SSAI Newsletter
statistical society of australia incorporated
March 2008 Number 122

SSAI 2007 Membership Survey

In December 2007 the Statistical Society of Australia Incorporated (SSAI) conducted an on-line survey of its members. The questionnaire was kept relatively short, with the aim to maximise the response rate and hence cover as much of the membership as possible. The achieved response rate of 44% is considered good for this type of survey.

While a major analysis was not carried out, the following points stand out:

- The largest group is of full members working in higher education (40%). These members are more likely to have been members for an extended period and more likely to renew their membership.

Reasons for continuing to be a member of the Society:

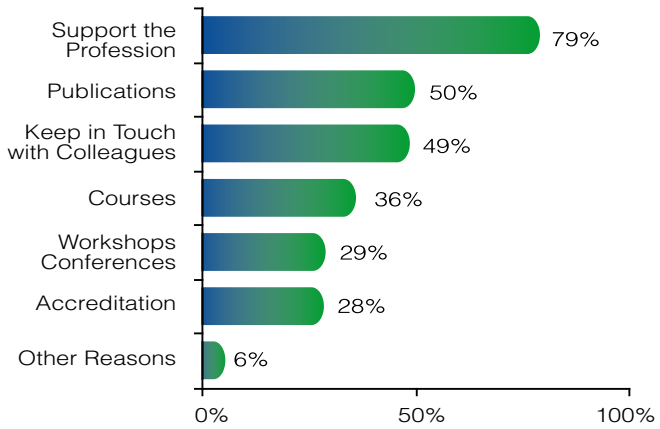
- The major reason for belonging to the Society is to "support the profession" (79%) followed by newsletters/journals and "keeping in touch with colleagues" both around 50%.
- While only a small proportion (10%) indicate that they do not intend to renew membership, the reason "value for money" strongly dominates (70%). This is reinforced in the open-ended comments.
- Branch meetings are a key activity for most members. In contrast more than half (57%) of the respondents had not attended any of the last three Australian Statistical Conferences. The Auckland conference was particularly poorly attended (13%).
- The Society Newsletter is well read, with more than half (57%) of the respondents reading "most of it" or more. In contrast the Journal is less well read. The open-ended comments strongly indicate that many members do not find it relevant.
- Accreditation received mixed comments, with attitudes strongly related to where members are employed. While many members in higher education are accredited, many others in higher education see it as not relevant.

Initially, there appears to be a segmentation in the Society, between those happy with an academic orientation and those who desire a more practical orientation. Overall, both groups have a strong attachment to the society.

Petra Roberts

John Henstridge

Reasons for continuing to be a member of the Society



Australian Statistical Conference 2008

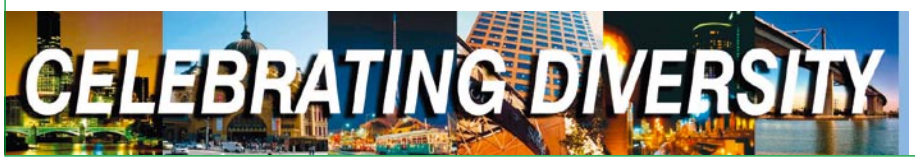
30th June to 3rd July 2008 – Hotel Sofitel, Melbourne

Confirmed International Speakers

- Enrivonmental Statistics – Adrian Raftery, University of Washington, Seattle
- Statistical Genetics and Bioinformatics – Elizabeth Thompson, University of Washington, Seattle
- Medical Statistics – Simon Thompson, Cambridge MRC Unit; Michael Hernan, Harvard
- Stochastic Modelling and Statistics in the Social Sciences – Fiona Steele, University of Bristol
- Statistical Methodology – Alistair Young, Imperial College

Conference website: http://www.asc2008.com.au

Early bird registration by 18 April 2008



AUSTRALIAN STATISTICAL Conference 2008

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DEADLINE FOR NEXT ISSUE: 10 May 2008

Editorial

Firstly, I'd like to use this first editorial of 2008 to welcome new and renewing members to the Society. I hope you gain many benefits from your membership this year, not least of course the opportunity to read this newsletter once a quarter!

I'd also like to thank all those members who took the time last year to complete the Society's survey of members. As a group of statisticians we should be uniquely qualified to seek views of the members in this way, and to analyse them thoroughly. A summary of the findings of the survey appears elsewhere in this newsletter.

As is common with the first newsletter of the year, there's a bit of looking backwards and a bit of looking forwards amongst the printed material. Looking back, there are reports from Branches about their last few meetings of 2007, as well as reports from conferences held in the December conference season. Looking forward, the lead article is the survey of members, and there is a reminder for the conference in Melbourne in July.

Do make the most of the opportunities you read about in the newsletter, and do take the time to report to this newsletter on statistical activities you attend. The Editors will be delighted to receive contributions from members at any time.

Conferences

International Symposium on Forecasting
22-25 June 2008, Nice, France
http://www.forecasters.org/isf/

Australian Statistical Conference 2008
30 June-3 July 2008, Melbourne, VIC
http://www.asc2008.com.au

International Society for Bayesian Analysis Conference
21-25 July 2008, Hamilton Island, QLD
http://www.isba2008.sci.qut.edu.au/

Pre-Olympic Congress on Computer Science in Sport
5-7 August 2008, Nanjing, China
http://www.olympiccongress.org

Australasian Conference on Mathematics and Computers in Sport
31 August-3 September 2008, Coolangatta, QLD
http://www.anziam.org.au/MathSport/Conference.html

International Conference on Applied Probability and Statistics (with emphasis in Business and Industrial Statistics)
1-3 December 2008, Hanoi, South Korea
http://www.action-m.com/CAPS2008/

Australasian GenStat Conference: Biometrics in Primary Industries and the Environment
2-5 December 2008, Marylands Country House, Yarra Valley, VIC
www.dpi.vic.gov.au/genstat2008

Australian Statistical Conference 2010
6-10 December 2010, Perth, WA

President's Corner

I was delighted with the high level of response to the recent survey of members conducted by Data Analysis Australia on behalf of Central Council. Of the 660 members emailed 93 were not contactable. Of the 567 contactable, 44% responded, which is an excellent level of responses for a survey of this type. A quick look at the results indicates good coverage of our members on a regional, employment type and age profile. To all members who responded to the survey let me personally say 'thank you' – the detailed responses given by members to the open ended questions were particularly thoughtful and have provided a wealth of vital information for Council.

I particularly want to thank John Henstridge and Petra Roberts at Data Analysis Australia for providing their services pro bono to the Society and for their very professional implementation, administration and analysis of the survey, particularly in December which is traditionally a very busy time. Those who do this kind of work would recognise that the value provided by Data Analysis Australia to the SSAI is very considerable in monetary terms as well as in terms of the survey skills provided.

Central Council will be discussing the results in detail at the meeting on February 28. All Council Members have been sent the results of the survey and have been asked to identify the critical issues as they see them and to match these against the recently revised Strategic Plan. Following the Central Council meeting summary results will be released and a decision will be made about making the raw data available, subject to us being able to protect individual privacy.

Without prejudging the outcome of the Central Council's deliberations on the survey my impression is that significant areas of concern have been identified, as well as considerable information that we previously did not have about our members and which is vital for future planning in order that the Society continue to add value to members. Among the major areas of concern were the recent increase in membership fees, the newsletter format and delivery mode, how to make branch activities better attended and more useful to members, and, a clear need for a program of continuing professional development workshops and short courses. I was particularly struck by the diversity of our membership, emphasising the challenges that the Society, both centrally and at the Branch level, faces in meeting the range of interests and needs of its members.

Briefly on other matters: planning for continuing professional development activities continues; for those in the research community, the Research Quality Framework has been scrapped by the incoming Government and will ultimately be replaced by an alternative; planning for ASC2008 in Melbourne is well advanced. ASC2008 is now open for registrations and, as I write this, emails are arriving asking for us to submit abstracts.

July will be an unusually rich month for professional meetings and workshops in Australia and surrounding regions. ASC2008 kicks of events in Melbourne from June 30 to July 3, the joint IMS/ Bernoulli 7th World Congress on Probability and Statistics in Singapore from July 14-18, the 9th World Conference of the International Society for Bayesian Analysis (ISBA), to be held on Hamilton Island, 21-25 July and the Econometric Society Australasian Meeting (ESAM) in Wellington, New Zealand, 9-11 July, 2008. There are also numerous specialist workshops and satellite events planned and listed on the various main conference web sites.

As President I met with two Chinese delegations, one from the Shanghai Municipal Statistics Bureau in December and the other from the Guangdong Provincial Bureau of Statistics in January. I also recently travelled to Japan on a research visit. It is clear to me that we need to develop much stronger links with the various professional societies and organizations in countries to our North and this is something I would particularly like to see develop during my term as President. I noticed the President's Corner in the September 2007 AMSTAT News that the ASA has recently formed a task force to "explore the role that the ASA can play for its members in the international industry arena" aimed at facilitating contact of its members with local statisticians, universities and professional societies. This is something I will be following up in the near future.

Last, but by no means least, I would personally like to welcome Marie-Louise Rankin as the new SSAI Executive Officer. I am delighted Marie-Louise agreed to work for the Society. She is proving to be a most valuable member of the SSAI administrative team and please contact her if you have any concerns about your membership or Society activities.

William Dunsmuir
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Counting Australia In

Eugene Seneta's extended review of this history of mathematics in Australia was the lead article in December 2007 newsletter. We did not have room for this photograph of Eugene's that is of particular interest for the history of statistics in Australia.

This photograph was taken at the Australian National University the day before Ted Hannan's death in January 1994.

Chris Heyde, Ted Hannan, Joe Gani, Eugene Seneta (L-R), ANU, January 1994.

BioInfoSummer

For the 6th consecutive year, the BioInfoSummer symposium in bioinformatics was held at the Australian National University. The symposium featured lectures and contributed papers, as well as workshops and poster sessions. Each day focussed on a theme: sequence and structure analysis, evolutionary biology and comparative genomics, gene expression and microarrays, and systems biology.

Matthew Wakefield presented an introductory lecture to biology, with a focus on molecular biology and genomics. Lloyd Allison tackled the problems linked to the study of biological sequences, their alignment, information content and compression. Rafael Najmanovich presented methods for the prediction of protein structure and protein-ligand interactions.

Allen Rodrigo introduced the main methods of phylogenetic inference, and hypothesis testing in phylogenetics. Mark Ragan showed an efficient way of building phylogenies, by bypassing the difficult problem of multiple sequences alignment. Karin Khassan demonstrated how these phylogenetic methods can be applied to comparative genomics, and showed how genome duplications are a source of genetic novelty in fishes. A public lecture with a record attendance was given by John Mattick, where he presented his work on non-coding RNA and genome complexity.

In the day dedicated to gene expression, Gordon Smyth showed how his Bayesian approach can significantly improve the analysis of microarray data. Conrad Burden and Hans Binder, both from a physics background, presented their progress at understanding the physical mechanisms underlying a microarray experiment.

Terry Speed gave a comprehensive coverage of the chromatin immunoprecipitation on chip (ChIP-chip) technique, and outlined the complexity of the analysis of such experiments. He also gave several examples of successful applications of this technique, ranging from developmental biology to cancer medicine. Finally Eric Schadt presented his revolutionary work, combining population genetics, expression microarrays, high density genetic markers and medical data to unravel some of the most complex human diseases.

There was also a number of very interesting workshops, contributed presentations and posters showcasing a wide range of subjects from a bioinformatical perspective.

Sylvain Floret

BioInfoSummer scholarship holders, with Garth Gaudry, 2007 Director of ICE-EM.

Biometrics by the Beach

Having submitted my MPhil thesis in November, I decided to give myself a treat by going to Coffs Harbour for a holiday—whoops, I meant attending the "Biometrics by the Beach" conference.

From hearing about Dr Dave Warton's "special relationship" with his eigenvectors to the many talks on Bayesian statistics, I have learnt a great deal. Prior to the conference, I had never been exposed to Bayesian statistics given that I was trained as a frequentist. However, after attending Prof Kerrie Mengersen's short course, I was so impressed with what Bayesian methods can do that I have decided to learn more about the topic.

Kevin gets his first kiss for the night from Elle.

In addition to the talks, another important aspect of conferences was the social interaction. With the help of Daniel Burrell and drink-sponsorship from the IBS Australasian Region, I managed to get about 15 young statisticians together to a Thai restaurant at the Jetty. We were all chatting about random non-statistical stuff when Dave Warton decided to bring up some questions regarding Bayesian statistics. At this point one of the girls could not help herself but said, "Oh my, this is the most nerdy dinner conversation I have ever had!".

The conference dinner at Pet Porpoise Pool was an excellent choice by the organising committee. It was certainly a memorable night for me, as I received my first kiss that night—from Elle the seal! I was also lucky enough to win the door prize—a swim with a dolphin. Unfortunately it is only valid for a year and I will not get back to Coffs Harbour within the next 12 months, so I decided to give the prize away.

Overall, the conference was a great success and it was due to the great effort that Dr Melissa Dobbie and her organising committee put in. I would also like to thank the IBS Australasian Region for sponsoring me the conference registration and the short course on Bayesian statistics.

Kevin Wang

ISOSS conference in Malaysia

The 9th Islamic Countries Conference on Statistical Sciences (ICCS-IX) was jointly organised by the Islamic Countries Society of Statistical Sciences (ISOSS) and Institute of Statistics Malaysia (ISM) during 12-14 December 2007. The Concorde Hotel, Shah Alam, Malaysia attracted over 350 professional Statistician participants of which some 160 papers were presented by international participants from 22 different countries, including Australia, Canada, UK, USA, Turkey, Iran, Saudi Arabia, and 80 papers by local participants. The presentations included 12 invited sessions on various topics in contemporary statistical research.

The conference was cosponsored by the *Pemodalan Nasional Berhad* (PNB), the largest Malaysian Government's Investment Corporation, a number of public universities in Malaysia and the Statistical, Economic, Social Research and Training Centre for Islamic Countries (SESRTCIC), a part of the Organisation of Islamic Conferences (OIC) having 57 member states.

Reflecting on the theme of the conference—Statistics in the Contemporary World—Theories, Methods and Applications—the tone of the conference was set by the first keynote speaker Y. Bhg. Tan Sri Dato' Hamad Kama Piah bin Che Othman, President, PNB. Himself being a Statistics graduate, Mr Othman strongly emphasised the role of Statistics in decision making at the highest level.

Dr Savas Alpay, DG of SESRTCIC, chaired the special session organised by SESRTCIC on the activities of various national statistical organisations (NSO). The session was addressed by Dr Unal Gundogan, Vice President, Turkish Statistical Institute; Mr Mohanna A Al-Mohanna, Deputy DG, Statistical Affairs, Saudi Arabia and Ms Hajah Wan Ramlah Wan Abd. Raof, Chief Statistician, Malaysia. The session provided a wide range of information on various statistical activities and programs conducted by the respective NSO. This is the first time such a special session was devoted to the official statistics in an ISOSS conference.

On the nomination of Professor Denise Lievesley, President of the International Statistical Institute (ISI), Professor Stephan Morgenthaler of Switzerland represented ISI in the conference. The recent meeting in November 2007 between the President of ISI with Dr Shahjahan Khan, President of ISOSS at the First Arab Statistics

Conference in Amman, has opened doors for increased cooperation between the two professional organisations.

In 1999 ISOSS introduced the award of the ISOSS Gold Medal for outstanding contribution in the development of statistics and services to ISOSS. During the Conference Dinner, the winners of the ICCS-IX Gold Medal were declared. The recipients are Professor Munir Ahmad (Founding President of ISOSS), Professor Shahjahan Khan (Australia), Professor Ali S Hadi (USA/Egypt) and Professor Hanif Mian (Pakistan).

Professor Ali S Hadi, Cornell University and American University of Cairo presented his keynote talk on a general method on detection of outliers for both linear and nonlinear models. Professor Kerrie Mengersen, Queensland University of Technology, Australia presented her keynote speech on the Bayesian priors. Professor Malay Ghosh, University of Florida gave the last keynote presentation on the role of ancillary statistics in statistical inference. Unfortunately, another keynote speaker, Professor A K Md Ehsanes Saleh, Carleton University, Canada was physically unable to travel.

The current state of the ICT and its origin from Statistics and Mathematics were covered in a special talk by Professor Hilal Al-Bayyati, DG, Arab Institute of Training and Research for Statistics (AIRTS), Jordan. Referring to his recent investigation he surprised the audience by revealing the fact that in Arab countries less than 25% of the positions designated for Statistics are occupied by statistics graduates.

The first memorial lecture in an ISOSS conference on Emeritus Professor M Safiul Haq (1935-2007) of the University of Western Ontario, Canada was presented by Professor Shahjahan Khan, University of Southern Queensland, Australia. The speaker highlighted the various aspects of Professor Haq's life and personality along with his significant research contributions in the area of predictive inference.

ISOSS started its journey in August 1988 from Lahore, Pakistan during the ICCS-I under the leadership of Professor Munir Ahmad and his esteemed team had succeeded in organising 8 biennial conferences, and had established ISOSS as a reputed regional organisation. Recently Professor Ahmad has bought and donated a property in Lahore to house the ISOSS Head Quarters. Surely, ICCS-IX has set the way for a global role for the development of Statistics and the profession.

The conference dinner was held in the evening of 12 December in the Concorde Hotel. The performances by young children from a local orphanage attracted a very high appreciation from the conference participants. Many participants donated money for the children of the orphanage.

The closing session was chaired by the Chief Statistician of Malaysia Ms Hajah Wan Ramlah Wan Abd. Raof. The Secretary of the Local Organising Committee, Dr Ibrahim Mohamed presented a brief report in the session. Professor Stephan Morgenthaler spoke on behalf of the intentional participants and Professor Shafie Mehad presented the views of the local participants.

As in the past, ISOSS will publish proceedings of the conference. However, selected number of conference papers will be published in a special volume of the Journal of Applied Probability and Statistics (JAPS), USA and the Pakistan Journal of Statistics (PJS) with peer review.

Shahjahan Khan, PhD
President, ISOSS (www.isoss.com.pk)
Department of Mathematics & Computing
University of Southern Queensland,

Maths matters, writes Kaye Basford

As my initial university degree was a BSc with First Class Honours in mathematics, it is not surprising that I believe the discipline of mathematics matters. I would even go so far as to say that it is a crucial foundation for almost all careers in science, engineering and technology. A couple of fairly influential people have similar views:

> *'Every advanced industrial country knows that falling behind in science and mathematics means falling behind in commerce and prosperity.'*
>
> UK Chancellor of the Exchequer Gordon Brown, Budget speech, March 2006.
>
> *'In this ever more competitive global economy, Australia's science, engineering and technology skills need to match the best in the world.'*
>
> Prime Minister John Howard, speech in Sydney, September 2006.

These quotes are on the back cover of Mathematics and Statistics: Critical Skills for Australia's Future, the National Strategic Review of Mathematical Sciences Research in Australia. It was commissioned by the Australian Academy of Science and launched in December 2006. I was a member of the Advisory Council for that review because I was then President of the Statistical Society of Australia Inc, which had commissioned the December 2005 Review of Statistics at Australian Universities.

Unfortunately, young people today do not share the view that mathematics is important. In an analysis of participation in Year 12 mathematics across Australia from 1995 to 2004, Frank Barrington found that although the overall proportion of mathematics enrolments had been maintained, there had been a net loss of students taking intermediate and advanced options in which higher-level skills were taught. He inferred that "this impacts on the ability of students to undertake tertiary studies in the quantitative sciences, and for the national capacity for innovation in engineering and technology".

What has contributed to this net decline in take-up?

Secondary school students are increasingly told to take subjects in their senior years that they like or are likely to do well in. This trend is sustained by a belief that, under those circumstances, students will score well in the Equivalent National Tertiary Entrance Rank (or other tertiary entrance scores) and hence be afforded the opportunity to undertake tertiary studies.

Universities have probably contributed to this viewpoint by discarding advanced or even intermediate mathematics as prerequisites for entry into certain programs. Students can study intermediate and/or advanced mathematics at university (if they have not passed these subjects at Year 12 level) and, on successful completion, receive credit for them as electives within a particular program.

This process is viewed by some academics as 'dumbing down' science, engineering and technology programs, as it means that more advanced disciplinary courses are displaced. Others see it as an educational advantage by enabling students to make decisions at a later stage in their development, rather than during their mid-teens. It fits quite comfortably with the concept of one's first university degree being somewhat general, but followed by a two-year focused masters program (such as in the University of Melbourne's new model).

In any case, the declining take-up of intermediate and advanced mathematics at senior secondary school level seems to be an inevitable outcome of current subject selection practices in secondary and tertiary education. To one who regards mathematics as a central pillar of scientific endeavour, this outcome is concerning. My apprehension is shared by many in business, industry and government. Two key recommendations from the mathematical sciences review address the challenge of reversing this decline:

- ensure that all mathematics teachers in Australian schools have appropriate training in the disciplines of mathematics and statistics to the highest international standards; and
- encourage greater numbers of high school students to study intermediate and advanced mathematics.

Perhaps the best way to achieve the second outcome would be to promote the vast and increasing range of rewarding careers available to those who obtain some training in mathematics and statistics. Their pervasiveness is not well understood by the community – just about every area of employment depends at some point on handling and interpreting data, and on predicting and modelling outcomes. Jobs requiring analytical skills are advertised in areas ranging from finance and commerce to the natural sciences and engineering. More specifically, undertaking mathematics in the senior school years opens up science, engineering and technology as possible career paths.

SSAI Bayesian Section co-supports Bayesian workshops and short course

The ISBA world meetings, held every two years, are one of the premier events in Bayesian statistics. The Australasian chapter of the International Society for Bayesian Analysis will host the 9th ISBA world meeting at Hamilton Island on July 21-25, 2008. Australia will therefore play host to several internationally renowned keynote speakers (including three COPSS medallists), comprising Jim Berger (Duke University), Sylvia Fruhwith-Schnatter (Johannes Kepler Universitat), Xiao Li Meng (Harvard University), Tony O'Hagan (Sheffield University), Gareth Roberts (University of Warwick) and Jeffrey Rosenthal (University of Toronto). A wide range of topics will be covered, including nonparametric modelling, prior elicitation, high dimensional data, MCMC and applications.

ISBA, with the support of the Bayesian Section of SSAI, will host a number of short courses and satellite meetings being held in conjunction with the conference. Two one-day short courses will be held at Hamilton Island: 'Bayesian Core' with Christian Robert and 'Hierarchical Bayesian modelling for spatially referenced data' with Sudipto Banerjee. Professor Robert, from Universite Paris Dauphine, will also be conducting a longer short course in Brisbane 4-8 August. There are also two satellite meetings: 'Calibration and validation of complex computer models' 27-28 July in Sydney and 'Bayesian environmetrics' 17-18 July in Brisbane. Further information on the conference, speakers, and satellite meetings can be found on the conference website: www.isba2008.sci.qut.edu.au.

You are warmly invited to participate in these events.

Kerrie Mengersen

The other key recommendations from the mathematical sciences review were:

- significantly increase the number of university graduates with appropriate mathematical and statistical training;
- broaden the mathematical sciences research base; and
- identify, anticipate and meet industry needs for a pool of tertiary-trained expert mathematicians and statisticians.

If all five recommendations were accepted and enacted, we would be able to build a critical mass of research, education, industry and government interaction, and ensure we maintained our technical and problem-solving capability, particularly in science, engineering and technology. We could also improve the percentage of university graduates with a mathematics or statistics major from the current 0.5 per cent a year to at least the OECD average of 1 percent.

I believe these reviews have contributed to a major change in the way mathematics and statistics are viewed by those in the Federal Government. The last Budget greatly improved the state of mathematical sciences in Australia. The disciplinary areas of mathematics and statistics are now in a higher funding band shared with computer science, with an increase of about 50 per cent in financial support per student. This is an excellent outcome that will have a big effect on relevant academics, with resulting benefits for their students.

Unfortunately, there does not appear to be a corresponding change in the way state governments view tertiary education in comparison with vocational education and training (VET), where skilled-labour shortages have been evident for some years.

In Queensland, for instance, where the government has supported higher education through its Smart State Strategy, a recent discussion paper, entitled 'Towards a 10-year plan for science, technology, engineering and mathematics (STEM) education and skills in Queensland', identified some areas of concern in professional/tertiary STEM training. However, the Queensland Government does not seem to be as proactive in addressing these issues as it is for those in the VET sector, where it is clearly very active.

Even though university education is primarily a Federal Government concern, state governments must also commit resources to encourage secondary school students to consider STEM training at tertiary level. This should happen now. Employers have already stated that they have not been able to source graduates within Australia in the enabling mathematical sciences, as illustrated by the following:

> *'Over the past few years it has been difficult for us to recruit top-class graduates in specific areas of the mathematical sciences from Australian universities. We have sought to recruit operations research and optimisation specialists from the US and Europe because of the difficulty of recruiting [them] … within Australia.'*
>
> BHP Billiton questionnaire submitted to the National Strategic Review of Mathematical Sciences Research in Australia, 2006.

I will close on a positive note. Any mathematical training is going to be useful, whether that be for everyday life or for career choices. Intermediate and advanced mathematical skills are essential if you want any sort of career in science, engineering or technology.

These analytical skills can be obtained at secondary school or university, but the earlier they are learnt the more advantaged the logical reasoning and problem-solving skills will be in other disciplinary areas.

Mathematics does matter!

Kaye Basford

Kaye Basford FTSE is Head of the University of Queensland's School of Land, Crop and Food Sciences, a multi-disciplinary cross-campus school focused on agricultural, environmental and food sciences. She is immediate Past President of the Statistical Society of Australia Inc. As Professor of Biometry, her teaching and research is at the forefront of statistics and quantitative genetics through the development and dissemination of appropriate methodology for the analysis and interpretation of genotypic adaptation in large-scale plant breeding trials. Her awards include the 1998 Medal of Agriculture from the Australian Institute of Agricultural Science and Technology and a 1986 Fulbright Postdoctoral Fellowship to Cornell University.

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Thinking Statistically

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By

Sarjinder Singh

Reviews:

Collins Carbno, *Technometrics,* 2007, 49(4), 496.

Marcin Kozak, *Statistics in Transition,* 2006, 7(6), 1407-9.

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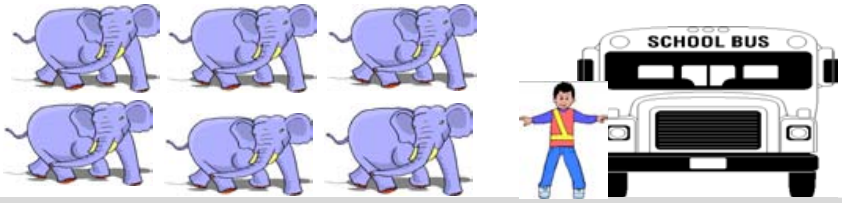

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Three Doors with Borek Puza (Edition 13)

Welcome to the 13th edition of *Three Doors*. Last time I presented The Two Uniforms Puzzle and am now pleased to announce Steven Stern as the next winner of the Three Doors Prize, a cheque for $60 as donated by SSAI. The solution and a discussion are given below, followed by the next puzzle.

The Two Uniforms Puzzle

Suppose that X and Y are independent random variables, and each is uniformly distributed from 0 to 1. Find the density function of $U = X/(X-Y)$.

Solution to The Two Uniforms Puzzle

First, observe that $R = Y/X$ has cdf $F(r)=P(R\leq r)=P(Y<rX)$, which equals $r/2$ for $0 < r < 1$ and $1-1/(2r)$ for $r > 1$. (Consider the area under the line $y = rx$ in the unit square in the x-y plane.) So R has pdf $f(r)=dF(r)/dr$, which equals 1/2 for $0 < r < 1$ and $1/(2r^2)$ for $r > 1$. Next, $V=1-R$ has pdf $f(v)=f(r)|dr/dv|$, which equals 1/2 for $0 < v < 1$ and $1/(2(1-v)^2)$ for $v < 0$. Finally, $U=V^{-1}$ has pdf $f(u)=f(v)|dv/du|$, which equals $1/(2u^2)$ for $u > 1$ and $1/(2(1-u)^2)$ for $u < 0$. (Note that $u=v^{-1}$ maps $(-\infty,1)$ to $(-\infty,0)\cup(1,\infty)$; so, $f(u)=0$ for $0 < u < 1$.)

Discussion

A second method of solution is to find the cdf of U (via $F(u)=P(X/(X-y)\leq u)=P(X<(X-Y)u, \quad X>Y)+P(X-Y)u, \quad X<Y)$ etc.), and to then calculate $f(u)=dF(u)/du$. A third method is to find $f(z,u)$, the joint pdf of $Z=X$ and $U=X/(X-Y)$ (via Jacobians), and to then integrate $f(z,u)$ with respect to z.

Like the first method, each of these two alternatives requires a consideration of two cases ($u < 0$ and $u > 1$). However, the first method is arguably the simplest of the three. It breaks the solution into *four* easy steps (find $F(r)$, find $f(r)$, find $f(v)$, find $f(u)$), whereas the second method consists of *two* relatively hard steps (find $F(u)$, find $f(u)$), and likewise the third method (find $f(z,u)$, find $f(u)$).

Nahin (2000) provides a rather lengthy solution using the second method (pp 121-128), and writes (pp 50-51): "After working on it all weekend, I finally did manage to get the correct density function, but it was just a bit tougher than I originally thought." I don't know how long it took Steven Stern, but the solution he submitted also based on the second method—was considerably shorter and clearer than Nahin's.

The Records Puzzle

Consider a sequence of n continuous iid random variables, indexed 1,...,n, and define the ith one to be a record if it is the largest amongst those indexed 1,...,i. Let R be the total number of records amongst the n random variables. Find the mean, m, and standard deviation, s, of R. Hence, for each j=1,2,...,10, find the smallest value of n such that m is at least j. Then, for each such value of n, calculate the corresponding exact values of m and s. Tabulate your results to 5 decimals and discuss briefly.

For your chance to win a fabulous mystery prize, send your solution to newsletter@statsoc.org.au.

References

Nahin, P. J. (2000). *Duelling Idiots and Other Probability Puzzlers*. Princeton NJ: Princeton University Press.

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Branch Reports

Queensland Branch News

On Tuesday 12 December Professor Helen MacGillivray spoke about *Developing probabilistic statistical thinking at the tertiary level* to an audience of local members at the Queensland University of Technology (QUT). Professor MacGillivray is the Director of the Maths Access Centre at QUT, providing expertise and support for mathematical and statistical literacy and learning, as well as the Discipline Coordinator for Statistics in the School of Mathematical Sciences. In addition, Professor MacGillivray is President-elect of the International Association for Statistics Education, and most recently was awarded a national Carrick Leadership Grant and a national Carrick Senior Fellowship.

In an interesting talk, Professor MacGillivray focussed on the need to maximise student learning and engagement, in probabilistic thinking, at the tertiary level. These goals may be achieved by maximising optimal learning environments—moving beyond the childhood introduction of probability reasoning, based on coins and dice, to a more developmental focus based on data-driven, realistic approaches to building probabilistic statistical thinking and problem-solving. The need for such development is not just for statistical majors but continues to increase in areas such as information technology, engineering, finance, health and many others.

Professor MacGillivray explained that there are two aspects of probability at the introductory tertiary level, (i) for use in introductory data analysis and (ii) as a foundation for further study and/or applications in statistical/stochastic modelling. Professor MacGillivray advocates a minimalist objective-oriented approach for use in introductory data analysis, and a constructivist, collaborative and data-linked approach as a foundation in probabilistic thinking and skills. Her talk focussed on the latter point, discussing learning and assessment strategies, as well as the analysis of student and tutor feedback, to evaluate the effectiveness of teaching probabilistic thinking to students in a collaborative problem-solving, data orientated environment.

To achieve these goals, a unit/module, which was designed specifically to provide a firm foundation in probabilistic statistical thinking, has been successfully implemented at QUT. The objectives of this first year unit include helping students to unpack, analyse and extend what they have brought with them to tertiary study, develop problem-solving skills, link with data and real investigations and processes, and consolidate and synthesize foundation mathematical skills. This is assisted by emphasising group work and collaboration amongst students.

Feedback from students has been extremely positive, with students actively participating in group projects, data based class activities, and group work in problem-solving within tutorials. This has not only increased student engagement, but also the strong emphasis on problem-solving skills has been shown to positively predict exam results for both this and more advanced units in both mathematics and statistics. The promotion of probabilistic statistical thinking at the tertiary level is an insightful and long overdue strategy aimed at maximising student engagement and learning, as well as providing enhanced problem-solving skills conducive to successful employment post university as well as further study.

This insightful presentation was well received by local members.

Canberra Branch News

The 2007 Knibbs Lecture

The 2007 Knibbs Lecture was held on November 27, 2007. Professor Rob Hyndman from Department of Econometrics and Business Statistics, Monash University was the Knibbs Lecturer. His lecture on this occasion was on the importance of being uncertain when performing population forecasting.

In his talk, he argued convincingly for the need to shift from current approach in forecasting using assumed fixed future condition (what-if projection) to a more realistic formulation using stochastic models. The what-if projection, although can be used to compute estimates, does not allow quantification of the uncertainty surrounding the estimates. The stochastic model-based forecast, on the other hand, allows the quantification of uncertainty and thus can produce useful prediction intervals. Another area in the need of stochastic model-based

Photograph copyright: Kevin Wang.

approach is exponential smoothing. In recent years, Prof. Hyndman and colleagues have come up with a class of state-space models that enable the uncertainty around exponential smoothing estimates to be computed easily. The algorithms to compute prediction intervals in exponential smoothing are available in two freely available packages in R (forecast) and Excel (PhiCast).

Prof. Hyndman then showed how the stochastic-based models can be applied to predict Australian Population up to 2023 by using three sub-models for mortality, fertility and migration for men and women. Taking advantage of modern computational techniques and methodology from functional data analysis, he showed some interesting patterns of prediction in each of the sub-models. Combining the different sub-models, he compared the prediction based on the stochastic models and the three Australian Bureau of Statistics (ABS) population projections termed "high", "medium" and "low" projections based on assumed future conditions and showed that the "high" and "low" projections are approximately the upper and lower bounds of the 80% prediction intervals from the stochastic models and for some variables such old-age dependency the coverage could be expected to be lower than 80%.

The two discussants, Dr. Patrick Corr from the ABS and Prof. Varshid Vahid from the ANU provided interesting comments afterwards. Dr. Corr commented on the link between Prof. Hyndman's works with the practice of forecasting at the ABS and illustrated some possible barriers before the methodology can be adopted. These barriers include educating users about the importance of uncertainty. Prof. Vahid, in his comments, clarified the uncertainty quantified in Prof. Hyndman's model is conditional only on past measurement of demographic variables used in the models and whether incorporating information from other countries with a more 'advanced' demographic feature may improve our measurement. He also gave a possible explanation on why average users may not be interested in forecasting not only mean value but the whole densities of the value, because they would find the decision making process after confronted with such forecast to be difficult and he suggested the need to let users evaluate the usefulness of forecast densities using their own loss function.

Victorian Branch News

Growing Up in Australia, the longitudinal study of Australian children

On a cold and drizzly July evening in Melbourne, about 40 Victorian Branch members and guests gathered to hear Carol Soloff talk about '*Growing Up in Australia,* the longitudinal study of Australian children (LSAC)'. Carol Soloff is the Australian Institute of Family Studies' Project Manager for this study, which she talked about in some detail, with particular emphasis on methodology. She has been working on the project since July 2002. Prior to this, Carol was employed at the Australian Bureau of Statistics and has experience in survey development at state and national levels across a range of subject areas, as well as survey management, operations and interviews.

Carol Soloff with a sample of gifts used in the LSAC.
Photo: Brian Phillips.

Growing Up in Australia is a landmark study that was initiated and funded by the Australian Government Department of Families, Community Services and Indigenous Affairs, and is developed and managed in partnership with the Australian Institute of Family Studies with advice from a consortium of leading researchers across Australia. This study's aims are designed to identify policy opportunities for improving support for children and their families and for early intervention and prevention strategies.

Carol took us through how the study came into being and the various players involved. She explained the conceptual model that underpins the study (Bronfenbrenner's ecological model) as well as outlining the key research questions the study is designed to address, which revolve around several issues: how well Australian children are doing on a number of key developmental outcomes; what child, family and community factors are related to different child outcomes; and what helps maintain an effective pathway, or how to change one that is not promising.

The study is following the lives of 2 cohorts of children over at least seven years. During 2004 (Wave 1), about 5,000 infants and 5,000 children aged 4-5 years were recruited to the study. Families were visited again in 2006 (Wave 2), with interviews completed for 90 per cent of families recruited in Wave 1. Interviewing has already started for the first phase of Wave 3.

Sample retention is clearly an important issue for a longitudinal study. Carol showed us the range of gifts and other products that are used to help families take ownership of the study and hence continue to take part. Copies of the study's most recent Annual Report were also available.

Carol went into considerable detail on the sample design. Children were selected at random from the Medicare enrolment data base, from randomly selected postcodes. Although the ideal design was to give all children of the right age an equal chance of selection in the study, there were many impediments to this. Carol discussed the challenges involved, such as an out-of-date sampling frame, a frame where many addresses were post office boxes (makes a face-to-face interview difficult!), the large variability in postcode geographic size and distribution of children across postcodes, only selecting one child per family, and children on multiple Medicare cards.

Carol also outlined the various sources of sample loss in Wave 1, with refusals (there were a number of stages where families had the opportunity to 'opt-out' of the study), and non-contacts (due to the relatively high mobility of

the population) being the major ones. (In Wave 2, non-contacts were more common than refusals.) Carol provided an overview of how the weighting of the data has taken into account the sample design and non-response bias. Variables significantly related to non-response were mothers with education level less than Year 12, and mothers who speak a language other than English at home. Carol referred us to the website www.aifs.gov.au/growingup for more information on the weighting process (via a technical paper) and for information about the study in general.

This study provides a very rich data source. A large range of data is being collected on the child and his or her family via a face-to-face interview with the parent who knows the child best, as well as via forms completed by parents, teachers and child carers in their own time. Additional data from Medicare Australia (service use, Pharmaceutical Benefits Scheme use and immunisation history) and the National Childcare Accreditation Council, and aggregate Census data are also attached to the file. Carol encouraged us all to become users of the data, if we are not already, as well as alerting us to issues that should be considered when analysing the data, such as the age range of the children and the need to allow for the study design and weighting. Wave 2 data are about to released and the data set is available at very low cost to researchers and academics once their use of the data has been approved by the study's funders.

We were also informed about the "Life at" documentary series, which is based on the LSAC study and is following 11 babies and their families. "Life at 1" screened on ABC TV last year, a "Life at 2" website is now available (www.abc.net.au/lifeat2) , and filming for "Life at 3" is underway. Carol said that she has greatly enjoyed being involved in this documentary and felt privileged to be invited into these families' lives.

After the meeting, a number of us adjourned to nearby restaurant for dinner and we continued our discussion about Carol's very meaningful and very interesting presentation.

Ann Maharaj

Predicting seabed fauna using physical data

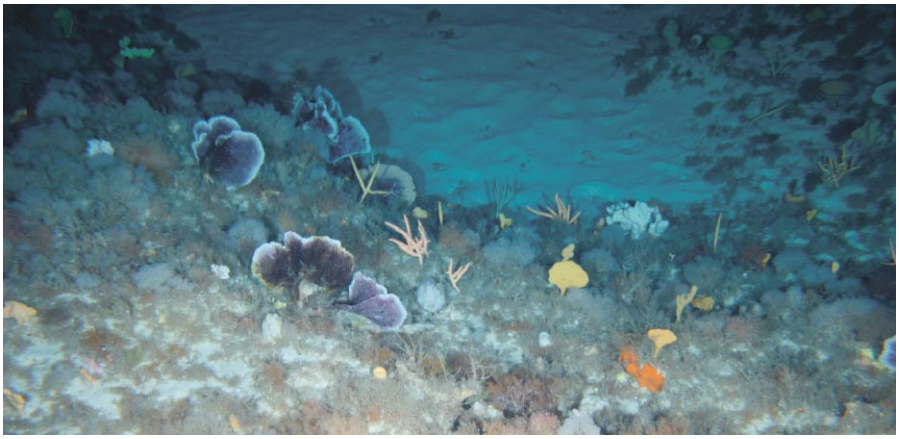
In recognition of the recent growth in the Tasmanian statistical community, the Victorian Branch invited Scott Foster, from CSIRO Mathematical and Information Sciences (CMIS) in Hobart, to address the September meeting. Scott is one of four statisticians in the Hobart CMIS group. He is collaborating with scientists in CSIRO Marine and Atmospheric Research on a major project on seabed monitoring. Its aim is to understand marine ecological processes in a critical range of Australia's continental slope (specifically, the depth range 150m to 1000m). The study will provide key inputs into major decisions on the management of Australia's marine economic zone, such as the selection of Marine Protected Areas.

The seabed monitoring project was born out of a dramatic improvement in technology for mapping the seafloor. Historically, marine maps were cobbled together from a variety of sources, and—to be polite—they were indicative rather than exact. Now specially equipped ships are able to bounce multiple sonar beams off the seafloor, and, after some fancy footwork, scientists then produce, from the reflected signals, detailed maps of depth, gradient and back-scatter (a measure of seabed roughness). The new 'swath' maps are a revelation. Furthermore, they are relatively quick to produce—potentially Australia's marine economic zone could be swath mapped within 3 years. Despite this quantum leap in quality, swath maps do not provide any definite information on ecological processes. For this, a second 'new' type of data can be used. A video camera is lowered to within a metre or two of the seafloor, and is towed behind a vessel along fairly linear transects over several kilometres. Each video is analysed frame by frame by marine biologists to provide information on substrate type (whether the seafloor is sandy, or rocky, or whatever), geomorphology (whether the seafloor is flat, or has ripples, for example) and fauna type (whether the dominant species in the frame consists of sponges, or sedentary fauna, and so on). These are important ecological variables.

The statistical challenge facing Scott and his colleagues is to model trivariate (substrate, geomorphology and fauna) categorical spatial data from the video transects, including covariates from the swath maps. As a second step, the model should then be extended to predict the distribution of fauna (with standard errors) over large marine areas that have been swath mapped, with perhaps a few scattered video transects intersecting the region. Scott described an approach using reversible Markov chains to model the video data, which seemed to work remarkably well on both simulated and real data. Scott finished his tour de force by describing some future challenges, including the provision of suitable diagnostic measures for spatial models with categorical responses.

The meeting was hosted by Monash University's Department of Econometrics and Business Statistics, now housed in their bright new high-rise building on the Caulfield campus. In keeping with a talk about deepwater issues, dinner after the meeting was in a basement restaurant in the depths of the same building.

Geoff Laslett



Rocky outcrop supporting sponges, octocorals and bryozoans. Video still: CSIRO Marine and Atmospheric Research.

South Australia Branch News

An Estimating Equation Approach to Census Coverage Adjustment

At the last meeting for the year, the SA branch was pleased to have Phil Bell from the Australian Bureau of Statistics describe his methodological work relating to the 2006 Census Post-Enumeration Survey (PES).

The population Census aims to cover all people in Australia on Census night so that it may be used to, among other things, estimate the resident population. Unfortunately however, the Census will miss some people, while others will be counted more than once. The purpose of the PES is to find missing people, although some will still be missed. The PES is conducted around one month after the census to avoid influencing Census results and a constant probability of selection is used within each state/territory. For each individual surveyed, interest lies in whether they should have been counted in the Census and this is compared to how many times they were counted. The survey data are weighted such that the survey estimate of how many people were counted equals the Census count. The difference between this number and the estimate of how many people should have been counted can then be used to estimate Census under-count.

The principle underlying weighting is that identical weight changes should apply to all units with the same characteristics, regardless of whether they were counted in the Census or not. All dwellings selected for the PES are initially weighted based on their selection probability and then the weights are adjusted. In the 2001 PES, the generalised regression estimator was used which adjusts weights based on Census information. This is problematic however, since individuals who weren't captured in the Census will not get a weight. Phil described a new method used in the 2006 PES called the prediction regression estimator, developed by the Australian Bureau of Statistics. Major advantages of the new method are that it can account for misclassification between the Census and the PES, and it gives all surveyed individuals a weight, not just those who were captured in the Census.

Lisa Yelland

The End of an Era: Demolition of the Mathematics Building at the University of Adelaide

Following a decision by the University Council, the Mathematics Building at the University of Adelaide has now been demolished. It will be replaced by a new Engineering Building which will not only house the School of Mathematics but also the Faculty Office for the Faculty of Engineering, Computer and Mathematical Sciences, the School of Computer Science and the School of Electrical and Electronic Engineering. The new building has a 5.5 star environmentally sustainable design rating and with nine floors, it will address some of the space issues the University currently faces and will continue to face in light of the predicted growth in the Faculty of Engineering, Computer and Mathematical Sciences of 37% (compared to 25% for the University overall). The new building is expected to be completed by Semester 1, 2010.

A celebration breakfast was held in late 2007 to give staff and students an opportunity to say farewell to a building that has been a second home to many over the years, though some did not see it as a cause for celebration. Staff previously located in the Mathematics Building have now settled into their temporary location on level 3 and 4 at 10 Pulteney Street.

The SA branch of the SSAI regularly held monthly meetings in the Mathematics Building. It will continue to hold many of its monthly meetings at the University of Adelaide, though now in a different location.

You can view the demolition of the Mathematics Building at: http://www.adelaide.edu.au/space/emcs/construction/

Lisa Yelland

NatStats 08 Conference

Organisation of the ABS hosted NatStats 08 Conference is underway. The conference will be held from 19-21 November 2008 in Melbourne, and will connect users and producers of official statistics, and provide an opportunity for participants to discuss strategies for measuring progress in Australian society. The conference focus will be on improving the range and quality of official statistics for the nation.

The main theme for the conference will be "Working together for a better informed and performed Australian Society". Keynote and invited speakers are being identified who can discuss and debate issues in their area of expertise or can provide insight into measuring the progress of Australian society and the future development of national statistics.

The NatStats 08 Conference will be linked with the global initiative being led by the OECD on Measuring Societal Progress in the 21st Century. As part of this initiative, the OECD will be holding it's third major international forum on Measuring the Progress of Societies, in Korea in mid 2009. The OECD World Forums are major events that provide an opportunity for collaboration between those who wish to measure, or assess, the progress of their society. The OECD World Forums attract politicians, policymakers and statisticians from around the globe. Previous forums were held in Pisa in 2005 and Istanbul in 2007.

We are also interested in hearing your suggestions on topics for the conference program or perhaps you have an interesting or innovative case study which you would like to share with the statistical community. If you would like to share your ideas please email Mark Lound at inquiries@nss.gov.au or phone (02) 6252 6325.

Details of the conference will be included in future editions of the SSAI Newsletter.