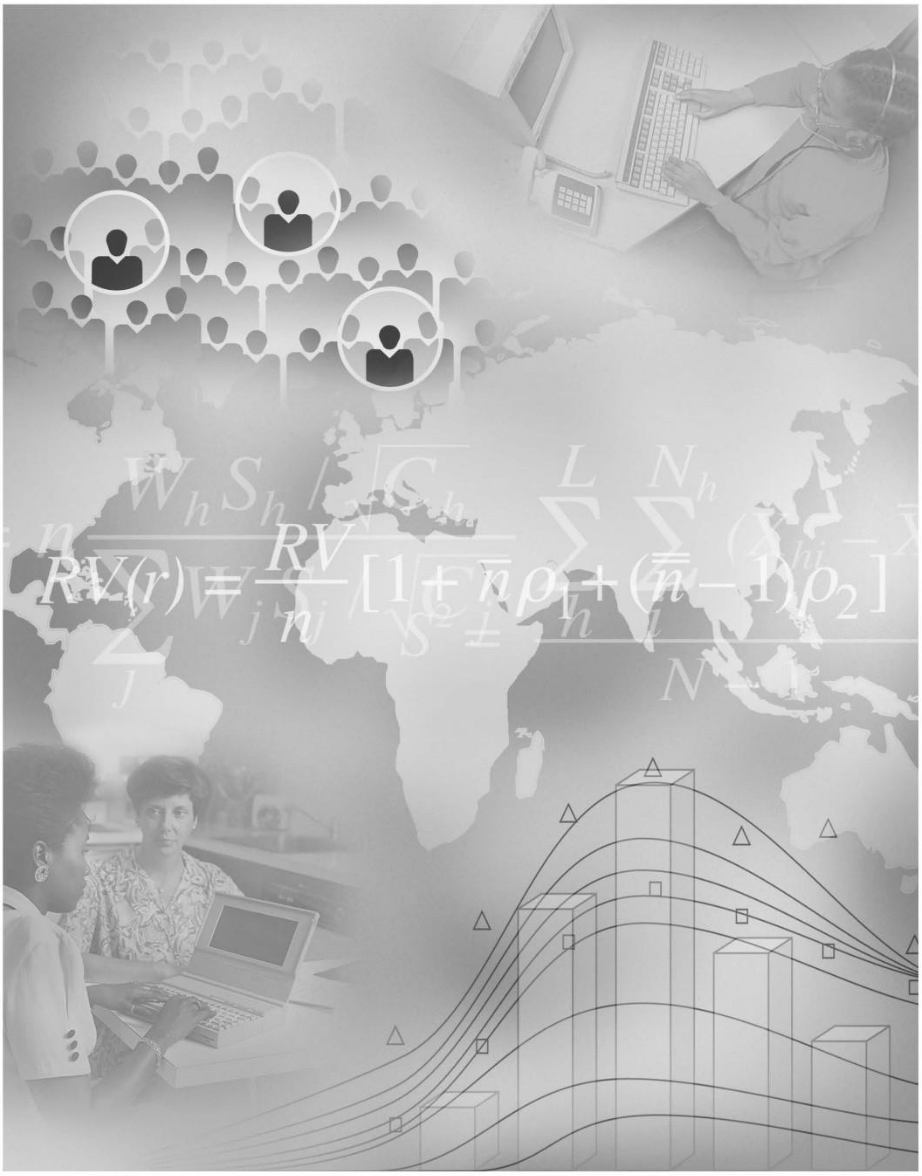

INTERNATIONAL ASSOCIATION OF SURVEY STATISTICIANS

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In this Issue:

Letter from the Editors

The July 2018 issue *of The Survey Statistician* consists of the traditional sections. It includes news in each of the sections and we expect that every reader will find something interesting.

The issue starts with the news loaded with the cheery information about the awards for some IASS members and invitation to take part in the competition for the Cochran-Hansen prize 2019.

In the **Ask the Experts** Section (edited by Kennon Copeland), Geert Loosveldt from the Centre for Sociological Research, Katholieke Universiteit Leuven, presents an article **"**What are Interviewer Effects on Measurement Error?" The modern technologies and data bases decrease the role of the interviewers in the statistical surveys, from one side, but the need to assess influence of errors arising in the various phases of the survey to the survey results, from other side, remain the important interviewer problem still switched-on.

In the **New and Emerging Methods** Section (edited by the Scientific Secretary Risto Lehtonen), Yves Berger from the Department of Social Statistics and Demography, University of Southampton, has contributed an article titled "Empirical likelihood approaches in survey sampling". The author presents an approach in the survey statistics as an instrument which is widely used in the classical statistics. The author has published several papers on this topic and made a sequence of presentations in the conferences and workshops. We are happy that Yves has agreed to present the empirical likelihood to the readers of this *Newsletter* as well.

Book and software Review section includes an overview of "Cross-cultural Survey Guidelines" by Olga Vasylyk and Tetiana Ianevych from Taras Shevchenko National University of Kyiv, Ukraine. The Guidelines cover all aspects of the survey lifecycle. They can be useful for students and practitioners as well as for their teachers.

The **Country Reports** Section (edited by Peter Wright) has always been a central feature of *The Survey Statistician.* This issue includes reports on the activities in eight countries in survey statistics and we thank all country representatives for their contribution. We ask all country representatives to please share information on your country's current activities, applications, research and developments in survey methods.

This issue of The Survey Statistician includes the letter with the thoughts about the urgent problems for he world statistical community from our **IASS President**, Peter Lynn, and the Report from the **Scientific Secretary,** Risto Lehtonen, about current activities of the IASS.

We thank the previous Editor of *The Survey Statistician* Natalie Shlomo for her help and kind advices; we thank Olivia Blum from the Israel Central Bureau of Statistics and the ISI Membership Officer Margaret de Ruiter-Molloy for their input to the current issue.

We thank Lori Young from Statistics Canada for collecting and designing the advertisements of upcoming conferences and for preparing the tables of contents in the *In Other Journals* section. We also thank Lori for her careful work preparing the model of *The Survey Statistician* as it is now.

As always, we have many thanks for everyone working hard to put *The Survey Statistician* together and in particular Nicholas Husek at the Australian Bureau of Statistics and Olivier Dupriez from the World Bank for their invaluable assistance.

Please let Risto Lehtonen (risto.lehtonen@helsinki.fi) know if you would like to contribute to the New and Emerging Methods Section in the future. If you have any questions which you would like to be answered by an expert, please send them to Kennon Copeland from the University of Chicago (copeland-kennon@norc.org). If you are interested in writing a book or software review or if you want to suggest a book to be reviewed, please get in touch with Danutė Krapavickaitė from the Vilnius Gediminas Technical University (danute.krapavickaite@vgtu.lt). The Country Reports should be send to Peter Wright from Statistics Canada (peter.wright2@canada.ca).

Please take an active role in supporting the IASS newsletter by volunteering to contribute articles, book/software reviews and country reports. We also ask IASS members to send in notifications about conferences and other important news items, about their organizations or individual members.

This is the first issue of *The Survey Statistician* composed by the new Editor Danutė Krapavickaitė.

The Survey Statistician is available for downloading from the IASS website at http://isi.cbs.nl/iass/allUK.htm.

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Letter from the President

INTERNATIONAL ASSOCIATION OF SURVEY STATISTICIANS (IASS)

Dear IASS colleagues,

Back in January the Executive Committee agreed on your behalf that the IASS should add its name as a signatory to a statement (http://www.amstat.org/asa/files/pdfs/GeorgiouStatement.pdf) urging the Greek authorities to end the legal proceeding against Andreas Georgiou, former President of the Greek national statistical service, ELSTAT, and other ELSTAT officials for their work at ELSTAT during the period 2010-2015. Sadly, they did not do this and in June The Greek Supreme Court sentenced Andreas to two years on probation and ruled that he must face further charges. This case highlights the need to protect statistical integrity from political interference in the most robust manner possible. At least one commentator has suggested that some statistical frameworks might benefit from review: http://bruegel.org/2018/06/the-european-union-must-defend-andreas-georgiou/ .

The IASS will continue to support and promote statistical rigour, integrity and independence. We will speak out whenever it is appropriate to do so. Our particular remit concerns data collected by means of statistical surveys. We should seek to ensure that neither the design of surveys, nor the analysis of survey data and publication of results, is influenced by political pressure. There is a role for all of us to stay alert to these possibilities.

To my mind, one of the most important roles of the IASS is to provide a means to share the expertise and knowledge of our members across the global community. The number of specialist survey statisticians in any one country, let alone within a single organisation, is typically rather small. It is easy to become rather isolated and unaware of new ideas and methods being developed in other places. To that end, we aim to be a global network, bringing people and ideas together.

This publication, *The Survey Statistician*, provides an important channel of communication throughout our network. Our twitter account provides another channel. But there remain considerable benefits in making personal, face-to-face contacts. To that end, the IASS sponsors workshops, conferences and short courses around the world. We have sponsored four such events in 2018 and in October we will be inviting organisers of events taking place in 2019 to apply for support. If you are involved in organising a survey statistics event in 2019, or have colleagues doing so, please get in touch.

In addition to giving these events general support, the IASS is particularly keen to enable the participation of statisticians who have few opportunities to participate in such events and who would be particularly likely to benefit from participation. With that in mind, we were recently successful in bidding for funds to support the participation of statisticians from developing countries at three of the conferences and workshops that we are supporting in 2018. The funds come from the ISI's allocation from the World Bank Trust Fund for Statistical Capacity Building and should cover the costs of around twelve participants across the three events. I am delighted that we have managed to do this, and I am looking forward to meeting some of these participants and hearing their feedback on our events.

Our thoughts, like those of the other ISI sections, are now turning towards the next World Statistics Congress in Kuala Lumpur in August 2019. Information about the WSC appears elsewhere in this issue, so I will not repeat it here. I would encourage you – our members – to take this opportunity to get involved, whether that be in organising a session, presenting a paper, or simply participating in the Congress and choosing from the wide and varied scientific and social programme. The WSC is always a wonderful event, with much to enjoy, much to learn, and many friends to make from around the world. Come to Kuala Lumpur if you can!

Peter Lynn,
IASS President

Report from the Scientific Secretary

The IASS has been involved in the preparation of the 62th World Statistics Congress of the ISI, to be held in 18-23 August 2019 in Kuala Lumpur, Malaysia. Call for Proposals of Invited Paper Sessions (IPS) has already been closed and the Scientific Programme Committee of the WSC, with Cynthia Clark as the IASS representative, has come to a decision concerning the proposals. Next, the session organizers will be contacted and the sessions published in the near term. So, the results are not available when writing this report but it is foreseen that in addition to the IASS President's invited session and the IASS Journal and Cochran-Hansen Prize Invited Session, a good number of interesting invited paper sessions on important topics in survey statistics will appear in the scientific programme. The efforts of IASS people so far in contributing to the scientific content of ISI WSC 2019 are greatly appreciated.

ISI WSC 2019 also offers additional options for survey statistics. Submissions for proposals for Special Topic Sessions (STS) are open right now and will be closed in 15 August 2018. Submission of IASS related STS proposals are strongly encouraged. Official guidelines for STS proposal preparation are available at ISI WSC website, see http://www.isi2019.org/call-for-proposal/. If you need advice in proposal preparation please do not hesitate to contact me. The IASS has been active also in the organization of Short Courses for the previous WSC events. For WSC 2019, proposals (with topics, lecturers and organizers) can be sent to me or to the (forthcoming) ISI Short Course Committee for ISI WSC 2019.

The Cochran-Hansen Prize of the IASS has been established in 1999 in celebration of the 25th anniversary of the society. The prize is awarded every two years and is given for the best paper on survey research methods submitted by a young statistician for a developing country or transition country. The prize winner will be invited to present his or her paper at the ISI WSC 2019. As announced by Dr Anders Holmberg, the Chair of the IASS 2019 Cochran-Hansen Prize Committee, the deadline for submission of papers for the 2019 prize is 15 February 2019. All papers must be sent to the chair of the prize committee, email anders.holmberg@ssb.no. The complete announcement with submission instructions is published in this TSS issue and at http://isi-iass.org/home/cochran-hansen-prize.

Financial support to the organization of scientific conferences and workshops on survey statistics is an important activity of the IASS. The IASS supported events have supplemented nicely the WSC and Satellite Meetings scheme. Financial support has been important for regional conferences and workshops, whose funding options are limited. In 2017 the IASS co-financed five scientific events (the conference honoring Professor J.N.K. Rao on the occasion of his 80th birthday, ITACOSM 2017, SAE 2017, BNU Workshop on Survey Statistics Theory and Methodology 2017, and EESW17, the fifth biennial European Establishment Statistics Workshop, see details in TSS January 2018 issue). In 2018 we are giving partial support to the following scientific events. The SAE 2018 Conference - Small Area Estimation and Other Topics of Current Interest in Surveys, Official Statistics, and General Statistics: A Celebration of Professor Danny Pfeffermann's 75th Birthday was held in 16-18 June 2018 in Shanghai, China. The keynote speakers were James O. Berger, Malay Ghosh and J.N.K. Rao. The 2018 SAE Award winner was announced in the conference. I want to congratulate Professor Danny Pfeffermann for the Award. The conference was hosted by the East China Normal

University (ECNU). More details can be found at the conference website https://www.sae2018.com.

Second International Conference on the Methodology of Longitudinal Surveys (MoLS2) will be held in 25-27 July 2018 in Essex, UK. On 24 July, four pre-conference workshops will be arranged. According to the conference information, MoLS2 follows on from the highly successful conference held in July 2006. The conference will highlight research relating to all stages of the design and implementation of longitudinal surveys, but with a particular focus on areas in which significant advances have been made in the last 12 years. Monograph papers presented at the conference will constitute chapters of a Wiley book entitled *Advances in Longitudinal Survey Methodology*, to be edited by Peter Lynn. The event is hosted by the Institute for Social and Economic Research (ISER) at the University of Essex. Complete scientific programme and more are available at the conference website https://www.understandingsociety.ac.uk/mols2.

The Baltic-Nordic-Ukrainian Network on Survey Statistics will organize its annual Workshop on Survey Statistics Theory and Methodology in 21-24 August 2018 in Jelgava, Latvia. The main theme of the workshop is *Population census based on administrative data*. Keynote speakers are Anders Holmberg and Li-Chun Zhang. In addition, talks of seven additional invited speakers and a number of contributed presentations are included in the scientific programme. The workshop is hosted by the Latvia University of Life Sciences and Technologies, Faculty of Economics and Social Development. Workshop programme and additional details are available at the workshop website http://home.lu.lv/~pm90015/workshop2018/index.shtml.

The Francophone Survey Sampling Colloquium will be held in 24-26 October 2018 in Lyon, France. In addition to the opening and closing talks, the scientific programme includes a total of 13 invited presentations and several contributed paper sessions. A plenary session for the presentation of the 2018 Waksberg Award laureate will be arranged. I am glad to have the possibility to congratulate Jean-Claude Deville for the Award. More information is available at the conference website http://sondages2018.sfds.asso.fr/.

The IASS Executive Committee will publish later in this year an announcement for applications to support for scientific events that will be organized in 2019.

The Survey Statistician, a journal of the IASS, is important for the IASS community for sharing news and information on events, announcing reports on country-specific activities and offering a regular Ask the Experts section, and for introducing recent research on methodological topics. The interesting article by Yves Berger in the New and Emerging Methods section entitled "Empirical likelihood approaches in survey sampling" discusses the application of empirical likelihood methods for complex surveys including multi-stage sampling, unequal probability sampling and unit nonresponse, and compares the methodologies with other methods, calibration as an example. The New and Emerging Methods section is open for methodological papers in various topical areas of survey statistics. Please do not hesitate to contact me if you are willing to write an article to the New and Emerging Methods section. I want to complete my report by warmly welcoming the new TSS Co-Editor Danutė Krapavickaitė and by addressing sincere gratitude to Natalie Shlomo for her excellent work for several years as the Co-Editor of The Survey Statistician. Wishing a refreshing summer period, and productive autumn season, for everybody.

Risto Lehtonen
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News and Announcements

Waksberg Award

The journal *Survey Methodology* has established an annual invited paper series in honor of Joseph Waksberg to recognize his contributions to survey methodology. Each year a prominent survey statistician is chosen to write a paper that reviews the development and current state of an important topic in the field of survey methodology. The paper reflects the mixture of theory and practice that characterized Joe Waksberg's work.
The recipient of the Waksberg Award receives an honorarium and gives the Waksberg Invited Address at the annual Statistics Canada Symposium. The paper is published in a future issue of *Survey Methodology*.

The 2018 Waksberg Award is granted to Jean-Claude Deville http://sondages2018.sfds.asso.fr/invites.html. A plenary session will be organised to the honour of the Waksberg Award winner at the 10th Francophone Survey Sampling Colloquium on 24-26 October in Lyon. Workshop on survey sampling in honour of Jean Claude Deville was also organised in June 24-26 2009, University de Neuchatel http://www.unine.ch/colloque_deville/en/home.html

Jean-Claude Deville has made important contributions to the field of survey methods. He has notably worked on calibration methods and generalized calibration; he has also proposed new sampling methods for both equal and unequal probabilities and balanced sampling, new methods for the treatment of non-response, for variance estimation and for resampling.

Jean-Claude Deville has consistently combined statistical innovation with a deep pragmatism, anticipating the implications of new statistical methods applied to the domain of survey methods. Most of his methods are currently used in several national bureaus of statistics and take a central part in their statistical methodology.

We congratulate Jean-Claude Deville on the award and wish him many fruitful ideas!

2018 CRM-SSC Prize Recipient David Haziza

The *Centre de recherches mathématiques* (CRM) and the Statistical Society of Canada (SSC) solicit nominations for the CRM-SSC Prize, which is awarded in recognition of a statistical scientist's professional accomplishments in research during the first fifteen years after earning a doctorate. The award is bestowed at most once a year upon a Canadian citizen or permanent resident of Canada whose research was carried out primarily in Canada.

The recipient of the CRM-SSC prize in 2018 is Professor David Haziza of the Department of Mathematics and Statistics at the University of Montréal.

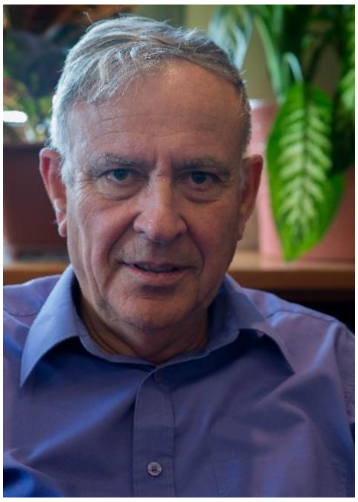
David Haziza grew up in Casablanca, Morocco. His family moved to Canada when he was 15. He obtained his BSc and his MSc from the *Université du Québec à Montréal* before starting his PhD studies in survey sampling at Carleton University under the supervision of J.N.K. Rao. While completing his PhD degree, which he obtained in 2005, he started working as a methodologist at Statistics Canada and keeps these contacts until now. It provided David with a unique outlook allowing him to do academic research on topics of crucial importance to practitioners. http://www.crm.umontreal.ca/prix/prixCRMSSC/prixCRMSSC18_an.shtml.

David works in several areas of survey sampling, including variance estimation, survey sampling methods robust to influential observations, calibration, small area estimation, and design. But most of his contributions address the very important practical problem of missing data. Given that there may be uncertainty in the imputation and nonresponse models, the availability of robust methods that work provided that at least one of these models is valid is very useful, both from a theoretical and a practical standpoint. This is the basis of the double and multiple robust methods that David has studied.

With more than 45 publications to date, David is a prolific author. Not only has he published in journals specialized in survey sampling such as *Survey Methodology*, *Journal of Survey Statistics and Methodology*, and the *Journal of Official Statistics*, but also in top general methodology journals such as *Biometrika*, *JASA*, *Statistica Sinica*, *Scandinavian Journal of Statistics* and *Statistical Science*. This shows that his work is fundamental and influential.

Another sign of excellence is his popularity as an invited speaker in various conferences – in fact, more than 10 a year. Indeed, David has spoken or given workshops in five continents! David's strong research record is based on strong theoretical arguments and motivated by practical issues found in the field. His impact is felt in national statistical organizations in Canada, France, and in the US, as well as in other organizations, such as Westat. His scientific leadership in survey sampling is already well established internationally.

We congratulate David Haziza on the award with the CRM_SSC Prize and wish him productive and joyful work!



Congratulations, Danny Pfeffermann!

The 2018 SAE conference, held in Shanghai, celebrated the 75th Birthday of Professor Danny Pfeffermann. Leading researchers from the academia and from national statistics offices around the world discussed recent developments in theoretical and applied statistics vis-à-vis estimation of small groups based on samples, in surveys and in censuses. The combination of theory and implementation presents the unique work done by Danny Pfeffermann as a Professor Emeritus of Statistics at the Hebrew University of Jerusalem, a Social Statistics Professor at the University of Southampton and as the present National Statistician and the Director General of the Central Bureau of Statistics in Israel.

Distinguished research professors congratulated him in the award ceremony and expressed their appreciation to his actively choosing to lead a national statistics system. In his speech, Professor Jon Rao referred to the need to follow Israel's example and to nominate *Statisticians* as National Statisticians.

The conference, chaired by Professor Dongchu Sun, from the hosting university ECNU, dealt with issues like Informative Sampling, Model-based Inference in Survey Sampling, Inference under Informative Selection in Complex Surveys, Inference for longitudinal and incomplete data, Advance Bayesian Methods and Sequential Allocation, as well as Application of SAE and Related Methods, Survey Sampling Techniques for Official Statistics, Time Series Problems in Repeated Surveys, and Sampling and Census (www.sae2018.com).

Danny Pfeffermann is leading further development of statistical methods for the production of official statistics in Israel and abroad; Using small area estimation in the next population census in its administrative part and with its complementary survey; improving the efficiency of samples in the numerous surveys conducted; using big data in selected topics like transportation statistics and price indices; and advising government agencies in their statistical activities. Moreover, Professor Pfeffermann leads the reorganization and the acknowledgment of the statistical system as a system, in order to meet future needs in a changing society.

We congratulate Danny Pfeffermann on his 75th birthday and wish him success in the upcoming years, in his distinguished and multi-facet work.

Cochran-Hansen Prize 2019: Competition for Young Survey Statisticians from Developing and Transitional Countries

In celebration of its 25th anniversary in 1999, the International Association of Survey Statisticians (IASS) established the Cochran-Hansen Prize, which is awarded every two years for the best paper on survey research methods submitted by a young statistician from a developing or transition country. The Cochran-Hansen Prize consists of books and journal subscriptions in the value of € 500.

Participation in competition for the prize is restricted to young statisticians from developing and transition countries that are living in such countries and were born in 1984 or later.

A paper submitted for the competition must consist of original work which is either unpublished or has been published after February 15th 2017. A paper may be based on a university thesis and should be written in English. The deadline for submission of papers for the 2019 prize is 15 February 2019. All papers must be sent to the chair of the IASS 2019 Cochran-Hansen Prize Committee, Dr Anders Holmberg, email address; anders.holmberg@ssb.no.

Each submission must be accompanied by a cover letter, stating the author's year of birth, nationality and country of residence. The cover letter should also indicate if the paper submitted is based on a PhD thesis and, in the case of a joint paper, the contribution to the paper made by the prize competitor. The papers submitted will be reviewed by members of the Cochran-Hansen Prize Committee appointed by the IASS. The decision of the Committee will be final.

The prize winner will be invited to present his or her paper at the World Statistics Congress of the International Statistical Institute (ISI) to be held in Kuala Lumpur, Malaysia, 18-23 Aug 2019; http://www.isi2019.org/. The IASS will provide the winner round trip economy class airfare and per diem for living expenses for the days that they participate in the 2019 WSC meetings in Kuala Lumpur.

For further information, please contact:
Dr Anders Holmberg
Head, Division of Methods, Statistics Norway.
Email: anders.holmberg@ssb.no

Request for Proposals for Invited Program Sessions 62nd ISI WSC in Malaysia, August 2019

The planning has begun for the 62nd ISI World Statistics Conference which will be held in Kuala Lumpur, Malaysia from 18-23 August 2019. The official call for Invited Program Sessions is now on the ISI conference website: http://www.isi2019.org/call-for-proposal/. You are invited to submit your proposal directly to the website. The deadline for Invited Program Session proposals is March 31, 2018.

Cynthia Clark, a member of the IASS Executive Committee, is the IASS representative on the Scientific Program Committee. Proposals relevant to the International Association of Survey Statisticians should be designated as such on the submitted proposal. If your proposal is relevant to other ISI sections, you may so designate. Please also send your proposal to Cynthia Clark, czfclark@cox.net. The proposals designated as IASS will be sent to the section for prioritization by the IASS Executive Committee. You should also indicate if you are willing to have your proposal considered as a Special Topic Contributed Session. Those proposals will also be reviewed by the IASS Executive Committee. Any proposals that have initially been sent to Cynthia Clark should now be posted to the ISI website. A copy of the final proposal should also be sent to Cynthia and labeled as SUBMITTED.

Please note that there are specific guidelines for participation in ISI sessions. These will have to be adhered to in the final program. They are provided for your information.

Guidelines for session organisers, chairs, presenters, and discussants

The following participation guidelines apply to organisers, chairs, presenters and discussants of Invited Paper Sessions (IPS), Special Topic Sessions (STS) and Contributed Paper/Poster Sessions (CPS) of the 61st WSC. In the description below, both STS and CPS are referred to as Contributed Papers.

1. Each individual can present only one paper as an oral presenter during the 61st WSC. Exceptions will be granted only in unusual circumstances, and requests must be approved by the Chairs of the Scientific Programme Committee (SPC) and Local Programme Committee (LPC). All requests should be sent to contact@isi2017.org.
2. A co-author of a paper being presented by someone else is not counted as a presenter. Hence it is possible for an individual to be a co-author of multiple papers being presented at the 61st WSC.
3. A participation as discussant is not counted as a participation as presenter.
4. An individual can serve as a chair or a discussant in more than one session provided that there is no schedule conflict.
5. Within the same session, any individual, including the session Organiser, can take up the role of either presenter or chair or discussant, but should not assume any two such roles.
6. Each individual can organise at most one STS. Exceptions must be approved by the Chair of the Local Programme Committee (LPC). All requests should be sent to contact@isi2017.org.
7. All Organisers, Chairs, Presenters and Discussants of any session must be registered participants of the WSC. Exceptions may be granted to organisers who are unable to attend, but not to individuals in any of the other roles.

Ask the Experts

What are Interviewer Effects on Measurement Error?

Geert Loosveldt

Centre for Sociological Research, KU Leuven

Introduction and basic concepts

It is sometimes claimed that research into interviewing effects is no longer relevant, because surveys administered by interviewers are increasingly considered the exception in times when a great deal of data is collected through online or mobile surveys. Nevertheless, face-to-face and telephone surveys are still regarded as very useful methods to collect reliable data, and many large-scale, (cross)-national face-to-face surveys are still conducted. To mention just a few in the European context: the European Social Survey, the European Values Survey, European Working conditions surveys, the European Quality of Life Survey, Labor Force Survey, The Survey of Health, Ageing and Retirement in Europe. In all these surveys, a large number of interviewers are deployed to collect the data. For example, about 3,000 to 4,000 interviewers are active during each biennial round of the European Social Survey.

Some ambiguity can, however, be observed with regard to the role and impact of interviewers. On the one hand, interviewers are considered very useful in convincing respondents to participate and supporting them during an interview. Interviewers can stimulate respondents to optimize their response behavior in order to give “correct” answers. On the other hand, interviewers are also indicated as a possible source of measurement error. Interviewers can adversely influence the response process and the answers obtained. Although the positive and negative impact of interviewers on the recorded answers can be considered as interviewer effects, the concept is mostly used to indicate the measurement error for which they could be responsible. Accordingly, “interviewer effects” refers to the undesired impact of an interviewer on the responses, and has a negative connotation.

Interviewers can create interviewer effects in an active or a passive way. Merely the presence of an interviewer–and certain interviewer characteristics–can have an influence on a respondent’s response behavior. Socially desirable answers may be a consequence of such a passive effect. For example, underreporting of socially undesirable behavior can occur simply due to the presence of an interviewer. However, interviewers can also create active effects. For example, by asking particular questions in a suggestive way, they can intentionally influence the respondent’s answer. It is therefore possible to distinguish between passive interviewer effects due to the presence of the interviewer and certain interviewer characteristics on the one hand, and active effects due to particular interviewer behavior on the other hand.

Both active and passive interviewer effects can create systematic or variable measurement error. If all or at least a majority of the interviewers have a dominant effect in the same direction, they will be responsible for bias (a systematic effect) in the estimates.

This can be the case, for example, if all the interviewers interpret and clarify a specific question in a particular way. In addition to these overall systematic effects, interviewers can also differ in the way they systematically influence the answers. This means that each interviewer can also have a systematic effect on the answers he or she obtains, but that these systematic effects are (partially) different for each interviewer. As a consequence of these differences between interviewers, there can be additional variance in the survey estimates, and thus part of the variance in the estimates can be explained as being due to the interviewers. This is what is meant by interviewer variance. This interviewer variability, measured by the proportion of variance due to the interviewers, is considered as a major type of interviewer effect, and sometimes the concepts interviewer variance, interviewer variability, and interviewer effects are used interchangeably. In the following text, details are limited to interviewer effects that can be measured by means of the analysis of interviewer variance. The basic model for the evaluation of this kind of interviewer effects is presented in the next section.

1. Interviewer variance analysis

The evaluation of interviewer effects by means of interviewer variance analysis is common practice in the assessment of survey data quality. As already noted, one particular but admittedly very important type of interviewer effect can be evaluated by means of interviewer variance analysis. However, it is not the intention that variance in substantive variables can be explained by interviewers.

The starting point for the analysis of interviewer variance is a two-level hierarchical dataset. Each interviewer interviews a set of respondents, and each respondent is interviewed by only one interviewer. As a consequence, respondents are nested within interviewers, and a two-level random intercept model with no independent variables is appropriate to analyze the interviewer variance.

The model can be formally expressed as:

$$Y_{ij} = \beta_{0j} + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$

and the two expressions can be integrated into one equation:

$$Y_{ij} = \gamma_{00} + \mu_{0j} + \varepsilon_{ij}$$

In this model, Y_{ij} is the value of variable Y for respondent *i* (i=1…N) interviewed by interviewer *j* (j=1…J), β_{0j} is the intercept for interviewer j, and ε_{ij} is the residual error term the for respondent *i* interviewed by interviewer *j*. This intercept for interviewer *j* can be divided into a fixed (overall) intercept γ_{00} and an interviewer-specific residual error term μ_{0j}. The residual error term at the interviewer level is the random intercept. A normal distribution for the residual term at the respondent level and the interviewer level is assumed. In these distributions, the means are zero and the variance at the respondent level and the interviewer-related error terms are respectively equal to σ_e^2 and σ_u^2. There are significant differences between interviewers when σ_u^2 differs significantly from zero. The interviewer effect for each variable *Y* is estimated by means of the intra-interviewer correlation:

$$\rho_{\text{int}} = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_e^2}$$

The intra-interviewer correlation (ρ_{int}) expresses the degree of homogeneity in the responses obtained by the same interviewer, and can be interpreted as the proportion of variance in *Y* explained by the interviewers.

In the same way as with a multiple regression analysis, a number (r=1…R) of respondent characteristics (X) can be added as independent variables to explain the variance in the dependent variable Y. To explain the variability of the random intercept at the interviewer level, a number (t=1…T) of interviewer characteristics (W) can be added at the interviewer level. This results in the following elaboration of the basic null model:

$$Y_{ij} = \gamma_{00} + \sum_{r=1}^{R} \gamma_{rj} X_{rij} + \sum_{t=1}^{T} \gamma_{0t} W_{tj} + \mu_{0j} + e_{ij}$$

It should be noted that this is a random intercept only model, which contains no random slopes. A further elaboration of this random intercept with random slopes is possible. The specification of a random slope in the model for one of the independent variables means that the effect of that independent variable can vary between interviewers. Although this can be a relevant issue in the evaluation of interviewer effects, the presentation here is restricted to the random intercept model only.

Repeated measurements of a respondent's characteristic are sometimes available. This results in a three-level hierarchical data structure: repeated measurements of the respondent's characteristics (measurement level) are nested within respondents (respondent level), and respondents are nested within interviewers (interviewer level). With this type of hierarchical dataset, the variance of the dependent variable Y can be broken down across the three levels.

Within this three-level structure, Y_{mij} is the value of Y for measurement *m* for respondent *i* interviewed by interviewer *j* (with *m* = 1,..M; *i* = 1, ...I ; *j* = 1,...J).

The basic intercept-only model for Y_{mij} in the three-level data structure is as follows:

$$Y_{mij} = \gamma_{000} + k_{0j} + \mu_{0ij} + e_{mij}$$

In this model there are no independent variables, and $k_{0j}, \mu_{0ij}, e_{mij}$ are respectively the unique parts of the intercepts at the interviewer level and the respondent level, and the residual error at the measurement level. The variances of these unique parts of the intercept are respectively:

$$\sigma_{k0}^2, \sigma_{u0}^2, \sigma_e^2$$

With this model we can break down the variance across the three levels and calculate how much variance is explained by the respondent (ρ_{resp}) and the interviewer (ρ_{int}) (Hox, 2010). The expressions for the proportions of explained variance are:

$$\rho_{resp} = \frac{\sigma_{u0}^2}{\sigma_{k0}^2 + \sigma_{u0}^2 + \sigma_e^2};$$

$$\rho_{\text{int}} = \frac{\sigma_{k0}^2}{\sigma_{k0}^2 + \sigma_{u0}^2 + \sigma_e^2};$$

This proportion of variance due to the interviewers combined with the average number of competed interviews per interviewer ($\bar{m}$) determines the interviewer design effect ($deff_{intv}$). The value of $deff_{intv}$ is the inflation factor of the variance and is a measurement of the increase of the variance of a parameter due to interviewer variance under the simple random sampling assumption (Biemer and Lyberg, 2003):

$$deff_{intv} = 1 + (\bar{m} - 1)\rho_{intv}$$

In turn, the interviewer design effect determines the effective sample size (n_{eff}):

$$n_{eff=n/deff_{int}}$$

Due to interviewer clustering, the effective sample size is smaller than initial sample size (*n*). This expression makes it clear that a high intra-interviewer correlation combined with a high average workload can have a serious impact on the sample size.

It is possible to use multilevel covariance structure analysis to evaluate the impact of interviewer effects on the relationship between variables (Muthén, 1994). In this approach, the total covariance matrix is divided into a within-interviewer covariance matrix and a between-interviewer covariance matrix. To take the interviewer effects into account, it is necessary to use the within-covariance matrix when analyzing the relationship between variables.

2. The basic assumption

The interpretation of the differences between interviewers as interviewer effects assumes that the differences are caused by the interviewers and not by differences in the group of respondents they interview. Accordingly, the basic assumption of the model for the evaluation of interviewer effects presented in the previous section is the "comparable respondents group" assumption. In the same way as in an experimental design, it is possible to realize the comparability of the interviewer's respondent groups by means of random assignment of the sample units to the interviewers. This procedure will also result in an interpenetrated design (Mahalanobis, 1946; O'Muircheartaigh and Campanelli, 1998). In such a design, one interviewer is active in several areas and the interviews in one area are administered by several interviewers. However, to reduce the fieldwork cost, a two-phase sampling design is commonly used: a random selection of primary sample units (PSUs, e.g., municipalities) and a random selection of individuals/households or addresses within these PSUs. Mostly, the interviewers' allocated sample units are concentrated in one or a small number of PSUs. As a consequence, there is no fully interpenetrated design, which would be needed to disentangle interviewer effects and area effects. In other words, a design-based evaluation of interviewer effects is not really possible. In this case, a model-based evaluation of interviewer effects is used. In this approach, one tries to realize the comparable group condition by controlling–in the analysis of interviewer variance–for some respondents' background characteristics and some proxy area variables.

Figure 1 illustrates the model-based approach to establish the "comparable respondent groups" assumption. It is assumed that interviewers and areas are both potentially related to the substantive survey variables, respectively represented by (*a*) and (*b*). In the path structure shown in the bottom panel of Figure 1, both relationships are controlled for respondents' background variables (e.g., gender, age, level of education, household size). It is assumed that these variables are not prone to interviewer effects. Using "proxy-area variables" is an alternative approach with which to integrate regional information in the model. Instead of adding the area clusters to the model as a separate random factor, a geographical indicator–such as province or county–can be used in combination with the population density. By doing this, the confounding of interviewer and area clustering is somewhat circumvented (West et al., 2013), while a (large) proportion of the area effects can be controlled for. This model-based evaluation of interviewer effects with fixed area and respondent characteristics is in line with the current practice suggested in literature (West and Olson, 2010; West and Blom, 2017; Schaeffer et al., 2010). Previous research also shows that interviewers are responsible for a larger part of the homogenizing effect compared with spatial clustering (O'Muircheartaigh and Campanelli, 1998; Schnell and Kreuter, 2005), and that a considerable part of the total interviewer variance appeared to be driven by interviewer measurement error (West, Kreute, an Jaenichen, 2013, p. 292).

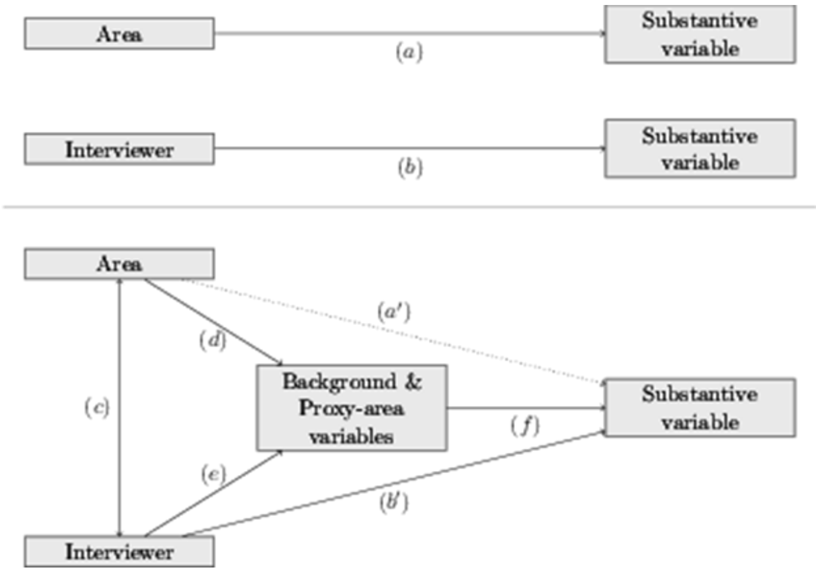


Figure 1: Impact of area and interviewer effects on substantive variables using the comparable respondents' assumption

3. Classification of interviewer effects

As already discussed, interviewer effects express systematic differences between interviewers. Depending on the type of dependent variable used in the analysis of variance, a difference can be made between a respondent-oriented and an interviewer-oriented evaluation of interviewer effects.

An interviewer-oriented evaluation concerns differences in the way interviewers perform their tasks. A typical example is the evaluation of interviewer effects on the outcomes of the contact procedure (e.g., response rates, refusal rates, and contact rates). With this type of analysis, it is possible to evaluate the differences in how successful interviewers are at contacting and persuading sample units to cooperate. Other task-related variables include the speed of interviewing, and other interaction characteristics (e.g., probing, and the number of adequate and inadequate reactions to inadequate respondent behavior). The results of an interviewer-oriented evaluation of interviewer effects are valuable information with which to assess an interviewer's performance.

In a respondent-oriented evaluation of interviewer effects, substantive variables and response behavior characteristics are used. In a traditional application of interviewer effects analysis, the substantive variables are used as dependent variables. However, response behavior characteristics–such as item nonresponse, response differentiation, straight lining, and other indicators of response styles–can also be used in the analysis. The results of this type of analysis show how interviewers differ in the extent to which they manage to optimize the response process.

4. Some examples of respondent and interviewer oriented evaluations of interviewer effects.

Interviewer effects on substantive variables and relationships between variables

Beulens and Loosveldt (2016) used data from six rounds of the European Social Survey (ESS) to evaluate interviewer effects on separate variables and the relationships between variables. The ESS is a probability sample based, biennial, cross-national and cross-sectional survey. The first round was organized in 2002, and in total 36 countries participated in at least one of the six rounds (150 country-round combinations). Some 48 continuous variables that are available for each round were used in the univariate analysis, and 87% of the calculated intra-class correlations were found to be significant. There are also considerable differences between countries. In eight countries, intra-class correlations of 0.15 to 0.20 or even higher were found, and the effective sample size is considerably smaller than the number of respondents. These results illustrate that the impact of interviewer effects in cross-national surveys should not be underestimated.

The same ESS data was used to evaluate interviewer effects on the relationship between variables. Some 50 pairs of variables out of the 48 available variables were randomly selected without replacement, making sure that the variables in a pair were different. One of the variables in a pair is considered as the dependent variable and the other as the independent variable, and a regression model was calculated for each pair in the 150 country-round combinations. To evaluate the interviewer's impact on the relationship between the variables of a pair, the regression coefficient and the standard error were calculated twice. One analysis was based on the total covariance matrix (with interviewer effects not taken into account) and for the other analysis, the within-interviewer covariance structure was used. The ratio of the estimates for both analyses (estimate based on within-interviewer covariance matrix/estimate based on the total covariance matrix) can be considered as an expression of the interviewer effect. A ratio of the regression coefficient smaller than 1 means that the results for the total covariance matrix overestimate the relationship between the two variables. The ratios of the squares of the standard error are expected to be greater than 1, and to indicate the underestimation of the standard errors when interviewer effects are not taken into account. The results clearly show that the average regression coefficients decrease when interviewer effects are taken into account. In some countries there is a decrease of the average effect size by 20% or more. The differences in effect sizes between countries are smaller when the interviewer effects are taken into account. This implies that in a cross-national survey it is necessary to take interviewer effects into account when comparing countries, or there is a risk that differences between countries will be incorrectly assessed as "real" differences. With regard to the standard errors, the expected increase is observed when working with the within-interviewer covariance matrix. Some 86% of all estimated regression coefficients have increased standard errors and all countries seem prone to variation inflation due to interviewer effects.

The results of the interviewers' impact on the relationship between variables is in line with previous findings concerning interviewer effects on latent constructs (Beullens and Loosveldt, 2014). Confirmatory factor analysis can be used to assess the measurement model of latent constructs. The input for such an analysis consists of the covariance matrix between the items used to measure the latent constructs. Hence, it can be assumed that when interviewers have an effect on the covariance between items, the interviewers will also have an impact on the results of a confirmatory factor analysis. To test this assumption, Beullens and Loosveldt (2014) used nine items from eight countries participating in the fifth round of the ESS. These items represent three latent constructs (social trust, political trust, and perceived threat from immigrants). The results indicate that items of the same construct are correlated at the interviewer level, and that in some countries the factor loadings are smaller after removing these interviewer effects.

In addition, the standard errors of the estimates in the measurement models are somewhat larger when the within-interviewer covariance matrix is used. The authors conclude that although interviewer effects on correlations between variables are present in the data, the impact of these effects on the measurement models is relatively modest. This confirms the idea that the results of a measurement model are less impacted by measurement error.

Interviewer effects on non-differentiation

The assessment of interviewer effects on particular characteristics of response behavior is another type of respondent-oriented analysis of interviewer effects. The general idea is that interviewers might not only have an impact on the substantive answers (see the previous section), but also on the way respondents answer the questions (response style). The tendency to provide the same answers to the questions in a block of questions about the same topic is a typical example of this response style, and is termed non-differentiation. A response style is normally considered as related only to respondents, and in which interviewers do not play an important role. However Loosveldt and Beullens (2017) clearly demonstrate that interviewers can have a significant impact on these forms of response tendencies. In their analysis, they used five blocks of items on different topics in the questionnaire of the sixth round of the ESS. The tendency to non-differentiate was measured in each block of items, and these measurements were considered as repeated measurements of non-differentiation. These repeated measurements are nested within the respondent. To analyze this data, a three-level, intercept-only model was run per country. In some countries, with regard to non-differentiation the proportion of variance explained by the interviewers is considerable (higher than 0.10) and the interviewer effects are larger than the respondent effects. The results support the idea that interviewers mediate the respondent's tendency to non-differentiate his or her answers, and that this response style is certainly not only a matter of the respondent's cognitive efforts and motivation. The differences between countries are probably related to differences in fieldwork capacity and survey practices.

Interviewer effects on interview speed

A typical example of an interviewer-oriented evaluation of interviewer effects is the assessment of the interviewer's impact on the interview duration or length and interview speed. The time it takes to ask and answer the questions is an easily measurable type of paradata. With the information about the interview length and the number of applicable questions for a respondent, it is possible to calculate the speed at which an interview proceeds. When standardized interview techniques are used, it can be assumed that the interview length should be almost the same for each interview with a similar respondent, and that interviewer effects on interview length and speed should be limited. However, research results show that differences between interviewers can explain about 30% of the variability in interview length (Olson and Peytchev, 2007). Loosveldt and Beullens (2013) measured the interview speed for different parts of the questionnaire of the fifth round of the ESS, and applied a three-level (repeated measurement of interview speed nested within respondents and respondents nested within interviewers) random intercept model to disentangle the interviewer and the respondent effects on interview speed. They conclude that for all participating countries, interviewers strongly determine the interview speed, and that for most countries the variance at the interviewer level is larger than the variance at the respondent level. Accordingly, the expectation based on the key principle of standardized interviewing–that there are no differences in interview length between interviewers–is not supported.

Conclusion

In survey modes with interviewers, the interviewer must be considered as a possible source of measurement error. The results presented in the examples section make it clear that significant differences between interviewers, both for the substantive variables of a survey and the relevant process variables, are not exceptional. The impact of this (additional) cluster effect created by the interviewers on the effective sample size should not be underestimated. It is therefore advisable and useful to integrate a respondent-oriented and interviewer-oriented assessment of interviewer effects as a standard component of data quality assessment procedures. Appropriate analytical tools and models are available with which to assess these interviewer effects, some of which are presented in this paper. However, in addition to the analytical approach, sufficient and perhaps more attention should also be paid to the training and monitoring of interviewers. Based on the observed differences in interviewer effects between countries, this seems especially important in cross-national surveys.

References

Beullens K., and Loosveldt G. (2014). Interviewer Effects on Latent Constructs in Survey Research. *Journal of Survey Statistics and Methodology* 2(4): 433–458.

Beullens K., and Loosveldt G. (2016). Interviewer Effects in the European Social Survey. *Survey Research Methods* 10(2): 103–118.

Biemer, P., and Lyberg, L. (2003). *Introduction to survey Quality*. New York: Wiley.

Hox, J. (2010). *Multilevel Analysis: Techniques and Applications* (2nd ed.). New York: Routledge.

Loosveldt G., and Beullens K. (2013). The impact of respondents and interviewers on interview speed in face-to-face interviews. *Social Science Research* 42(6): 1422–1430.

Loosveldt G., and Beullens K. (2017). Interviewer Effects on Non-Differentiation and Straightlining in the European Social Survey. *Journal of Official Statistics* 33(2): 409–426.

Mahalanobis, P. (1946). Recent Experiments in Statistical Sampling in the Indian Statistical Institute. *Journal of the Royal Statistical Society* 109: 325–370.

Muthén, B. (1994). Multilevel covariance structure analysis. *Sociological Methods and Research* 22(3): 376–398.

Olson, Kristen, and Peytchev, Andy. 2007. Effect of Interviewer Experience on Interview Pace and Interviewer Attitudes. *Public Opinion Quarterly* 71(2): 273–286.

O'Muircheartaigh, C., and Campanelli, P. (1998). The Relative Impact of Interviewer Effects and Sample Design Effects on Survey Precision. *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 161(1): 63–77.

Schaeffer, N.C., Dykema, J., and Maynard D.W. (2010). Interviewers and Interviewing. In *Handbook of Survey Research*, Second Edition, eds. J.D. Wright and P.V. Marsden. Bingley, UK: Emerald Group Publishing Limited, 437–470.

Schnell, R., and Kreuter, F. (2005). Separating Interviewer and Sampling-Point Effects. *Journal of Official Statistics* 21(3): 389–410.

West, B.T., and Blom, A. (2017). Explaining interviewer effects: a research synthesis. *Journal of Survey Statistics and Methodology* 5: 175–211.

West, B.T., and Olson, K. (2010). How Much of Interviewer Variance is Really Nonresponse Error Variance? *Public Opinion Quarterly* 74: 1004–1026.

West, B., Kreuter, F., and Jaenichen, U. (2013). Interviewer Effects in Face-to-face Surveys: A Function of Sampling, Measurement Error or Nonresponse? *Journal of Official Statistics* 29(2): 277–297.

New and Emerging Methods

Empirical likelihood approaches in survey sampling

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Abstract

There are two different empirical likelihood approaches for complex sampling designs: the pseudo-empirical likelihood introduced by Chen and Sitter (1999) and the unequal probability empirical likelihood approach proposed by Berger and Torres (2014, 2016). Both approaches are described and reviewed critically. We do not pretend to give an exhaustive account of all the applications of empirical likelihood in survey sampling. This paper is an extended version of Berger (2018*b*).

Keywords: Design-based approach, estimating equations, inclusion probabilities, side information, stratification

Introduction

We consider a "*design-based approach*"; that is, we assume that survey variables are vectors of constants (Neyman, 1938). The design-based approach is often considered in survey sampling theory, because it gives a non-parametric distribution free inference, which does not rely on distributional assumptions about the variables of interest.

We use standard notation; that is, we have a finite population $U = \{1, \ldots, N\}$ of *N* units. A vector of constant variables $y_i \in \mathbb{R}^{d_y}$ is measured for each unit *i* in a sample $S \subset U$. The sampling design specifies the random selection of S within U. Populations are often stratified into *H* non-overlapping groups U_1, …, U_h, …, U_H called strata; such that $\cup_{h=1}^{H} U_h = U$. Stratified sampling consists in selecting independent samples S_h from each U_h. We assume that S_h is a sample of n_h units selected with unequal selection probabilities π_i. We assume that n_h are given constants. The overall sample and sample size are $\cup_{h=1}^{H} S_h = S$. and $n = \Sigma_{h=1}^{H} n_h$. First, we consider single-stage designs. Then, we shall show how empirical likelihood can be used with multi-stage designs. Unit non-response is another important feature of survey data. We will also show how empirical likelihood can accommodate unit non-response.

Godambe (1966) showed that under the design-based approach, the likelihood function cannot be used for inference, because this function is flat. As solution to this problem, Hartley and Rao (1968) showed that an empirical likelihood function can be used instead.

Owen (1988), Qin and Lawless (1994) developed the properties of this approach under a semi-parametric framework (see also Owen, 2001). Most of the recent developments of empirical likelihood in survey sampling can be classified into two groups: Berger and Torres's (2016) unequal probability empirical likelihood approach and Chen and Sitter's (1999) pseudo-empirical likelihood approach (see also Wu and Rao, 2006). There is also Chen and Kim's (2014) population-empirical likelihood approach based on Poisson sampling, which will not be covered in this paper.

Customary approach in survey sampling focus on estimating totals, with well-defined variance estimators. However, for more complex parameters, linearization is often needed for variance estimation. Linearization consists in approximating a non-linear parameter by a total of a linearized variable, which depends on parameters, which need to be estimated. In fact, linearization is essentially based on inference about totals. There is no unified linearization approach, since different linearization approaches have been developed. Bootstrap is also used for variance estimation. However, asymptotic theory of bootstrap is restricted to simple settings. Its properties are often limited to means, and solely based on simulations. Jackknife is another approach which is closely related to linearization. The primary purpose of variance estimates is to construct confidence intervals. Empirical likelihood tackles the problem of measuring the precision of an estimator from a different angle. It focuses on confidence intervals which can be easier to obtain than variance estimates. Empirical likelihood does not rely on linearization, even when the parameter of interest is not linear. The point estimator does not need to be normally distributed. It can handle nuisance parameters, which are often treated as constants with standard approaches.

We consider a large class of parameters defined by estimating equations. Let $\theta_U \in \mathbb{R}^{d_\theta}$ be an unknown population parameter which is defined as the solution to

$$\sum_{i \in U} e(y_i, \theta) = 0, \tag{1}$$

where $e(y_i, \theta) \in \mathbb{R}^{d_e}$ $(d_e \geq d_\theta)$ is a known function which defines θ_U. For example, θ_U can be the coefficients of a generalised linear regression model, a mean, a total, a quantile, etc. Under a design-based approach, the parameter θ_U is a vector of unknown population values.

2 Unequal probability empirical likelihood approach

Berger and Torres's (2012; 2014; 2016) "*empirical log-likelihood function*" is defined by

$$\ell_{max}(\theta) := \max_{p_i : i \in S} \left\{ \ell(p) : p_i > 0, \sum_{i \in S} \frac{p_i}{\pi_i} e(y_i, \theta) = 0, \sum_{i \in S} p_i \, z_i = \frac{\vec{n}}{n} \right\}, \tag{2}$$

where

$$\ell(p) := \sum_{i \in S} \log(p_i),$$
$$z_i := (z_{i1}, \dots, z_{ih}, \dots, z_{iH})',$$
$$z_{ih} := \begin{cases} 1 & \text{if } i \in U_h, \\ 0 & \text{otherwise}, \end{cases}$$
$$\vec{n} := \sum_{i \in S} z_i = (n_{i1}, \dots, n_{ih}, \dots, n_{iH})'.$$

The z_i are stratification variables and $\vec{n}$ is the strata allocation.

The key feature of (2) is the stratification constraint $\sum_{i \in S} p_i \, z_i = \vec{n} n^{-1}$, which is not motivated by moment conditions. This constraint is used to account for the sampling design. We also have that the constraint involving the parameter contains the standard sampling weights π_i^{-1}. Other approaches incorporate the information about the design within $\ell(p)$ (see

Section 3). The function (2) reduces to Owen's (1988) empirical log-likelihood function when we have a single stratum and $\pi_i = n/N$, $\forall\, i \in U$. The advantage of (2) is that it can be used as a standard likelihood function for design-based inference.

The "*maximum empirical likelihood estimator*" $\hat{\theta}$ is defined as the vector which maximises $\ell_{max}(\theta)$. Berger and Torres (2016) showed that $\hat{\theta}$ is also the solution to the sample estimating equation

$$\sum_{i \in S} \pi_i^{-1} e(y_i, \theta) = 0. \tag{3}$$

For example, when θ_U is a population mean, we have $e(y_i, \theta) = y_i - \theta N n^{-1}$ and $\hat{\theta}$ is the Horvitz and Thompson's (1952) estimator. Hence, this estimator is a maximum empirical likelihood estimator. Traditional point estimators can be re-derived under the empirical likelihood framework. The key advantage is the self-normalising property which can be used for testing and model building.

The function (2) can be used for testing, by using the profile likelihood principle, or the self-normalisation property. Suppose we wish to test $H_0\colon \theta_U^{(1)} = \theta_0^{(1)}$, against $H_a\colon \theta_U^{(1)} \neq \theta_0^{(1)}$, where $\theta_U^{(1)} \in \mathbb{R}^{d_{\theta^{(1)}}}$ is a sub-parameter of θ_U; that is, $\theta_U = (\theta_U^{(1)\prime}, \theta_U^{(2)\prime})'$. Oğuz-Alper and Berger (2016) showed that under H_0,

$$\hat{r}\left(\theta^{(1)}\right) := 2\left\{\ell_{max}(\theta) - \max_{\theta_U^{(2)}} \ell_{max}(\theta)\right\} \xrightarrow{d} \chi^2_{d_{\theta^{(1)}}}, \tag{4}$$
$$\text{if } \theta^{(1)} = \theta_0^{(1)},$$

under with replacement stratified sampling, as $n \to \infty$, where $\chi^2_{d_{\theta^{(1)}}}$ denotes a χ^2-distribution with $d_{\theta^{(1)}}$ degree of freedom and $\theta = (\theta^{(1)\prime}, \theta^{(2)\prime})'$. Extensions to without-replacement sampling are given in Section 2.3. The function $\hat{r}\left(\theta^{(1)}\right)$ is an empirical likelihood ancillary ratio statistics. Thus, the p-value of the test $H_0\colon \theta_U^{(1)} = \theta_0^{(1)}$ is given by

$$\text{p-value} := \int_{\hat{r}\left(\theta_0^{(1)}\right)}^{\infty} \chi^2(x)\,dx, \tag{5}$$

where $\chi^2(x)$ is the density of the χ^2-distribution with $d_{\theta^{(1)}}$ degree of freedom. Inverse testing can be used to construct confidence intervals, when $\theta_U^{(1)}$ is unidimensional ($d_{\theta^{(1)}} = 1$); that is, the α-level confidence interval of a scalar $\theta_U^{(1)}$ is

$$CI\left(\theta_U^{(1)}\right) := \left\{\theta^{(1)} \colon \hat{r}\left(\theta^{(1)}\right) \leq \chi_1^2(\alpha)\right\},$$

where $\chi_1^2(\alpha)$ is the upper α -quantile of the χ^2-distribution with one degree of freedom. Note that $\hat{r}\left(\theta^{(1)}\right)$ is a convex non-symmetric function with a minimum at $\theta^{(1)} = \hat{\theta}^{(1)}$. This interval can be found by using any root search method. This involves calculating $\hat{r}\left(\theta^{(1)}\right)$ for several values of $\theta^{(1)}$. An algorithm to compute (4) can be found in Oğuz-Alper and Berger (2016, Appendix).

The ancillary statistics $\hat{r}\left(\theta^{(1)}\right)$ can be also used for model building, when comparing two nested models. In this case, $\theta_U = (\theta_U^{(1)\prime}, \theta_U^{(2)\prime})'$ is the parameter of the full model and $\theta_U^{(2)}$ is the parameter of the reduced model. The p-value (5) gives the significance of the relative fit.

Remark 2.1 *Berger and Torres* (2016) *and Oğuz-Alper and Berger* (2016) *used a different parametrisation based upon* $m_i := np_i\pi_i^{-1}$; *that is,*

$$L_{max}(\theta) := \max_{m_i: i\in S}\left\{\sum_{i\in S}\log(m_i) : m_i > 0, \sum_{i\in S} m_i\, e(y_i,\theta) = 0,\ \sum_{i\in S} m_i\pi_i\, z_i = \vec{n}\right\}. \tag{6}$$

By substituting m_i *by* $np_i\pi_i^{-1}$ *within* (6), *we obtain* $L_{max}(\theta) = \ell_{max}(\theta) + \sum_{i\in S}\log(n\pi_i^{-1})$. *Note that the quantity* $\sum_{i\in S}\log(n\pi_i^{-1})$ *does not depend on* θ *and* m_i. *Therefore* (2) *and* (6) *give the same maximum empirical likelihood estimate. Straightforward algebra shows that the same function* (4) *is obtained by using* (2) *or* (6). *The empirical log-likelihood function* (6) *may be more suitable in a survey sampling context, because the* m_i *are scale-loads which are estimated by the weights* π_i^{-1} *within* (3). *However, we prefer using* (2) *in order to simplify the comparison with other empirical likelihood approaches.*

2.1 Side information

Consider a different parameter $\varphi_U \in \mathbb{R}^{d_\varphi}$, which denotes some side information assumed known without sampling error, and such that

$$\sum_{i\in U} f(y_i,\varphi_U) = 0, \tag{7}$$

where $f(y_i,\varphi_U) \in \mathbb{R}^{d_f}$ ($d_f \geq d_\varphi$) is a known vector-function, which is often called "*auxiliary information*" in the survey sampling literature (e.g. Deville and Särndal, 1992; Lesage, 2011). For example, the most common situation in practice is to know a set of totals, means or proportions from large external censuses or surveys. Examples can be found in Imbens and Lancaster (1994), Berger and Torres (2016) and Oğuz-Alper and Berger (2016). Side information is the core of survey sampling theory (e.g. Kott, 2009). It can also be found in the mainstream empirical likelihood literature (Owen, 1991, 2001, §3.10) and in econometrics (Imbens and Lancaster, 1994).

Obviously, it will not be necessary to estimate φ_U because it is known. We shall treat φ_U as a vector of constants, not as a parameter to estimate. The idea is to combine θ_U and φ_U to improve the precision of θ_U. Let $\psi_U := (\theta_U', \varphi_U')'$ be the unique solution to

$$\sum_{i\in U} g(y_i,\theta,\varphi) = 0, \tag{8}$$

where

$$g(y_i,\theta,\varphi) := \{e(y_i,\theta,\varphi)', f(y_i,\varphi_U)'\}' \in \mathbb{R}^{d_g} \qquad (d_g \geq d_\theta), \tag{9}$$

with $e(y_i,\theta,\varphi)$ defined as in (1). Now, we write $e(y_i,\theta,\varphi)$ as a function of φ, because it may indeed depend on φ, as in Example 2.1 below. Note that (8) implies (7).

Example 2.1 *Suppose we wish to fit a logistic regression model with a known success rate in the population. In this case,* $y_i = (x_i', \delta_i)'$, *where* x_i *are some covariates and* δ_i *are the* (*dependent*) *binary variable specifying the successes and failures. Suppose that* $\varphi_U = N^{-1}\sum_{i\in U}\delta_i$ *is known. The estimating functions are* $e(y_i,\theta)$

$$e(y_i,\theta,\varphi) = x_i'\delta_i - x_i'\exp(x_i'\theta)\{1+\exp(x_i'\theta)\}^{-1},$$

$$f(y_i,\varphi) = \delta_i - \varphi.$$

With side information, Berger and Torres's (2016) "*empirical log-likelihood function*" is defined by

$$\ell_{max}(\theta,\varphi_U) := \max_{p_i : i\in S}\left\{\begin{matrix}\ell(p) : p_i > 0, \\ \sum_{i\in S}\frac{p_i}{\pi_i} g(y_i,\theta,\varphi_U) = 0, \sum_{i\in S} p_i\, z_i = \frac{\vec{n}}{n}\end{matrix}\right\}. \qquad (10)$$

It can be shown that the "*maximum empirical likelihood estimator*" $\hat{\theta}$ which maximises (10), is also the solution to

$$\textstyle\sum_{i\in S}\widehat{m}_i(\varphi_U)e(y_i,\theta,\varphi_U) = 0,$$

where $\widehat{m}_i(\varphi_U)$ are the empirical likelihood weights defined by

$$\widehat{m}_i(\varphi_U) := n\hat{p}_i(\varphi_U)\pi_i^{-1}, \qquad (11)$$
$$\hat{p}_i(\varphi_U) := n^{-1}\left\{1 + \eta(\varphi_U)' c_i(\varphi_U)\pi_i^{-1}\right\}^{-1},$$
$$c_i(\varphi_U) := \{f(y_i,\varphi_U)', \pi_i z_i'\}'.$$

Here, $\eta(\varphi_U)$ is a Lagrangian parameter which is such that

$$\sum_{i\in S}\widehat{m}_i(\varphi_U)c_i(\varphi_U) = (0', \vec{n}')'.$$

A modified Newton-Raphson algorithm (e.g. Polyak, 1987) can be used to compute $\eta(\varphi_U)$. Oğuz-Alper and Berger (2016) showed that the self-normalisation property holds; that is, (4) holds after replacing $\ell_{max}(\theta)$ replaced by $\ell_{max}(\theta,\varphi_U)$. Hence, (10) can be used for testing, confidence intervals and model building.

2.2 Empirical likelihood versus calibration

Empirical likelihood should not be viewed as a particular case of calibration (Deville and Särndal, 1992). Calibration relies on auxiliary information. On the other hand, empirical likelihood can be used without auxiliary information. However, the calibration property indeed holds with the empirical likelihood weights $\widehat{m}_i(\varphi_U)$ because the constrain within (10) and (9) imply

$$\sum_{i\in S}\widehat{m}_i(\varphi_U)f(y_i,\varphi_U) = 0.$$

This property is the consequence of the maximisation of (2) and the fact that φ_U is constant. Here, calibration is a property which is the results of a maximum likelihood principle. In survey sampling literature, calibration is viewed from a different angle. It is mainly a weighting procedure, rather than the consequence of the maximisation of likelihood function.

Calibration relies on a distance function between the sampling weights π_i^{-1} and the calibrated weights (Deville and Särndal, 1992). This function is only used for weighting and does not serve any other purpose, other than obtaining cosmetically acceptable weights. The distance function is also disconnected from the mainstream statistical theory. With empirical likelihood, we have an objective function $\ell(p)$, rather than a distance function, because $\ell(p)$ does not depend on π_i. This function is related to the likelihood principle in mainstream statistics. This function is used for point estimation, for tests and confidence intervals.

Empirical likelihood is based on a likelihood principle based on a maximisation of an objective function. This gives point estimates and an ancillary statistics (4). Calibration is just a procedure to obtain weights satisfying a given constraint. It is worth noticing that the first works related to calibration (Hartley and Rao, 1969; Owen, 1991; Imbens and Lancaster, 1994) are linked with likelihood principles.

2.3 Large sampling fractions and sampling without-replacement

The self-normalising property (4) is based on sampling with-replacement or sampling without-replacement with negligible sampling fraction n/N, since with and without-replacement sampling are equivalent when n/N is negligible. In this section, we show how empirical likelihood can be extended to accommodate non-negligible sampling fractions and sampling without-replacement. This approach is limited to single stage sampling. An extension to large sampling fraction with multi-stage sampling can be found in Berger (2018*a*).

The approach of Section 2.1 can still be used for point estimation, but the property (4) does not hold. A solution is to use Berger and Torres's (2016) "*penalised empirical likelihood function*", which is defined by

$$\tilde{\ell}_{max}(\theta,\varphi_U) := \max_{p_i:i\in S}\left\{\tilde{\ell}(p): p_i > 0, \sum_{i\in S}\frac{\nu_i}{\pi_i}g(y_i,\theta,\varphi_U) = 0, \sum_{i\in S}\nu_i\, z_i = \frac{\vec{n}}{n}\right\}.$$

where

$$\tilde{\ell}(p) := \sum_{i\in S}\log(p_i) - n\sum_{i\in S}p_i + n,$$

$\nu_i := p_i q_i - \psi_i$ are penalties, with $q_i := (1-\pi_i)^{1/2}$, $\psi_i := (q_i - 1)n^{-1}$. Note that ν_i is a function of p_i. The q_i are Hájek's (1964) finite population corrections. Under without-replacement stratified sampling and Hájek's (1964) asymptotic framework, Berger and Torres (2016) showed that under $H_0: \theta_U = \theta_0$, we have that

$$\tilde{r}(\theta,\varphi_U) := 2\left\{\tilde{\ell}_{max}(\varphi_U) - \tilde{\ell}_{max}(\theta,\varphi_U)\right\} \xrightarrow{d} \chi^2_{d_\theta}, \quad \text{if } \theta = \theta_0, \tag{12}$$

where

$$\tilde{\ell}_{max}(\varphi_U) := \max_{p_i:i\in S}\left\{\tilde{\ell}(p): p_i > 0, \sum_{i\in S}\frac{\nu_i}{\pi_i}f(y_i,\varphi_U) = 0, \sum_{i\in S}\nu_i\, z_i = \frac{\vec{n}}{n}\right\}.$$

Berger (2016) extended this Section's approach to Rao et al.'s (1962) sampling design with large sampling fraction. Tests and confidence regions can be derived from (12).

2.4 Multi-stage sampling

Berger (2018*a*) showed how empirical likelihood can be modified to accommodate multi-stage sampling and non-response, when the primary sampling units (PSUs) are sampled with unequal probabilities. The sample of PSUs can be stratified. Side information at PSU-level or at a lower level can be taken into account. The key assumption is a negligible sampling fraction at PSU-level.

The idea is to use a "*PSU-level empirical likelihood function*", which can be found in Berger (2018*a*). We not give the actual expression of this function, because the notations are heavy due to the multi-stage structure of the design. Berger (2018*a*) gives the regularity conditions under which the PSU-level empirical likelihood ratio statistics is ancillary as in (4). In Berger (2018*a*), this empirical likelihood approach is applied to a logistic model based on the 2006 PISA survey data (OECD, 2006) for the United Kingdom.
The empiric

This assumption of negligible sampling fraction can be relaxed, but there is a price to pay. Berger (2018*a*) showed how empirical likelihood can be modified to obtain an ancillary empirical log-likelihood ratio statistic likelihood under multi-stage sampling with large sampling fraction. Unfortunately, this involves calculating an adjustment factor based on variance estimates. In Berger (2018*a*), a simulation study suggests that the effect of this factor is small. Non-adjusted confidence intervals based on the PSU-level version of (4) gives more conservative intervals, and even better coverages than the approach involving an adjustment factor. Thus, this suggests that the more conservative confidence intervals based on (4) may be preferable.

2.5 Unit non-response

Non-response is another important aspect which is covered by Berger (2018*a*). In order to simplify the notation, we now consider a single-stage sampling. The general approach involving multi-stage sampling and non-response can be found in Berger (2018*a*). Response propensities can be used to adjust for missing data. This involves adding an additional non-response constraint to the empirical likelihood function. Adding the non-response constraint is equivalent of modifying the function (9); that is, (9) needs to be replaced by

$$g(y_i,\theta,\lambda,\varphi) := [r_i P_i(\lambda)^{-1} e(y_i,\theta,\varphi)', \xi_i'\{r_i - P_i(\lambda)\}, f(y_i,\varphi)']',$$

where $r_i = 0$ if the unit i is missing and $r_i = 1$ otherwise. Here,

$$P_i(\lambda) := \Psi^{-1}(\xi_i'\lambda),$$

where $\Psi^{-1}: \mathbb{R} \to (0,1]$ is the inverse of a link function Ψ (e.g. logit, probit, complementary log-log). The vector λ is a non-response parameter and ξ_i denotes (non-missing) variables, which defines the non-response mechanism. The function Ψ may describe re-weighting classes, when the ξ_i are dichotomous variables describing categories. In this case, $P_i(\hat{\lambda})$ reduces to response rates. For point estimation, the sample estimating equation (3) reduces to

$$\sum_{i\in S} \widehat{m}_i(\varphi_U) \frac{r_i}{P_i(\lambda)} e(y_i,\theta,\varphi_U) = 0, \tag{13}$$

$$\sum_{i\in S} \widehat{m}_i(\varphi_U) \xi_i'\{r_i - P_i(\lambda)\} = 0. \tag{14}$$

The quantities $r_i P_i(\lambda)^{-1}$ are "*propensity-score adjustments*". The non-response parameter λ is estimated from (14), which is the weighted estimating equation of a generalised linear model. The parameter θ_U is estimated from the equation (13), which includes the propensity-scores $r_i P_i(\lambda)^{-1}$.

Berger (2018*a*) showed that the independence between the response mechanism and the sampling design implies that the empirical log-likelihood ratio statistic likelihood (4) is ancillary and does not need to be adjusted for missing data. It is common practice to treat the estimated response propensities as deterministic within variance estimators. This may lead to shorter confidence intervals. Since the empirical log-likelihood ratio statistic likelihood possesses the self-normalising property, the confidence intervals reflect the estimation of these propensities.

3 Pseudo-empirical likelihood

Chen and Sitter (1999) developed a different empirical likelihood approach called "*pseudo-empirical likelihood*" (see also Wu and Rao, 2006; Rao and Wu, 2009). For simplicity, non-response is not considered in this Section. The "*pseudo-empirical log-likelihood function*" is defined by

$$\mathcal{L}_{max}(\theta,\varphi_U) := \max_{p_i: i\in S} \left\{ \mathcal{L}(p): p_i > 0, \sum_{i\in S} p_i\, g(y_i,\theta,\varphi_U) = 0, \sum_{i\in S} p_i\, z_i = 1_H \right\}. \tag{15}$$

where 1_H is the $H \times 1$ unit vector,

$$\mathcal{L}(p) := n \sum_{i\in S} \frac{\phi_i}{\pi_i} \log(p_i), \qquad \phi_i := \frac{1}{N} \sum\nolimits_{h=1}^{H} \frac{N_h}{\widehat{N}_h} z_{ih},$$

$N_h := \sum_{i\in U} z_{ih}$, $\widehat{N}_h := \sum_{i\in S} z_{ih}\, \pi_i^{-1}$. The function (15) is not an empirical likelihood function, because $\mathcal{L}(p)$ is different from $\ell(p)$. This is the reason why the approach is called "*pseudo-empirical likelihood*". The function $\mathcal{L}(p)$ is adjusted to take the design into account. The π_i are incorporated within $\mathcal{L}(p)$ and ϕ_i takes into account of the stratification. The stratification constraint $\sum_{i\in S} p_i\, z_i = 1_H$ is also different from the stratification constraint $\sum_{i\in S} p_i\, z_i = \vec{n} n^{-1}$ used within (2).

Chen and Sitter (1999) showed that the "*maximum pseudo-empirical likelihood estimator*", which maximises $\mathcal{L}_{max}(\theta, \varphi_U)$, is the solution to

$$\hat{E}(\theta, \varphi_U) := \sum_{i\in S} \widehat{w}_i(\varphi_U) e(y_i, \theta, \varphi_U) = 0, \tag{16}$$

where $\widehat{w}_i(\varphi_U)$ are the pseudo-empirical likelihood weights which are different from (11) (see Berger, 2018*b*, for an expression for $\widehat{w}_i(\varphi_U)$ using this paper's notation). Hence, maximum pseudo-empirical likelihood and empirical likelihood estimates are different. However, simulation studies in Berger and Torres (2016) shows that the differences are usually negligible, as long as the same side information is used.

The main issue with the pseudo-empirical likelihood approach is that the pseudo-empirical log-likelihood ratio statistic likelihood is not ancillary. To solve this problem, Wu and Rao (2006) proposed to multiply this statistics by a "*design effect*". However, we will see that this also bring other issues. Suppose that $d_\theta = d_e = 1$; that is, we have a scalar parameter θ_U. Let $\hat{\theta}$ be the maximum pseudo-empirical likelihood estimator. Wu and Rao (2006) showed that under $H_0{:}\, \theta_U = \theta_0$, we have that

$$\hat{r}(\theta, \varphi_U)_{PEL} := \frac{2\{\mathcal{L}_{max}(\hat{\theta}, \varphi_U) - \mathcal{L}_{max}(\theta, \varphi_U)\}}{Deff(\theta_0, \varphi_U)} \xrightarrow{d} \chi^2_{1,} \quad \text{if } \theta = \theta_0, \tag{17}$$

where $Deff(\theta_0, \varphi_U)$ is called the "design effect" and is given by

$$Deff(\theta_0, \varphi_U) := Var\{\hat{E}(\theta_0, \varphi_U)\} Var_{SRS}\{\hat{E}(\theta_0, \varphi_U)\}^{-1} \tag{18}$$

Here, $\hat{E}(\theta_0, \varphi_U)$ is defined by (16), when $d_e = 1$. The quantity $Var\{\hat{E}(\theta_0, \varphi_U)\}$ is the variance under the sampling design and $Var_{SRS}\{\hat{E}(\theta_0, \varphi_U)\}$ is the variance under simple random sampling. This design effect is a population value that would need to be estimated. We refer to Wu and Rao (2006), for more details about the estimation of (18).

Pseudo-empirical likelihood can be applied in principle to any complex sampling designs, because the design effect takes the complexity of the design into account. Note that the approach of Section 2 covers most of the designs used in practice. The property (4) is limited to multi-stage design with small sampling fractions. The property (12) holds for single stage design with large and small sampling fractions, under Hájek (1964) asymptotic framework.

The function (17) has the disadvantage of relying on variance estimates, which can be tedious to compute under complex sampling. The estimation of the design effect adds some additional variability that may affect the convergence of $\hat{r}(\theta, \varphi_U)_{PEL}$ towards the χ^2-distribution. Berger and Torres (2016) showed via a series of simulation that coverages of confidence intervals obtained from (4) and (12) are closer to the nominal value, than coverages obtained from (17).

The main disadvantage of pseudo-empirical likelihood is that (17) is based on a scalar parameter ($d_\theta = d_e = 1$). It cannot be used with multidimensional parameters, because the design effect has to be scalar; that is, $\hat{E}(\cdot)$ and the variances have to be unidimensional. Thus, the pseudo-empirical log-likelihood ratio statistic likelihood cannot be used for multidimensional regression parameters. It is recommended to use a traditional approach based on linearized variances estimates computed from (16) and use pseudo-empirical likelihood as a method to derive calibrated weights. This has modest advantages over traditional approaches. The key advantage of empirical likelihood is the self-normalising property which does not hold with pseudo-empirical likelihood for multidimensional parameters. On the other hand, the self-normalising property holds with multidimensional parameters under the approach of Section 2.

References

Berger, Y. G. 2016, "Empirical Likelihood Inference for the Rao-Hartley-Cochran Sampling Design," *Scandinavian Journal of Statistics*, 43, 721–735.

Berger, Y. G. 2018*a*, "An empirical likelihood approach under cluster sampling with missing observations," *Annals of the Institute of Statistical Mathematics (accepted for publication)*, https://eprints.soton.ac.uk/421738/.

Berger, Y. G. 2018*b*, "Empirical likelihood approaches under complex sampling designs," *Wiley StatsRef: Statistics Reference Online* doi: 10.1002/9781118445112.stat08066, 20pp.

Berger, Y. G., Torres, O. D. L. R. 2012, "A unified theory of empirical likelihood ratio confidence intervals for survey data with unequal probabilities," *Proceedings of the Survey Research Method Section of the American Statistical Association, Joint Statistical Meeting, San Diego*, p. 15pp.

Berger, Y. G., Torres, O. D. L. R. 2014, "Empirical likelihood confidence intervals: an application to the EU-SILC household surveys," *Contribution to Sampling Statistics, Contribution to Statistics: F. Mecatti, P. L. Conti, M. G. Ranalli (editors). Springer*, p. 20pp.

Berger, Y. G., Torres, O. D. L. R. 2016, "An empirical likelihood approach for inference under complex sampling design," *Journal of the Royal Statistical Society Series B*, 78(2), 319–341.

Chen, J., Sitter, R. R. 1999, "A pseudo empirical likelihood approach to the effective use of auxiliary information in complex surveys," *Statist. Sinica*, 9, 385–406.

Chen, S., Kim, J. K. 2014, "Population empirical likelihood for nonparametric inference in survey sampling," *Statist. Sinica*, 24, 335–355.

Deville, J. C., Särndal, C.-E. 1992, "Calibration Estimators in Survey Sampling," *Journal of the American Statistical Association*, 87(418), 376–382.

Godambe, V. 1966, "A new approach to sampling from finite population I, II," *Journal of the Royal Statistical Society Series B*, 28, 310–328.

Hájek, J. 1964, "Asymptotic Theory of Rejective Sampling with Varying Probabilities from a Finite Population," *The Annals of Mathematical Statistics*, 35(4), 1491–1523.

Hartley, H. O., Rao, J. N. K. 1968, "A new estimation theory for sample surveys," *Biometrika*, 55(3), 547–557.

Hartley, H. O., Rao, J. N. K. 1969, "A new estimation theory for sample surveys, II," in *New Developments in survey Sampling*, eds. N. L. Johnson, H. J. Smith, New York: John Wiley and Sons, pp. 147–169.

Horvitz, D. G., Thompson, D. J. 1952, “A Generalization of Sampling without Replacement from a Finite Universe,” *Journal of the American Statistical Association*, 47(260), 663–685.

Imbens, G. W., Lancaster, T. 1994, “Combining Micro and Macro Data in Microeconometric Models,” *The Review of Economic Studies*, 61(4), 655–680.

Kott, P. S. 2009, “Calibration weighting: combining probability samples and linear prediction models,” in *Sample Surveys: Design, Methods and Applications*, eds. D. Pfeffermann, C. Rao, Handbook of Statistics, Amsterdam: Elsevier, pp. 55–82.

Lesage, E. 2011, “The use of estimating equations to perform a calibration on complex parameters,” *Survey Methodology*, 37(1), 103–108.

Neyman, J. 1938, “On the Two Different Aspects of the Representative Method: The Method of Stratified Sampling and the Method of Purposive Selection,” *Journal of the Royal Statistical Society*, 97(4), 558–625.

OECD 2006, *PISA 2006 Technical Report*, https://www.oecd.org/pisa/data/42025182.pdf.

Oğuz-Alper, M., Berger, Y. G. 2016, “Empirical likelihood approach for modelling survey data,” *Biometrika*, 103(2), 447–459.

Owen, A. B. 1988, “Empirical Likelihood Ratio Confidence Intervals for a Single Functional,” *Biometrika*, 75(2), 237–249.

Owen, A. B. 1991, “Empirical Likelihood for Linear Models,” *Ann. Statist.*, 19(4), 1725–1747.

Owen, A. B. 2001, *Empirical Likelihood*, New York: Chapman & Hall.

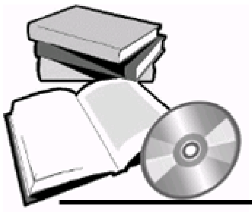
Polyak, B. T. 1987, *Introduction to Optimization*, New York: Optimization Software, Inc., Publications Division.

Qin, J., Lawless, J. 1994, “Empirical Likelihood and General Estimating Equations,” *Ann. Statist.*, 22(1), pp. 300–325.

Rao, J. N. K., Hartley, H. O., Cochran, W. G. 1962, “On a Simple Procedure of Unequal Probability Sampling without Replacement,” *J. R. Stat. Soc. Ser. B. Stat. Methodol.*, 24(2), pp. 482–491.

Rao, J. N. K., Wu, C. 2009, “Empirical Likelihood Methods,” in *Sample Surveys: Inference and Analysis*, eds. D. Pfeffermann, C. Rao, Handbook of Statistics, Amsterdam: Elsevier, pp. 189–207.

Wu, C., Rao, J. N. K. 2006, “Pseudo-empirical likelihood ratio confidence intervals for complex surveys,” *Canada. J. Statist.*, 34(3), 359–375.



Book and Software Review

An overview of "Cross-cultural Survey Guidelines"

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Recently we were lucky to learn about the "Cross-cultural Survey Guidelines" (CCSG), which, in our opinion, is an extremely useful resource for survey statisticians all over the world.

According to the information, presented at the website http://www.ccsg.isr.umich.edu/ the "Cross-cultural Survey Guidelines" were developed as part of the Comparative Survey Design and Implementation (CSDI) Guidelines Initiative. The aim of the Initiative was to promote internationally recognized guidelines that highlight best practice for the conduct of multinational, multicultural, or multiregional surveys, which were referred to as "3MC" surveys. The intended audience is researchers and survey practitioners planning or engaged in comparative survey research across cultures or countries.

The CCSG Guidelines draw upon and are based on: (1) general good practice survey methodology, as well as cross-cultural and comparative literature on survey methodology; (2) available study-specific manuals and documentation; and (3) the experiences and lessons learned that authors, reviewers, and editors have added through their work on and with numerous comparative surveys. At the present time, the Guidelines relate to not just cross-sectional surveys of households and individuals but also computer-assisted personal interviewing modes and the usage of pardata and statistical analyses. At a later point in time, they may be expanded to include establishment and longitudinal surveys.

The CCSG initiative is led by Beth-Ellen Pennell, currently the director of international survey operations at the Survey Research Center, Institute for Social Research at the University of Michigan. Also instrumental in the development and operationalization of the guidelines are Kirsten Alcser and Sue Ellen Hansen of Survey Research Operations, Survey Research Center, and Institute for Social Research. The guidelines were initiated at the 2005 meeting of CSDI and have involved more than 70 **survey research professionals** from more than 35 organizations worldwide. **The list of contributors can be found at** http://www.ccsg.isr.umich.edu/index.php/about-us/contributions**.** The authors of the Guidelines hold the copyright for all materials presented at CCSG website.

The goal of the CSDI Initiative has been to develop **Cross-Cultural Survey Guidelines**, which cover all aspects of the survey lifecycle. This currently has resulted in 18 chapters and 11 sub-chapters. Three additional chapters on study design and organizational structure, survey quality, and ethical considerations are relevant to all processes throughout the survey production lifecycle.

The 18 chapters of the CCSG Guidelines are:

- Study Design and Organizational Structure
- Study Management
- Tenders, Bids, & Contracts
- Sample Design
- Questionnaire Design
- Instrument Technical Design
- Translation
- Adaptation
- Pretesting
- Interviewer Recruitment, Selection, and Training
- Data Collection
- Paradata and Other Auxiliary Data
- Data Harmonization
- Data Processing & Statistical Adjustment
- Data Dissemination
- Statistical Analysis
- Survey Quality
- Ethical Considerations

All of the chapters have a similar layout. Each chapter is composed of a set of guidelines containing the subsections of rationale, procedural steps, and lessons learned. The "Rationale" provides some background on the guideline; the "Procedural steps" show the way through the process of implementing the guideline; and the "Lessons learned" provide some context for outcomes related to the guideline. Navigate to the chapters with guidelines by clicking on a stage in the survey lifecycle in the figure or by using the menu to the left at the tab "Chapters".

On the "Resources" tab of the website, one can find links to "Global Glossary" with survey terms and their detailed definitions, and to "Global References" with the literature used for creation of the Guidelines. Also, it is possible to download the files with the CCSG Full Guidelines, CCSG Global Glossary, CCSG Global References, or Individual Chapters of CCSG from the "Downloads" link.

The new 2016 version of the Guidelines consists of 853 pages. The guidelines that were published in 2010 have been archived. The old version is available; the link can be found by clicking the "Archive" link under the "Resources" tab.

Concluding, we must say that the website is very user-friendly, and the authors have presented the Guidelines so well, that it is hard to add something else. We have gained the impression that these Guidelines are ready-to-use tutorials for all stages of comparative surveys, containing not only necessary information and procedures for performing specific tasks of the surveys but also numerous references for deeper understanding the considered issues. We are particularly impressed by the "Lessons learned" sections of the Guidelines and examples from real surveys given in these sections.

Also, we should mention the Appendix A “Code resources for different types of analysis using different software packages” of the Chapter “Statistical Analysis”, which provides links to different statistical analysis techniques using such statistical packages, as SAS, R, Stata, Mplus and LISREL, as well as links to specific codes, their descriptions, and examples of their usage.

Certainly, the authors of the “Cross-cultural Survey Guidelines” have done a great job and deserve special gratitude from the statistical community. We are sure that users will highly appreciate this resource.

References:

Survey Research Center. (2016). *Guidelines for Best Practice in Cross-Cultural Surveys*. Ann Arbor, MI: Survey Research Center, Institute for Social Research, University of Michigan. Retrieved April, 20, 2018, from http://www.ccsg.isr.umich.edu/

ARGENTINA

Reporting: Veronica Beritich

Presentation of the Unique Registry of Cases of Violence against Women

The National Institute of Statistics and Censuses (INDEC) announced the presentation of the Unique Registry of Cases of Violence against Women (RUCVM), whose objective is to centralize and systematize the information available in administrative records on this social problem. The first report was published on March 7, 2018 and will have an annual periodicity.

Data, based on complaints from women aged 14 years and over who have been victims of violence, were collected and processed by the INDEC in an administrative record.

The RUCVM is the result of a joint effort between INDEC, the National Institute for Women (INAM), the Provincial Statistics Offices and the agencies that assist and record cases of violence against women. In this first edition, it gathers the records provided between 2013 and 2017. As established by Statistical Secrecy Law No. 17.622, the INDEC will not disseminate information that puts at risk the integrity and safety of women complainants. To preserve confidentiality of responses, no microdata files will be released, only cross tabulations between two or three variables.

In the initial registry, the INDEC articulated with 12 national institutions and 45 provincial and municipal levels, seeking that all provinces and agencies that have basic statistics adhere to the Registry to achieve full coverage. The sources correspond to administrative records, which have a totally different objective than censuses and surveys. There, a request for assistance is registered by a woman who is suffering from an aggression at that precise moment. The information that is processed is very heterogeneous. For this reason, the variable 'type of registration' is included to differentiate, for example, how many cases are advisory and how many are judicial or police complaints. Also other variables about the fact of abuse are considered as ‘modality of violence’ (domestic; institutional; at workplace; against the reproductive freedom; obstetrical), ‘frequency of violence’ (once; more than once), ‘duration of abuse’(less than 1 year; 1-5 years; 6-10 years; more than 10 years), ‘type of violence’(psychological; symbolic; economic/property; sexual; physical), and ‘number of types of violence’(1; 2; 3 and over).

The objective of the RUCVM is to characterize the victims socio-demographically, according to their age, their level of education and their work situation, identifying the link with the aggressor (partner; ex-partner; children; father; mother; others; unknown) and the Characteristics of the fact of abuse. There is also information about the aggressors: their age, gender, their level of education and their work situation.

The Unique Registry will be a tool for the organisms that are responsible for the elaboration of social policies to generate the mechanisms to eradicate gender violence.

General information on this survey can be found at www.indec.gob.ar.
For further information, please contact ces@indec.gob.ar.

BOSNIA AND HERZEGOVINA

Reporting: Edin Šabanović

New master sampling frame will be created in Bosnia and Herzegovina

The Agency for Statistics of Bosnia and Herzegovina is preparing a project for creating a new master sampling frame for household based statistical surveys. The project is related to total enumeration of individuals, households and dwellings within nearly 3,000 enumeration areas. These enumeration areas will be primarily sampling units and they are selected from the data base of 2013 Census of Population, households and Dwellings in Bosnia and Herzegovina. The enumeration will be made on a quarterly basis within three successive years. It is harmonized with the sizes and designs of most important households surveys (Labor Force Survey, Household Budget Survey, EU-SILC and ICT Survey), which will be conducted in this period, allowing also the introduction of other surveys. In the first enumeration year about 1,500 enumeration areas will be enumerated and this part of project is financially supported by European Delegation in Bosnia and Herzegovina and Eurostat. The second half of enumeration areas will be enumerated in last two project years and this enumeration will be financed by budgets of three statistical institutions in Bosnia and Herzegovina. The whole project is technically supported by the World Bank and within a scope of the current multi-annually project of the cooperation between the Agency for Statistics of Bosnia and Herzegovina and the World Bank.

Updated master sampling frame will allow the Agency for Statistics of Bosnia and Herzegovina to better design sample surveys, to reduce respondent burden and to have more reliable survey results. Consequently, it will increase the level of the harmonization of the statistical system of Bosnia and Herzegovina with the European Union statistics.

For more information, contact Edin Šabanović (edin.sabanovic@bhas.gov.ba), Sector for Statistical Methodology, Standard, Planning, Quality and Coordination, Agency for Statistics of Bosnia and Herzegovina.

CANADA

Reporting: Serge Godbout, Lucie Veilleux, Jessica Legault and Nathalie Hamel

Feasibility Study on GPS Data – Deriving and Classifying Trucking Stops and Business Register Linkage

A review of the *Canada Transportation Act* revealed that users require more and better quality transportation data to deal with many key issues. Statistics Canada is preparing the redesign of the Trucking Commodity Origin and Destination Survey, aiming to simplify the sampling design, modernizing the data collection and processing and improving the survey coverage. The evaluation of GPS data as a new source for trucking data has been identified as a priority.

A feasibility study was conducted in the summer of 2017 using GPS test files provided to Statistics Canada by Transport Canada. These files contained date, time, latitude and longitude of GPS records (pings) from more than 40,000 trucks owned by 670 different companies and covered the time period between July and December 2016. Internal identifiers for companies and GPS devices were also included but cannot be used for direct identification. The goal of this first study was to elaborate, experiment and assess methods to translate the raw GPS data into concepts usable to analyze truck trips and model commodity movements.

The key concept for the GPS analysis was the trucking stop. An algorithm to derive trucking stops from a sequence of pings was proposed by Gingerich et al. (2016). A stop is confirmed if a truck has 2 or more consecutive pings within a specified radius, for at least a minimum elapsed time threshold. When time between pings is longer than the time threshold, a stop is considered possible if the average travel speed between 2 consecutive pings is smaller than a maximum speed threshold. Many combinations of radius and time thresholds were tested and the parameters proposed by Gingerich et al. (2016), 250 metres radius and 15 minutes, based on spatial error analysis were confirmed as balancing false positive and false negative errors though further analysis have shown some missed trucking stops. The use of less stringent parameters should minimize the proportion of missing real stops which are considered major errors when analysing trucking trips.

A trucking stop can be classified into primary, which implies a transfer of commodities (pickup or drop off), or secondary to accommodate truck or driver needs (coffee, fuel refill…) without commodity transfer. The distributions of the stopping locations and the route deviations for each stop have been analyzed to validate two assumptions: first, secondary stops are more likely to be visited by multiple companies, and second, they are also less likely to show large route deviation when comparing to the stops right before and after. The coherence between both measures was quite high, though the study of some trips highlighted that primary versus secondary classification should not be treated as absolute but as an indicator to identify highly probable pickup or drop off stops and likely ignorable stops for commodity movements.

The trucking stops were matched by coordinates to the operating entities on the Business Register to associate economic activities. Originally, the target was to link a stop to a single business but we quickly realized that any error may compromise the consistency of a truck trip. Instead, a more flexible linkage process generated an inventory of the businesses in the close area around each stop, with the list of the expected economic activities. In general, the record linkage worked well but detailed examinations of the results for some stops has shown important limitations. First, to be on the Business Register, an operating entity has to meet criteria on permanency and dedicated labour and capital, which may be an issue for some industries like forestry or oil exploration. As a second limitation, the stop coordinates generally point to a parking lot while the coordinates available on the Business Register refer to the civic address, usually located on the street or the street block.

Assuming that the truck is owned by or operates for the most frequent business in its stop network, another significant value from the Business Register linkage is the possibility of associating the statistical data generated from a truck's GPS data to a specific business. Two thirds of the companies with GPS stops located in Canada were associated to a single company, primarily in transportation, manufacturing, construction, wholesale trade and retail trade. This result opens the possibility of using statistical information derived from GPS data as a replacement for collected data or nonresponse imputation for sampled companies.

In conclusion, this feasibility study demonstrated that the GPS data have the potential for many analytical uses. The data can be used to derive trucking stops and trips, calculate trip distances, measure road congestion and stopping time. We recommend testing the development of performance measures for trucking industry analysis.

Reference

Gingerich, K., Maoh, H., & Anderson, W. (2016). Classifying the purpose of stopped truck events: An application of entropy to GPS data. Transportation Research Part C: Emerging Technologies, 64, 17-27.

GERMANY

Reporting: Ralf Münnich

A Simulation Centre for Germany

The German Research Foundation (Deutsche Forschungsgemeinschaft) has granted the Research Unit Multi-Sectoral Regional Microsimulation Model (MikroSim). The goal of this project is to develop a microsimulation model for the German population on person- and household-level based on existing data including surveys and administrative data. The Research Unit is a collaboration of Ralf Münnich (spokesman, Trier University), Rainer Schnell (co-spokesman, University of Duisburg-Essen), Johannes Kopp (Trier University), Petra Stein (University of Duisburg-Essen) and Markus Zwick (German Federal Statistical Office).

The project is based on detailed regional data down to the lowest available aggregation level in Germany. The primary purpose of the simulation is the study of socio-economic effects of elderly care and migration. Since the required micro-data does not exist, a synthetic population database will be constructed from conditional distributions estimated from surveys. In addition, known totals from administrative or census data will be used for calibration. Some of the required totals may not be available on the respective regional level with sufficient accuracy but can be obtained using small area estimation. The estimates will be mapped down to geographical structures extracted from OpenStreetMap. For updating the synthetic population, a series of different program modules will be developed. The modules will allow the study the socio-economic effects of different policies over time.

The modules developed first will model need for the care of the elderly and the integration of migrants into the labour market. The future demand for care of the elderly depends on the socio-demographic development and household composition of the population. By modifying the projection modules, the model will be able to identify critical paths for social change.

These studies are intended to avoid undesirable social developments. Policymakers have recognized the importance and the power of microsimulation tools and have modified the German statistics law accordingly. The German Federal Statistical Office is now obliged to conduct microsimulations. The computing capacity to manage such intensive tasks has just recently become available. One of the aims of the project is to open the simulation model and the underlying database as a research infrastructure to other researchers.

HUNGARY

Reporting: Máté Dobány

Sample Coordination to Reduce the Response Burden

In business populations, the distribution of study variables is usually much skewed. This produces high sampling fractions among medium and large businesses, which implies a significant administrative burden on these respondents. Since the burden placed on these businesses can easily result in increasing non-response rates, which strongly affects the quality of official statistics, the need for methods to limit the burden has arisen at the Hungarian Central Statistical Office (HCSO). **Sample coordination** aims at obtaining good estimates for each wave of the surveys while spreading the response burden across the entire population.

Since business populations of Hungary change dynamically from one sampling occasion to the next, and so does the ratio of businesses moving from one sampling stratum to another, a sampling coordination method that could handle these survey features needed to be developed. Furthermore, as the majority of business surveys at the HCSO use stratified random sampling, the sampling coordination method should not alter the probability of inclusion to avoid biased estimates.

After the construction of instruments indispensable for the new coordination technique (response burden values of surveys, artificial stratification that helps avoiding under- or overrepresentation of certain businesses in the samples), through the use of carefully implemented simulations of sample selections on actual populations, it was examined whether the new method meets all the following criteria:

- it spreads the total response burden significantly more evenly than the current sample selection design
- it does not affect the sampling selection probabilities
- it has no adverse effect on the estimates, i.e., they remain approximately normally distributed and unbiased

To measure the efficiency of sample coordination, the number of samples in which the businesses were selected to during a given time period were examined, and the expected, actual and avoidable loads were also analyzed. The results clearly showed that the new method could spread the total response burden significantly more evenly amongst the population, and the avoidable load could have been reduced by 90-95%.

In order to answer the question whether the currently used estimation methodology still holds after introducing the new sampling coordination method, the empirical selection probabilities resulting from the simulations were compared to the theoretical probabilities by using asymptotic confidence intervals and u-tests. In addition, based on net income data provided by National Accounts, the estimates were calculated for all the simulated samples to analyze how well their distribution follow the normal distribution, and whether the estimates remained unbiased. It was confirmed by the results that using sample coordination does not affect the estimates negatively.

The proposed sampling coordination method has already been approved, and the sampling selection procedure of business surveys is currently under significant development to incorporate the coordination technique. For more information, please contact Máté Dobány at Mate.Dobany@ksh.hu.

ISRAEL

Reporting: Eran Ropalidis

New Developments at the Israel Central Bureau of Statistics

We are pleased to report on several developments at the Israel Central Bureau of Statistics (ICBS) since the last country report.

The importance of statistics as an essential component for government decision making, as well as for research and practically all aspects of life, is well recognized. In October of last year, the National Statistician made an hour-long presentation before the Government of Israel that highlighted new statistics which were collected and produced in the previous year. This presentation, the second of its kind, was well-received by the Prime Minister and other government ministers.

Following the National Statistician's decision to promote the establishment of a National Statistical System, a conference was held in November, 2017, in which representatives from various government ministries discussed the importance of relevant data in decision-making, the necessity of high quality data collection and processing, and the need to coordinate their work. The conference underlined the importance of a coordinated National Statistical System committed to upholding international quality standards for official statistics, based on the experience accumulated throughout the world and in Israel. The need to develop practical tools for building such a system to answer the needs of the public and decision makers has been emphasized, and the system is being consolidated.

Preparations are underway for Israel’s 2020 Census. In 2017, an initial field test was conducted, which examined various aspects of census work: methodology, technology, interviewing, use of the internet as a preferred mode of response, etc. In addition, this year, the first agriculture census after a 35 year hiatus will be conducted, with the aim of obtaining an up-to-date picture of agriculture and the structure of the agricultural economy in Israel.

The second Twinning Program with Statistics Denmark will come to an end in August of this year. Following the success of the first Twinning Program which began in 2013, the second program started in October 2016 with four components: 1) enhancing quality management of official statistics in Israel; 2) developing procedures for enhancing access to microdata by researchers; 3) further development of infrastructure for agricultural statistics (specifically, a farm register); 4) developing methodological and geo-spatial tools for improving the quality and efficiency of field surveys. The Twinning Program is funded by the European Union.

The use of indices characterizing the local authorities has contributed to the implementation of differential central government policies relating to local authorities. Following a request by the Finance Committee of the Knesset, in 2016 the ICBS published a new socio-economic index of localities in Israel. This index reflects an analysis of the socio-economic characteristics of the population residing in the locality, such as financial resources, education, housing, etc. In addition, in 2017, the ICBS developed a new peripherality index to measure the geographical position of a locality with respect to the centers of economic activity. The peripherality index is derived on the basis of the proximity of the locality to all the other localities in the country, taking into account population size and proximity to the Tel Aviv District, which is the country's economic and business center.

In March of this year, the ICBS published the third government report on a large number of indices of well-being, sustainability, and national resilience in the following domains: quality of employment; personal security; health; housing and infrastructure; education; higher education and skills; personal and social well-being; environment; civic engagement and governance; material standard of living; information technology; and leisure, culture, and community. To date, 61 indicators in these domains have been developed, and the work on developing new indices continues. In addition, and for the first time, the report includes data on the quality of life in large cities. The report was published as part of the implementation of a government resolution from 2015 that the ICBS will publish these indicators annually.

Finally, the Public Council on Statistics in Israel, together with the ICBS, has appointed an advisory committee made up of academic specialists and experts from the public and private sectors to overview the statistics published by the ICBS on the housing market. The committee worked very intensively for more than a year and formulated recommendations in a variety of aspects that improve the information published to the general public, decision makers in the housing market and researchers. The interim recommendations of the committee and the findings of the report were published last January.

NEW ZEALAND

Reporting: Chen Chen

Reducing respondent burden and producing new insights: Administrative data and the Retail Trade Survey

In 2017, Stats NZ applied a new 'administrative data first' design for the Retail Trade Survey. This continues the journey of breaking our reliance on sample surveys, and their inherent disadvantages of data from a limited number of businesses and high levels of respondent burden and collection costs.

This approach maximises the use of the goods and services tax (GST) administrative data from Inland Revenue for sub-annual business financial collections, where GST data (direct or modified by modelling) is used wherever possible, supplemented by a managed collection of large and complex businesses where the use of administrative data is not suitable.

Advantages of the redeveloped Retail Trade Survey

As well as significantly reducing respondent burden – the increased use of the GST data allowed us to reduce direct surveying of retail businesses by 90 percent – we were able to add new variables to the collection, thus supplement the existing sales and inventories variables. We can now measure purchases, salaries and wages, and operating profit primarily using administrative data. We published the first outputs using this approach in Retail trade survey: September 2017 quarter. [Note for Survey Statistician: link here is www.stats.govt.nz/information-releases/retail-trade-survey-september-2017-quarter].

We overcame some limitations of the historic design for Retail Trade associated with a stratified random sampling. We found evidence that the series produced by the new design are of better quality, due to the GST data's 'near census' coverage. We also moved the production of Retail Trade from a stand-alone system to a multi-faceted system that produces most of our economic outputs, resulting in increased efficiencies.
The redevelopment also created flexibility in our statistical production. The 'census-like' coverage enables us to produce estimates at lower levels of detail for the likes of ad-hoc research and in response to new customer demands. For example, we have produced new retail trade series for the 16 regional council across New Zealand. We also produced new insights into retail sales patterns in the Upper South Island following the 2016 Kaikoura earthquake.

Stats NZ first introduced the 'administrative data first' design to the production of existing manufacturing and wholesale trade outputs in the September 2015 quarter. This created efficiencies by reducing the sample size for the manufacturing and wholesale industries from 1800 to 900, which we estimated the time savings to small and medium sized businesses to be over 1000 hours a year. In the June 2016 quarter, we expanded this new design out to most industries in the economy and created an experimental Business Data Collection. This will support the development of quarterly income measures in our economic statistics.

For more details of the new developments:

- Stats NZ (2017). Methodology changes to the Retail Trade Survey. Available from http://archive.stats.govt.nz [Note for Survey Statistician: link here is http://archive.stats.govt.nz/browse_for_stats/industry_sectors/RetailTrade/Methodology-changes-retail-trade.aspx
- Stats NZ (2017) Business Data Collection – Initial data release. Available from http://innovation.stats.govt.nz [Note for Survey Statistician: link here is http://innovation.stats.govt.nz/initiatives/business-data-collection-initial-data-release/?_ga=2.93521817.522762208.1523831479-2088791063.1507001800]
- Contact: chen.chen@stats.govt.nz

POLAND

Reporting: Tomasz Żądło

Polish Statistics Competition for high school students

On 13th March 2018 took place the final of the second annual Polish Statistics Competition for high school students. It was organized by Statistics Poland and Polish Statistical Association under the patronage of the Ministry of National Education. The competition is organized to promote the interests of high school students in statistics in socio-economic analyses. The scope of the Statistics Competition concentrates on the following topics: survey programs of official statistics; descriptive statistics; probability theory; market, economy and enterprises; socio-economic transformations in Poland and in the world; social structure in Poland and the European Union; technology, environment and health sciences.

In the first stage of the competition took part almost 2600 students from more than 300 high schools in Poland. The second stage was organized in 16 regions by local statistical offices and universities located in these regions. In the final stage 30 high school students competed in Warsaw in the head office of Statistics Poland. In each stage students had to solve tests with the following types of tasks: true/false, multiple choice and ordering answers (e.g. ordering countries according to increasing values of HDI index) in the appropriate sequence. The last type of tasks was assessed based on the transformed value of Spearman’s rank correlation coefficient between the sequence ordered by students and the correct sequence. Additionally, in the final stage students were solving problems based on three data sets.

Students could win: free admissions to cooperating universities, laptops, 5000 PLN or 3000 PLN or 2000 PLN (ca. €1200 or €700 or €500) prize money for first three finalists and the familiarization trip to Brussels (European Parliament).

Upcoming Conferences and Workshops

The list below highlights events that have sessions or main subject related to areas such as survey methods, official statistics, data linkage and confidentiality. For a more wide-ranging list, please check the ISI Calendar of Events at
https://www.isi-web.org/index.php/activities/calendar

28th Annual Conference of the International Environmetrics Society (TIES2018)
Where: Guanajuato, Mexico
When: July 16 - 21, 2018
Homepage: ties2018@cimat.mx

ECMTB2018
The 11th European Conference on Mathematical and Theoretical Biology (ECMTB 2018)
Organized by: CMAF-CIO
Where: Lisbon, Portugal
When: July 23 – 27, 2018
Homepage: http://www.ecmtb2018.org

Second International Conference on the Methodology of Longitudinal Surveys
Organized by: Understanding Society
Where: Essex, United Kingdom
When: July 25 – 27, 2018
Homepage: https://www.understandingsociety.ac.uk/mols2

The Joint Statistical Meetings (JSM) 2018
Organized by: Lead with Statistics Vancouver Convention Centre
Where: Vancouver, British Columbia, Canada
When: July 28 - August 2, 2018
Homepage: http://ww2.amstat.org/meetings/jsm/2018/conferenceinfo.cfm

Baltic-Nordic-Ukrainian Network Workshop on Survey Statistics 2018
Organized by: Baltic-Nordic-Ukrainian Network
Where: Jelgava, Latvia
When: August 21-24, 2018
Homepage: https://wiki.helsinki.fi/display/BNU/Events

Joint International Society for Clinical Biostatistics and Australian Statistical Conference 2018
Where: Melbourne Convention and Exhibition Centre, Australia
When: August 26 – 30, 2018
Homepage: iscbasc2018@arinex.com.au

Utrecht University Summer School Course: Survey Research; Statistical Analysis and Estimation
Organized by: Utrecht University Summer School
Where: Utrecht, The Netherlands
When: August 27 - 31, 2018
Homepage: http://www.utrechtsummerschool.nl/courses/social-sciences/survey-research-statistical-analysis-and-estimation

COMPSTAT 2018
Organized by: The 23rd International Conference on Computational Statistics
Where: Unirea Hotel, Iasi, Romania
When: August 28-31, 2018.
Homepage: http://www.compstat2018.org/

Royal Statistical Society 2018 International Conference
Organized by: The Royal Statistical Society
Where: Cardiff, Wales
When: September 3-6, 2018
Homepage:
http://www.rss.org.uk/RSS/Events/RSS_Conference/2018_International_Conference/RSS/Events/Conference/RSS_2018_International_Conference.aspx?hkey=a556f955-22c6-4502-8956-5994c7f7c047_

ISMI-ICTAS18
Organized by: Malaysia Mathematics in Industry Workshop (MMIW 2018)
Where: UTM Kuala Lumpur, Malaysia
When: September 4-9, 2018
Homepage: http://www.science.utm.my

ADVICE/2018 – FIRST INTERNATIONAL CONFERENCE ON STATISTICAL ADVICE
Organized by: Oslo Centre for Biostatistics and Epidemiology (OCBE)
Where: Oslo, Norway
When: September 9-11, 2018
Homepage: http://www.advice2018.bio

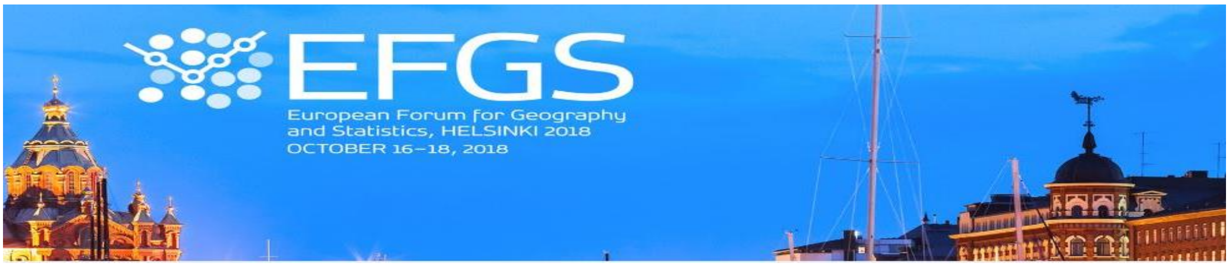
6th International Conference on the Use of R in Official Statistics (uRos2018)
Organized by: Statistics Netherlands
Where: The Hague, The Netherlands
When: September 12 – 14, 2018
Homepage: https://www.aanmelder.nl/uros2018

IAOS-OECD Conference 2018
Organized by: The International Association for Official Statistics (IAOS) and the Organisation for Economic Co-operation and Development (OECD)
Where: Paris, France
When: September 19 – 21, 2018
Homepage: http://www.oecd.org/iaos2018/

SINAPE 2018
Organized by: Fonte Colina Verde
Where: São Pedro, Brazil
When: September 23-28, 2018
Homepage: http://www.sinape2018.com.br/

IEREK
Organized by: The International Conference On Future Smart Cities
Where: Cairo, Egypt
When: September 25 – 27, 2018
Homepage: https://www.ierek.com/events/future-smart-cities

UNECE Workshop on Statistical Data Collection
Organized by:
Where: Palais des Nations in Geneva
When: October 10-12, 2018
Homepage: https://statswolo.unece.org/display/Collection/2018+Data+Collection+Workshop



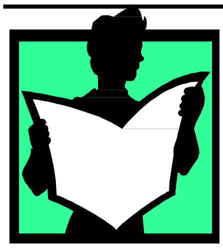
11th Conference on the Integration of Geography and Statistics
Organized by: The European Forum for Geography and Statistics (EFGS)
Where: Marina Congress Center, Helsinki, Finland
When: October 16 – 18, 2018
Homepage: www.efgs2018.fi

10ème COLLOQUE FRANCONPHONE SUR LES SONDAGES
Organized by: 10ème Colloque francophone sur les sondages
Where: l'Université de Lyon
When: 24 au 26 octobre 2018
Homepage: http://sondages2018.sfds.asso.fr./

11th International Statistics Days Conference (11th ISDC)
Where: Bodrum Mugla **TURKEY**
When: October 3 – 7, 2018
Homepage: www.igs2018.mu.edu.tr

BigSurv 2018
Organized by: International Conference on Big Data Meets Survey Science
Where: Barcelona, Spain
When: October 25 – 27, 2018
Homepage: http://www.bigsurv18.org/

62nd ISI World Statistics Congress 2019 (ISI WSC 2019)
Organized by: International Statistical Institute (ISI) 62nd ISI World Statistics Congress
When: August 18-23, 2019
Where: Kuala Lumpur, Malaysia
Homepage: http://www.isi2019.org/



In Other Journals

Journal of Survey Statistics and Methodology

Volume 6, Number 2 (June 2018)
https://academic.oup.com/jssam/issue

Survey Methodology

Statistics Canada Statistique Canada Canada

Volume 44, Number 1, (June 2018)
http://www.statcan.gc.ca/pub/12-001-x/12-001-x2017001-eng.htm

Model based inference using ranked set samples
Omer Ozturk and Konul Bayramoglu Kavlak

Linearization versus bootstrap for variance estimation of the change between Gini indexes
Guillaume Chauvet and Camelia Goga

Growth Rates Preservation (GRP) temporal benchmarking: Drawbacks and alternative solutions
Jacco Daalmans, Tommaso Di Fonzo, Nino Mushkudiani and Reinier Bikker

Investigating alternative estimators for the prevalence of serious mental illness based on a two-phase sample
Phillip S. Kott, Dan Liao, Jeremy Aldworth, Sarra L. Hedden, Joseph C. Gfroerer, Jonaki Bose and Lisa Colpe

Strategies for subsampling nonrespondents for economic programs
Katherine Jenny Thompson, Stephen Kaputa, and Laura Bechtel

Robust Bayesian small area estimation
Malay Ghosh, Jiyoun Myung and Fernando A.S. Moura

Model-assisted calibration of non-probability sample survey data using adaptive LASSO
Jack Kuang Tsung Chen, Richard L. Valliant and Michael R. Elliott

Journal of Official Statistics

Volume 34: Issue 2 (June 2018)
https://content.sciendo.com/view/journals/jos/34/1/jos.34.issue-1.xml

Overview of the Special Issue from the Fifth International Conference on Establishment Surveys (ICES-V)
Katherine J. Thompson; Polly Phipps; Darcy Miller; and Ger Snijkers

Economic Statistics: How to Become Lean and Mean?
Peter van de Ven

Exploring a Big Data Approach to Building a List Frame for Urban Agriculture: A Pilot Study in the City of Baltimore
Linda J. Young; Michael Hyman; and Barbara R. Rater

Combining Multiple Methods in Establishment Questionnaire Testing: The 2017 Census of Agriculture Testing Bento Box
Jaki S. McCarthy, Kathleen Ott; Heather Ridolfo; Pam McGovern; Robyn Sirkis; and Danna Moore

Experimenting with Contact Strategies in Business Surveys
Alfred D. Tuttle; Jennifer L. Beck; Diane K. Willimack; Kevin P. Tolliver; Aryn Hernandez and Cha-Chi Fan

Response Burden Management for Establishment Surveys at Four National Statistical Institutes
Deirdre Giesen, Mario Vella, Charles F. Brady, Paul Brown, Daniela Ravindra and Anita Vaasen-Otten

Business Data Collection: Toward Electronic Data Interchange. Experiences in Portugal, Canada, Sweden, and the Netherlands with EDI
Gert Buiten, Ger Snijkers, Paulo Saraiva, Johan Erikson, Anna-Greta Erikson and Alice Born

Adaptive Design Strategies for Nonresponse Follow-Up in Economic Surveys
Stephen J. Kaputa and Katherine J. Thompson

Assessing Nonresponse in a Longitudinal Establishment Survey Using Regression Trees
Morgan Earp, Daniell Toth, Polly Phipps and Charlotte Oslund

Setting M-Estimation Parameters for Detection and Treatment of Influential Values
Mary H. Mulry, Stephen Kaputa and Katherine J. Thompson

Nowcasting Austrian Short Term Statistics
Markus Fröhlich

Small Area Estimation with a Lognormal Mixed Model under Informative Sampling
Thomas Zimmermann and Ralf Thomas Münnich

A Study of Small Area Estimation for Italian Structural Business Statistics
Orietta Luzi, Fabrizio Solari and Fabiana Rocci

Population Size Estimation Using Multiple Incomplete Lists with Overcoverage
Davide Di Cecco, Marco Di Zio, Danila Filipponi and Irene Rocchetti

Letter to the Editor
Arnout van Delden, Boris Lorenc, Peter Struijs and Li-Chun Zhang

Volume 11, Number 2 (2018)
http://www.surveypractice.org/issue/591

Identifying Non-Working Phone Numbers for Response Rate Calculation in Africa Asking About
Charles LauNicolas di Tada

Asking About Subsidies for Health Insurance Premiums in Surveys: Does Question Wording Matter?
Victoria LynchJoanne PascaleKathleen Thiede CallMichael Karpman

Asking About Subsidies for Health Insurance Premiums in Surveys: Does Question Wording Matter?
Victoria LynchJoanne PascaleKathleen Thiede CallMichael Karpman

Are Embedded Survey Items the Solution to Low Web Survey Response Rates? An Investigation of the Interaction Between Embedded Survey Items and Time of Survey Administration
Lebena VargheseRaeal MooreBenjamin Earnhart

It's Getting Late: Improving Completion Rates in a Hard-to-Reach Sample
Jennifer CantrellMorgane BennettRandall K. ThomasJessica RathElizabeth HairDonna Vallone

What's a Methodologist? - An Interview with Kyley McGeeney
Margaret R. Roller

Recent Books, Papers, and Presentations:

Recent Books and Journals Articles in Public Opinion, Survey Methods, Survey Statistics, Big Data and User Experience Research. 2017 Update
Mario Callegaro

I Don't Know. The Effect of Question Polarity on No-opinion Answers
Naomi KamoenJasper Van de PolAndré KrouwelClaes De VreeseBregje Holleman

The Changing Costs of Random Digital Dial Cell Phone and Landline Interviewing
Thomas GuterbockGrant BensonPaul Lavrakas

The Impact of Advance Letters on Cellphone Response in a Statewide Dual-Frame Survey
Eva AizpuruaKi H. ParkMitchell AveryJill WittrockRodney MuilenburgMary E. Losch

Survey Translation: Why and How Should Researchers and Managers be Engaged?
Mandy ShaStephen Immerwahr

A Qualitative Study on the Effects of Grouped versus Interleafed Filter Questions
Aleia Clark-FobiaKathleen KephartDawn V. Nelson

The Fine Print: The Effect of Legal/Regulatory Language on Mail Survey Response
Brian BucksMick P. Couper

Health Behaviors and Chronic Conditions of Movers: Out-of-state Interviews Among Cell Phone Respondents, BRFSS 2014
Pranesh ChowdhuryCarol PierannunziWilliam S GarvinMachell Town

Giving Respondents Voice? The Feasibility of Voice Input for Mobile Web Surveys
Melanie RevillaMick P. CouperCarlos Ochoa

The Impact of Question and Scale Characteristics on Scale Direction Effects
Ting YanFlorian KeuschLirui He

Survey Research Methods SRM

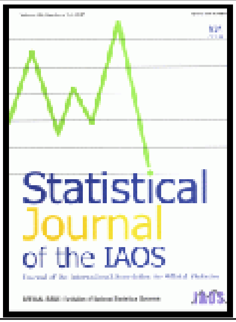
Journal of the European Survey Research Association

Home About Login Register Search Current Archives Editorial Board

Volume 12, Number 1 (2018)
https://ojs.ub.uni-konstanz.de/srm/index

Table of Contents

Articles



Statistical Journal of the IAOS: Journal of the International Association for Official Statistics

Volume 34, Issue 2 (2018)
https://content.iospress.com/journals/statistical-journal-of-the-iaos/34/2?start=10

Editorial:

Divide-and-Conquer solutions for estimating large consistent table sets
Daalmans, Jacco

The value added and operating surplus deflators for industries: The right price indicators that should be used to calculate the real interest rates
Sakuma, Itsuo | Tsujimura, Masako | Tsujimura, Kazusuke

An exploratory study of how undergraduate students use official statistics as a source of information for their academic assignments
Silva, José Luis Ángel Rodríguez | Aguilar, Mario Sánchez

Uncertainty and automatic balancing of national accounts with a Swedish application
Xie, Yingfu | Lennmalm, Andreas | Lennartsson, Daniel | de Groote, Annica

Variance reduction using a non-informative sampling design
Zimmermann, Thomas

International Statistical Review
Revue Internationale de Statistique

Volume 86, Issue 1 (April 2018)
http://onlinelibrary.wiley.com/doi/10.1111/insr.v85.3/issuetoc

Original Articles:

Bayesian Model Averaging: A Systematic Review and Conceptual Classification
Tiago M. Fragoso; Wesley Bertoli; Francisco Louzada

Online Principal Component Analysis in High Dimension: Which Algorithm to Choose?
Hervé Cardot; David Degras

Estimation Techniques for Ordinal Data in Multiple Frame Surveys with Complex Sampling Designs
Maria del Mar Rueda; Antonio Arcos; David Molina; Maria Giovanna Ranalli

Simplified Jackknife Variance Estimates for Fuzzy Measures of Multidimensional Poverty
Gianni Betti; Francesca Gagliardi; Vijay Verma

Stratification of Skewed Populations: A Comparison of Optimisation-based versus Approximate Methods
Michael A. Hidiroglou; Marcin Kozak

What Does Objective Mean in a Dirichlet-multinomial Process?
Danilo Alvares; Carmen Armero; Anabel Forte

Ecological Fallacy and Covariates: New Insights based on Multilevel Modelling of Individual Data
Michela Gnaldi; Venera Tomaselli; Antonio Forcina

Robust Small Area Estimation under Spatial Non-stationarity
Claudia Baldermann; Nicola Salvati; Timo Schmid

Book Reviews:

Monte Carlo Methods and Stochastic Processes
Alexander Tsodikov

Nonlinear Modeling of Solar Radiation and Wind Speed Time Series Luigi Fortuna, Giuseppe Nunnari and Silvia Nunnari Springer, 2016.
Sue Ellen Haupt

Modern Data Science with R Benjamin S. Baumer, Daniel T. Kaplan and Nicholas J. Horton Chapman & Hall/CRC, 2017.
Shuangzhe Liu

Noninferiority Testing in Clinical Trials: Issues and Challenges Tie-Hua Ng Chapman & Hall/CRC, 2014.
Lili Zhao

Financial Analytics with R Mark J. Bennet and Dirk L. Hugen Cambridge University Press, 2016.
Krzysztof Podgorski;

Observation & Experiment: An Introduction to Causal Inference Paul R. Rosenbaum Harvard University Press, 2017.
Carol Joyce Blumberg

Errors, Blunders, and Lies: How to Tell the Difference David S. Salsburg ASA-CRC Series on Statistical Reasoning in Science and Society. Chapman & Hall/CRC, 2017.
Reijo Sund

TRANSACTIONS ON
DATA PRIVACY
Foundations and Technologies
http://www.tdp.cat

Volume 11, Issue 1, (April 2018)
http://www.tdp.cat/issues16/vol10n03.php

Table of Contents

ROYAL STATISTICAL SOCIETY
DATA | EVIDENCE | DECISIONS

Journal of the Royal Statistical Society
Statistics in Society
Series A

Volume 181 Issue 1 (January 2018)
http://onlinelibrary.wiley.com/doi/10.1111/rssa.2018.181.issue-1/issuetoc

Statistical challenges of administrative and transaction data
David J. Hand

Preface to the papers on 'Data confidentiality and statistical disclosure control'
Jörg Drechsler
Natalie Shlomo

Differentially private model selection with penalized and constrained likelihood
Jing Lei; Anne-Sophie Charest; Aleksandra Slavkovic; Adam Smith; Stephen Fienberg

Bayesian non-parametric generation of fully synthetic multivariate categorical data in the presence of structural zeros
Daniel Manrique-Vallier; Jingchen Hu

Generating partially synthetic geocoded public use data with decreased disclosure risk by using differential smoothing
Harrison Quick; Scott H. Holan; Christopher K. Wikle

General and specific utility measures for synthetic data
Joshua Snoke; Gillian M. Raab; Beata Nowok; Chris Dibben; Aleksandra Slavkovic

On solving endogeneity with invalid instruments: an application to investment equations
Antonio F. Galvao; Gabriel Montes–Rojas; Jose Olmo; Suyong Song;

Open Access:

Smoothing mortality data: the English Life Tables, 2010–2012
Erengul Dodd; Jonathan J. Forster; Jakub Bijak; Peter W. F. Smith

Tracking and modelling prices using web-scraped price microdata: towards automated daily consumer price index forecasting
Ben Powell; Guy Nason; Duncan Elliott; Matthew Mayhew; Jennifer Davies; Joe Winton

An assessment of the causes of the errors in the 2015 UK general election opinion polls
Patrick Sturgis; Jouni Kuha; Nick Baker; Mario Callegaro; Stephen Fisher; Jane Green; Will Jennings; Benjamin E. Lauderdale; Patten Smith; Joshua L. Warren; Penny Gordon-Larsen

Factors associated with supermarket and convenience store closure: a discrete time spatial survival odelling approach
Joshua L. Warren; Penny Gordon-Larsen

Autologistic models for benchmark risk or vulnerability assessment of urban terrorism outcomes
Jingyu Liu; Walter W. Piegorsch; A. Grant Schissler; Susan L. Cutter

Estimating onset time from longitudinal and cross-sectional data with an application to estimating gestational age from longitudinal maternal anthropometry during pregnancy and neonatal anthropometry at birth
Ana Maria Ortega-Villa; Katherine L. Grantz; Paul S. Albert

Sensitivity of treatment recommendations to bias in network meta-analysis
David M. Phillippo; Sofia Dias; A. E. Ades; Vanessa Didelez; Nicky J. Welton

Bayesian joint modelling of longitudinal data on abstinence, frequency and intensity of drinking in alcoholism trials
Eugenia Buta; Stephanie S. O'Malley; Ralitza Gueorguieva

Effect of forced displacement on health
Ivan Zilic

Obituaries:
David John Bartholomew, 1931–2017
Stanley Francis James, 1927–2017
Nicholas Rodney James Fieller, 1947–2017
Walter Werner Holland, 1929–2018
Frank Ernest Whitehead, 1930–2018

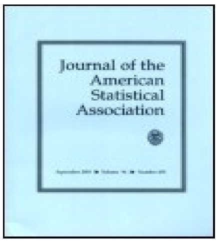
Book reviews:

Big Data and Social Sciences: a Practical Guide to Methods and Tools I. Foster, R. Ghani, R. S. Jarmin, F. Kreuter and J. Lane (eds), 2017 Boca Raton, Chapman and Hall–CRC 356 + xviii pp., £32.99 ISBN 978-1-498-75140-7
Kuldeep Kumar

Risk Theory: a Heavy Tail Approach D. G. Konstantinides, 2017 Singapore, World Scientific xii + 496 pp., £149.00 ISBN 978-9-813-22314-1
Morteza Aalabaf-Sabaghi

Bit by Bit: Social Research in the Digital Age M. J. Salganik, 2017 Princeton, Princeton University Press 448 pp., £27.95 ISBN 978-0-691-15864-8
Thomas King

Foundations of Ergodic Theory M. Viana and K. Oliveira, 2016 Cambridge, Cambridge University Press 530 pp., £79.99 ISBN 978-1-107-12696-1
Peter Walters



Journal of the American Statistical Association

Volume 113, Issue 521 (June 2018)
http://www.tandfonline.com/toc/uasa20/112/519?nav=tocList

Learning Optimal Personalized Treatment Rules in Consideration of Benefit and Risk: With an Application to Treating Type 2 Diabetes Patients with Insulin Therapies
Yuanjia Wang, Haoda Fu, Donglin Zeng

Nonparametric Adjustment for Measurement Error in Time-to-Event Data: Application to Risk Prediction Models
Danielle Braun, Malka Gorfine, Hormuzd A. Katki, Argyrios Ziogas, Giovanni Parmigiani

The Effect of Probing "Don't Know" Responses on Measurement Quality and Nonresponse in Surveys
Jouni Kuha, Sarah Butt, Myrsini Katsikatsou, Chris J. Skinner

Analyzing Two-Stage Experiments in the Presence of Interference
Guillaume Basse; Avi Feller

Compression and Conditional Emulation of Climate Model Output
Joseph Guinness, Dorit Hammerling

Modeling for Dynamic Ordinal Regression Relationships: An Application to Estimating Maturity of Rockfish in California
Maria DeYoreo; Athanasios Kottas

BNP-Seq: Bayesian Nonparametric Differential Expression Analysis of Sequencing Count Data
Siamak Zamani Dadaneh, Xiaoning Qian, Mingyuan Zhou

Variable Selection for Skewed Model-Based Clustering: Application to the Identification of Novel Sleep Phenotypes
Meredith L. Wallace, Daniel J. Buysse, Anne Germain, Martica H. Hall, Satish Iyengar

Modeling Heterogeneity in Healthcare Utilization Using Massive Medical Claims Data
Ross P. Hilton, Yuchen Zheng, Nicoleta Serban

Pair Copula Constructions for Insurance Experience Rating
Peng Shi & Lu Yang

A Bayesian Approach for Estimating Dynamic Functional Network Connectivity in fMRI Data
Ryan Warnick, Michele Guindani, Erik Erhardt, Elena Allen, Vince Calhoun, Marina Vannucci

Theory and Methods

Discussion

Mission CO2ntrol: A Statistical Scientist's Role in Remote Sensing of Atmospheric Carbon Dioxide
Noel Cressie

Theory and Methods
Petra M. Kuhnert
William F. Christensen & C. Shane Reese
Frédéric Chevallier & François-Marie Bréon
Marc G. Genton & Jaehong Jeong

Rejoinder
Noel Cressie

Minimax Optimal Procedures for Locally Private Estimation
John C. Duchi, Michael I. Jordan & Martin J. Wainwright

Comment
Anderson Y. Zhang & Harrison H. Zhou
Alfred Hero
Vishesh Karwa
Moritz Hardt
Aaron Roth
John C. Duchi, Michael I. Jordan & Martin J. Wainwright

Articles:

Martingale Difference Divergence Matrix and Its Application to Dimension Reduction for Stationary Multivariate Time Series
Chung Eun Lee & Xiaofeng Shao

Exact p-Values for Network Interference
Susan Athey, Dean Eckles & Guido W. Imbens

Network Cross-Validation for Determining the Number of Communities in Network Data
Kehui Chen & Jing Lei

ECA: High-Dimensional Elliptical Component Analysis in Non-Gaussian Distributions
Fang Han & Han Liu

Classified Mixed Model Prediction
Jiming Jiang, J. Sunil Rao, Jie Fan & Thuan Nguyen

A General Framework for Estimation and Inference From Clusters of Features
Stephen Reid, Jonathan Taylor & Robert Tibshirani

Analysis of Gap Times Based on Panel Count Data With Informative Observation Times and Unknown Start Time
Ling Ma & Rajeshwari Sundaram

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INDIA – INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION PO NEW FOREST
ITALY –INSTITUTO NAZIONALE DI STATISTICSA (ISTAT)
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MEXICO – NUMÉRIKA-MEDICION Y ANALISIS ESTAD. AVANZADO, SC
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NORWAY – STATISTICS NORWAY
PORTUGAL –INSTITUTO NACIONAL DE ESTADÍSTICA (INE)
SWEDEN – STATISTICS SWEDEN
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July 2018

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