

‘Truth, damned truth and statistics’



Dennis Trewin, the Australian Statistician, addresses the National Press Club

It's not every day that we can see the head of Australia's official statistical agency in action under the scrutiny of Australia's political press gallery. Dennis confidently faced the blowtorch for the Australian Bureau of Statistics – and the profession – in March. His talk kicks off ABS's centenary celebrations and gave him an opportunity to air several issues.

He argued that ABS has a strong and key role in a democracy by providing impartial, relevant and comprehensive information to inform public debate and decision making. As he said, *'I am always gratified to see public debate that uses ABS statistics without qualification or question. For the fact is, the public and Australia can have strong faith in their official statistics. The same cannot be said for many other countries where pressure and influence can impact on what is collected, how it is collected and how it is released.'* Later, he said, *'Because of this trust [in ABS's data], discussions can focus on what the statistics mean for policy rather than on the integrity of the statistics themselves.'*

The reliability of ABS statistics was raised in the questions that followed his talk because the Reserve Bank had just raised interest rates for the first time after a long period, and in doing so publicly doubted the ABS statistics that the economy was already slowing. Dennis displayed a keen grasp of the issues,

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reiterated his confidence in the ABS data and explained, in non-technical terms, why he believed his faith was justified – maybe by the time you read this article, we will know whether the ABS view of an already slowing economy was correct!

Dennis also reacted quickly and decisively to the suggestion that Kerry Packer had got the question on internet usage inserted into the 2001 Census – with an emphatic 'No!'

Another issue canvassed by Dennis was that of privacy. The balance between privacy and access to data is a thorny issue, with some researchers wishing for greater access to detailed data, even though this has the potential for disclosure about the individual sources of the data.

This issue is perennial, as Dennis's anecdote about Sir Roland Wilson, who was the Commonwealth Statistician for periods in the 1930's and 1940's, shows:

'Apparently the legislation for a Census of Wealth was hastily drawn up in the days before World War II. Consequently the legislation was badly drafted and mentioned that the Commissioner of Taxation could have access to the data – without making it clear that he could access only the collated information.

Subsequently, during a tax evasion case, the Commissioner of Taxation got the idea that he could win the case by accessing the defendant's individual Census of Wealth data. According to Wilson

"He ... came storming into my office one day and demanded this bloke's wealth card and I said he couldn't have it. 'Why?' 'Because they are confidential and if it was used in a court case it could wreck our reputation.'"

The Commissioner of Taxation, not content with this reply, took the matter to Cabinet and convinced it to approve his access to the individual's data. Then he went back to Wilson to collect the information.

"Oh, he was on the seventh heaven of delight and he came storming along with his two Deputies, waved the Cabinet decision at me and said 'You've got to hand those cards over to me'. 'I'm sorry ... I can't' [said Wilson]. 'What do you mean, I've got a Cabinet decision' [the Commissioner exclaimed]. [Wilson replied,] 'You're about a week too late, I piled them into two trucks

Possum Dreaming

In the February and this issue photographs of Dennis Trewin, the Australian Statistician, have appeared with him wearing the same tie. There is a story behind the tie and it goes like this ... the design of the tie is taken from the painting "Possum Dreaming".

The painting Janganpa Mungapunju Jukurrpa (Native Possum Dreaming at Mungapunju) and Janganpa Mawurrji Jukurrpa (Native Possum Dreaming at Mawurrji) was commissioned by the Australian Bureau of Statistics and hangs in the foyer of its building in Belconnen, Canberra.

It is a collaborative work of 35 artists from the Warlukurlangu Artists Aboriginal Association from Yuendumu, 290 kilometres north west of Alice Springs, Northern Territory. The principal artist was Andrea Nungarrayi Martin. The eleven metre by one metre acrylic painting on canvas was completed in 2003 and hangs in the atrium of ABS House, Canberra.

Painting meaning: This painting concerns the creative actions of the Janganpa or Native Possum ancestors at two major sites west of the artists' community of Yuendumu in the Tanami Desert. The sets of concentric circles represent the sites and ceremonial camps, the U-shapes are people sitting, the E-shapes are the footprints of the Possum Ancestors, and the wavy lines their paths of travel.

last week, sent them down to Sydney and incinerated them.'"

Dennis added, *'I can assure you that I will be similarly protective of data provided to [the ABS], but not use the same tactics'.*

Dennis also argued that ABS has an important role as a statistical leader – both internationally (ABS is proud to be one of the top agencies worldwide) and within Australia. As the Australian official statistics world changes and moves toward a national system where the ABS is only one of the providers of information, the other providers are looking for leadership, a role which the ABS is keen to provide. Dennis clearly sees a strong and continuing place for the professional skills that statisticians can contribute to ensuring that comparable

data are collected efficiently and well and are analysed and presented appropriately.

Although Dennis was too modest to mention it, ABS also demonstrates its leadership by its strong support for the statistical profession. This includes active sponsorship of professional activities such as workshops, conferences (witness, the recent ISI in Sydney) and the current review of statistics at Australian universities, as well as its own training and development of statisticians.

The full text of Dennis' televised luncheon address at the National Press Club on the 9th of March can be found under the March 2005 press releases at www.abs.gov.au.

Michael Adena

Statistics and schooling

Some observations prompted by perceptive questions and comments from young statisticians at ISI and by the release of the RSS report, April, 2005, at <http://www.rss.org.uk>

Although there have been, and remain, differences between the situations with statistics in schools in the UK and in Australia, the similarities are sufficiently strong since 1990 for the key recommendations of the RSS *Report on Teaching Statistics Across the 14-19 Curriculum* to be as pertinent in Australia as they are in the UK. The very brief comments below are taken from my paper *Coherent And Purposeful Development In Statistics Across The Educational Spectrum*, Proceedings 2004 IASE (International Association for Statistical Education) Roundtable on *Curricular Developments in Statistics Education*; from invited talks to SSAI branches in 2003-2005; and from *Data, Statistical Literacy and the New Syllabus*, Qld May, 2005, conference for grade 1-10 teachers.

Statistics was introduced into Australian school curricula in various forms before 1990, but it was the National Statement for Mathematics (Curriculum Corporation, 1990) that prompted a strong emphasis on statistics up to grade 10 in the form of Chance and Data strands. This emphasis on statistics was, and is, because statistics is regarded as important, and statistical literacy a fundamental component of citizenship. No statistical society or professional statisticians could disagree with this.

The curricula in Chance and Data up to grade 10 levels are similar across Australia, with the data strands built around collecting, exploring and graphing data, but with the chance strands still dominated by very traditional emphases on games of chance, counting outcomes and other contexts isolated from the real, the everyday and all notions of modelling with probability and data. At the grades 11, 12 levels, the National Statement provided little coherent or relevant guidance, but in the states in which statisticians have been extensively included in senior syllabus committees and support for teachers, the statistics strands at the senior levels are similar in theme and emphasis. It is this longterm involvement "at the coalface" at the senior school levels that has provided, and continues to provide, the impetus, trust and respect that enable statisticians to become involved and influential across the educational spectrum.

Although the emphasis on exploring data through graphs was, and is, desirable and commendable, there was very little understanding of how to develop concepts of variation and the representational nature of data, particularly as students moved into junior secondary schooling. That is, there was little scope to take students beyond the "draw, read, quote and answer questions" stages with clean, official or non-complex datasets. Major consequences of this include: (1) a tendency to regard the data-in-hand as the "full story"; (2) over-emphasis on conclusive decisions based on graphs only, without consideration of data variation; (3) frustration for teachers, students, parents and statisticians from the resulting tedium in junior secondary schooling of the repetition in graphing and data handling without progress in the development of statistical thinking. Benefits of the above bad effects are that it has provided the impetus for internationally-acclaimed ground-breaking research over the past decade by Australians such as Jane Watson and her co-workers on the development of statistical thinking across schooling ages; and it has prompted the Australian statisticians involved in senior and introductory tertiary education to also turn their attention to trying to help at the junior secondary and even late primary levels.

There are no quick fixes or magic wands. Helping to develop quality education in chance, data and statistics across schooling can only happen through statisticians working with teachers, educationalists and educational authorities on a longterm basis. Participating in syllabus development and writing is important and very demanding in time and patience (!) but is only the first step. This is because the formats of syllabi are controlled by educational administrators. The real differences are made through resources and other supports for implementation of syllabi, and working with teachers and teacher groups. Working with leading maths teachers emphasises their talent and commitment to developing quality statistical education. A significant characteristic of leading maths teachers is their desire and capacity for learning, their intense interest in modern statistics and mathematics, and their commitment to translate what they learn into *their* realm of expertise – the classroom. Just a few such leading teachers include Anthony Harradine (SA), Rob

Drummond (Qld), Wayne Stevens (Qld), Michael Evans (Vic), and teachers such as James Nicholson (Belfast, UK) and Maxine Pfannkuch (NZ) who now holds a joint appointment in statistics and education at the University of Auckland. Statisticians working closely with teachers include Kay Lipson (Vic), Brenton Dansie (SA), Gary Glonek (SA), John McColl (Glasgow, UK), the staff at the RSS Centre for Statistical Education, and statistics staff at University of Auckland. Tasmania has the outstanding expertise of Jane Watson. There needs to be better and more widespread knowledge within the statistics community of the entire schooling spectrum.

There are also many statistician parents and professionals who contribute their time and passion in helping to bring statistical literacy, thinking and applications to schools and teachers. You may feel that the task is too large for small contributions to help. Not so – every bit of involvement by statisticians contributes to the longterm development of statistical literacy and thinking.

So are we progressing and what are the current main challenges? These comments are too brief to permit full discussion, so I will give just a few examples from Queensland where I have much involved for more than a decade. Because of the system of school-based, centrally-moderated assessment, and my membership of a state panel, I have been able to see a cross-section of student and teacher work in statistics at the senior level. This is still very diverse, but the influence of leading teachers and teachers whose tertiary study included at least two statistics subjects, is growing. I have been told of a number of reasons why the situation with statistics at school is different in NSW to other states, but it is of interest to note that NSW is the state most oriented to single central examinations and least oriented to teacher-centred developments. The work required for a teacher to turn a good context and good data into learning and assessment experiences should not be underestimated. The increasing spread and number of teachers with statistics in their tertiary study is of significant benefit. For example, all QUT secondary education students with maths as one of their designated teaching areas are required to do one, and preferably two, of our first year statistics subjects. The difficulties and challenges of syllabus

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**DEADLINE FOR
NEXT ISSUE:
10 JULY 2005**

Editorial

The deadline for copy to make it into this newsletter coincided with the session of the International Statistical Institute held in Sydney. We hope that everyone who attended found it a great conference.

Annual General Meetings have also recently been held in all the branches, and several of the branch reports in this newsletter list the members of the new councils. Each Branch should have a newsletter correspondent, to whom you can submit material for the newsletter. Of course you can also submit material direct – the email addresses of the Editors appear in every issue of the newsletter. Keep those contributions and photos coming!

Another deadline that has just passed is the one for the draft report of the review of statistics in Australian universities. The newsletter will carry information about this report as soon as it becomes available. In the meantime, keep an eye of the Society's website, <http://www.statsoc.org.au> for the most up-to-date information.

The CensusAtSchool Project

The Australian Bureau of Statistics (ABS) is embarking on an exciting and interesting project for Australian school students – the CensusAtSchool project. CensusAtSchool is based on a similar program developed by the Royal Statistical Society (RSS) Centre for Statistical Education in the United Kingdom, under the guidance of Professor Neville Davies. In Australia, two previous projects that focused on students (one run by the Noel Baker Centre for School Mathematics in South Australia and one by the Office for Economic and Statistical Research in Queensland) are collaborating with the ABS on the CensusAtSchool project.

The CensusAtSchool project aims to satisfy two important needs: to increase statistical literacy; and to promote the 2006 Census in Australian schools. Statistical literacy is an essential life skill for the information age we live in today (i.e. the ability to understand, interpret and evaluate statistical information and make sensible, informed decisions). Also, traditionally the ABS has had a program with schools as part of the lead up to each Population Census. These programs have a number of objectives, including improving awareness of the Census, explaining why Australia holds a Census every five years, and providing details on how a Census is run. The next Australian Population Census will be in August 2006.

CensusAtSchool provides a unique e-learning opportunity for Australian school students to investigate questions of interest to them, through the analysis of data about themselves. It also provides the opportunity for Australian teachers to use this technology along with their students. Through a free web site, students can participate by completing an online questionnaire that focuses on them and their interests. Students will then have the ability to take samples of raw data from the population of responses received Australia wide. The web site will also have a library of census and statistics related information for classroom use. In addition, classroom activities will be provided with students from Years 5 through to 10 in mind. They will focus on Mathematics, as well as studies of Society and the Environment.

The ABS has worked closely with all state/territory education intermediaries in the development of the CensusAtSchool project. The project is currently in its advance development stage, with a web site ready for release testing in July 2005. Schools will be able to register to participate in CensusAtSchool from October 2005 onwards.

More information about CensusAtSchool can be obtained by contacting Ms Soo Kong, National Education Services Unit, on 1800 623 273 or 03-9615 7360, or by emailing censusatschool@abs.gov.au.

President's Corner

SSAI Review of Statistics

During February the Review Team of Professors Adrian Smith, David Vere-Jones and Ian James visited each Branch of SSAI and heard submissions and contributions from a broad cross-section of the profession and employers of people with statistical expertise. As this newsletter goes to press we are expecting the first draft of the team's report. In the first instance this report will go to the managing team and then I expect that it will be circulated for comment from members. Thank you to every one who made submissions and found time to talk to the team. Special thanks go to the people in each Branch who organised the scheduling of the sessions.

Direct Election of Executive Officers

At the SSAI AGM in July, Ken Russell moved that we consider the direct election of Executive officers by all SSAI members instead of the current approach where a nominating committee, made up of the Executive plus Branch presidents, puts forward nominations to Central Council. Doug Shaw put together a paper on the subject and this was published in the previous issue of this Newsletter. Comments, suggestions and thoughts can still be made through the Branches or via any member of the Executive.

Science Meets Parliament 2005

For some years now, FASTS (Federation of Australian Scientific and Technological Societies) has been holding a 'Science Meets Parliament' session involving scientists and many parliamentarians. This year was the 6th in the series after missing 2004 because of election timing. About 250 scientists and over 50 politicians participated this year on the day when members of the Danish Royal Family were visiting Parliament House. This occasion highlighted the contrast between the public role of politicians and the daily workings to which the scientists contributed for the day. Groups of two or three scientists were allocated to at least two different politicians and sessions took place in between all of the other activities that each parliamentarian was involved with. The sessions in which I participated involved Senator Gavin Marshall from Victoria and the Honorable Sophie Panopolous, the Liberal Party Member for Indi in North Eastern Victoria (my electorate). These sessions lasted about half an hour and involved each person talking about what they did and the issues involved. At a dinner on the previous evening, I was fortunate to have discussions with Senator Lyn Allison (the Australian Democrats' leader) and the Honorable Dick Adams (the ALP member for Lyons in Tasmania). It is quite refreshing to experience first hand just how well informed politicians are about scientific issues and the rich variety of backgrounds that they bring. I highly commend the experience to anyone who wishes to participate in future 'Science Meets Parliament' sessions. The time and effort involved was very worthwhile because of the opportunity to talk directly to a few parliamentarians as well as other scientists.

ISI 2005

The 55th session of the International Statistical Institute (ISI) was held recently in Sydney and SSAI has participated in some of the organization for this conference as well as setting up a booth amongst the exhibitors. Two excellent sessions that I attended were about careers in statistics and the future for statistical societies. Many comments were made about the high quality of many of the talks presented.



The conference was also part of the celebrations to mark the centenary of the Australian Bureau of Statistics. Congratulations go the Dennis Trewin and everyone at ABS for reaching this milestone with such a high level of credibility with the Australian public, census users and amongst the statistical profession.

ANZJS Team Changes

Discussions are taking place with the relevant people about introducing an electronic form of the ANZJS in addition to the printed version and the PDF version currently available. It is likely that this will come on stream at the beginning of 2006 but there are other changes that affect the Journal that are happening in the interim. Firstly, Chris Lloyd is stepping down as Managing Editor after a replacement has been found. Chris has done an excellent job as Editor over about four years and we thank him for his efforts. A replacement will hopefully be appointed by Central Council in July and nominations will be sought by the SSAI Nominating Committee that is made up of the Branch Presidents plus members of the Executive. Ray Watson is also standing down as Technical Editor after earning widespread respect for over eight years of work in this role. Thank you Ray for your excellent contribution over such an extended time. Ken Russell has agreed to take on the role.

Neville Bartlett

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Apology

The editors apologise that the Queensland Branch Report by Ross Darnell in the February issue was incorrectly attributed to Brenton Clarke.



Hosted By

The Statistical Society of Australia (SSAI) and The New Zealand Statistical Association (NZSA).

Contact Details

ASC/NZSA 2006 Conference Managers
GPO Box 128, Sydney NSW 2001
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Email: statsnz2006@tourhosts.com.au

Expression of Interest

If you are interested in attending the Conference,
please register your interest
on-line www.statsnz2006.com

Scientific Program

A stimulating and cutting edge Scientific Program is being developed to cover a wide range of topics relevant to all statisticians. The program will provide practical knowledge and insights from prominent international and Australasian speakers and will address the latest developments in statistical research, education and practice.

Workshops

Technical workshops that are of particular interest to practitioners will be included in the Conference Program. The Scientific Program Committee is seeking potential workshop presenters. If you are interested in contributing please contact David Scott at d.scott@auckland.ac.nz.

Looking for a job?

For a listing of current statistical vacancies in Australia and New Zealand visit:

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ANZJS Discussion Paper - May 2005

The purpose of this note is to raise several options for ANZJS so that these can be discussed by members of NZSA and SSAI before any decisions are taken at Society meetings that will take place early in July.

Background

In a typical year ANZJS is made of 4 issues of 128 pages but during 2004 it was agreed by NZSA and SSAI to use financial reserves to reduce a substantial backlog of papers. It was felt that such a situation was undesirable and that action needed to be taken. Consequently, three issues during 2004 were extended to 192 pages. At A\$75 per page for 3 x 64 pages this comes to a total of A\$14,400 that is shared between the two societies.

We now find ourselves in the position where we still have a substantial backlog of accepted papers (35 papers that equate to about 3 issues) and we are debating what, if anything, we should do about it. An optimal backlog would be 1.5 to 2 issues.

The options below are indicative of the broad range of options that are possible and members of both societies are invited to give this matter some thought and to contribute suggestions about which options are considered to be desirable or undesirable. Many variants and combinations are also possible and one should not consider the list below to be the only ones available.

Chris Lloyd reports that there has not been a noticeable increase in standard of papers that are currently being submitted so that the problem does not appear to be caused by an consistent increase in volume of high quality submissions.



Option A

Do nothing about bumper issues but ask the editorial panel to increase the standard so that the problem will steadily dissolve (albeit fairly slowly) over the next year or so.

Option B

Run some more bumper issues of 192 pages to reduce the backlog and once again fund this from the financial reserves of both Societies. The costs would be similar to those quoted above for 2004. Do members feel that this is a suitable use of financial reserves.

Option C

Increase the size of the ANZJS on a regular basis and have Blackwell revise the quoted cost. This would be cheaper than running ad hoc bumper issues but would need a consistently higher rate of acceptance of papers of suitable quality. The Editor reports that he does

not believe that the current submissions warrant this step.

Option D

One way to reduce the demand on financial reserves is to introduce page charges. Many Journals do this nowadays and the idea has some advantages. The funds raised can be used to pay for bumper issues in the short term and lessen the financial load on Society members in the longer term. Variations include offering authors so many free pages before page charges apply and to allow members of the Societies advantages over non-members.

Option E

Extend Option D to the extreme and make page charges the main source of funding for the production and distribution of the Journal. This option has been included after hearing about the PLOS (Public Library of Science) Journals that are fully funded via page charges but published with completely open access. The PLOS has several electronic-only Journals available (see <http://www.plos.org/> for more details).

Comments

Any thoughts, suggestions or concerns that you have can be sent to the ANZJS Editors, anyone on the NZSA or SSAI Executives or Branch Representatives.

*Neville Bartlett and Murray Jorgensen
SSAI and NZSA Presidents*

Year	Papers Submitted	Papers Accepted
2002	119	40
2003	141	37
2004	114	25
2005	119 (projected)	20 ?

Three Doors

Three Doors with Borek Puza (Edition 2)

Welcome to the second edition of *Three Doors*, a regular feature of the *SSAI Newsletter* which focusses on interesting questions, paradoxes, conundrums, etc. in the field of probability and statistics. In the last edition we described The Monty Hall Three Doors Problem and posed an extension of it called The Two Monties Puzzle. Unfortunately, none of the solutions proffered (before 22 March) were correct and so no prize will be awarded this time. We now repeat the puzzle, solve it, and discuss a commonly made error. The next puzzle will then be presented.

The Two Monties Puzzle

Suppose you're on a game show and given a choice of three doors. Behind one is a car; behind the others are goats. You pick door No. 1, and the host, who knows what's behind them, opens No. 3, which has a goat. He then asks if you want to pick No. 2. Find the probability that the car is behind No. 2 under the following assumptions:

(a) the car was hidden randomly; (b) you were definitely going to pick a door randomly; (c) the host was definitely going to open a goat door (other than the door picked by you) and offer the option to switch; (d) the host is one of two (called M1 and M2) who take turns at staging the show on alternate nights; (e) whenever presented with a choice of two doors to open, M1 opens the door with the lowest number, and M2 decides by flipping a coin; and (f) you randomly chose a night on which to play and have no extra information regarding the host's identity.

Solution to The Two Monties Puzzle

As in the last edition, let "1" and "2" denote the car being behind doors No. 1 and 2, respectively; let A be the event that you initially pick No. 1; let H be the event that the host opens No. 3 and gives you the option to switch; and let $q = P(H|1A)$ (i.e. the probability with which the host opens No. 3 and gives you the option to switch in the event of you correctly picking No. 1). Now, if q were known then the unconditional probability of known events could be written

$$\begin{aligned} P(AH) &= P(1AH) + P(2AH) \\ &= P(1)P(A|1)P(H|1A) + \\ &\quad P(2)P(A|2)P(H|2A) \\ &= (1/3)(1/3)q + (1/3)(1/3)(1) = (1 + q)/9. \end{aligned} \quad (1)$$

But q is actually a random variable with prior $f(q) = 1/2$, $q = 0, 1/2$ (corresponding to your host being M1 and M2, respectively). Therefore (1) must be rewritten as $P(AH|q) = (1 + q)/9$, and so the unconditional probability of known events is in fact

$$\begin{aligned} P(AH) &= P(q=0)P(AH|q=0) + P(q= \\ &\quad 1/2)P(AH|q=1/2) \\ &= (1/2)(1+0)/9 + (1/2)(1+(1/2))/9 = \\ &\quad (1/2)(1/9) + (1/2)(3/18) = 5/36. \end{aligned}$$

Hence by Bayes' rule the posterior probability of M1 being your host is

$$\begin{aligned} P(q=0|AH) &= P(q=0)P(AH|q=0) / \\ P(AH) &= (1/2)(1/9) / (5/36) = 2/5. \end{aligned} \quad (2)$$

Now, if $q = 0$ then $p = 1$, and if $q = 1/2$ then $p = 2/3$ (by the formula $p = 1/(1 + q)$, which was derived in the Appendix of the last edition). Hence the posterior probabilities of p being 1 and $2/3$ are $2/5$ and $3/5$, respectively. It follows that the posterior probability of the car being behind door No. 2 is

$$\begin{aligned} P(2|AH) &= E\{P(2|AH,q)|AH\} = E(p|AH) \\ &= (1)(2/5) + (2/3)(3/5) = 4/5. \end{aligned} \quad (3)$$

Illustration via a mental experiment

To see this result another way, consider 18000 hypothetical games on subsequent days. Exactly 9000 of these games will be hosted by M1 and 9000 by M2. About 3000 of the 9000 games hosted by M2 will have the car behind No. 1; and of these 3000, about 1000 will have the player choose No. 1. Then, in about 500 of these 1000 games the host will open No. 2, and in the other 500-odd the host will open No. 3.

By considering a tree diagram with all such branches, we find that the total number of games wherein the player chooses No. 1 and the host opens No. 3 will be about 2500. Also, the total number of games wherein the player chooses No. 1 and the host opens No. 3 and the car is behind No. 2 will be about 2000. Therefore in the current game, the conditional probability that the car is behind No. 2, given that the player chooses No. 1 and the host opens No. 3, is $2000/2500 = 4/5$.

Discussion

The fact implied by (2) that M2 is probably your host makes intuitive sense, because M2 is more likely than M1 to open

No. 3 when presented with a choice, and because No. 3 was in fact opened. Without thinking it through one may be tempted to say that the required probability is the straight average $(1)(1/2) + (2/3)(1/2) = 5/6$. However, this is the *unconditional* expectation $E(p)$ rather than the required *conditional* expectation $E(p|AH)$ at (3). Failure to condition on AH here amounts to not realizing that the known events in the game tell us something about the host's strategy.

A similar error occurs in Morgan *et al.* (1991; page 286). There it is stated that "the noninformative prior" (presumably $f(q) = 1$, $0 < q < 1$) makes the required probability equal to the integral of $1/(1 + q)$ from 0 to 1, which is 0.693. However, this is wrong, and it is shown in Puza *et al.* (2005) that the correct probability is $2/3$. This error in Morgan *et al.* poignantly reinforces the sentiment in the abstract of that article (page 284), where the authors write: "The solution and failed attempts at solution [of The Monty Hall Three Doors Problem] are rich in their lessons in thinking about conditional probability."

The Sample Size Puzzle

Consider a random sample of n values from the normal distribution with mean k and variance 1. Suppose that n had previously been obtained by flipping a coin and taking n as 1 if tails came up and as 2 if heads came up. Also suppose that k is assigned an improper flat prior distribution over the whole real line, independently of n . We now observe that the total of the n values is 1.000. Find the probability that $n = 1$.

For your chance to win a fabulous mystery prize, send your solution (sooner rather than later) to <borek.puza@anu.edu.au>. Extra chances will be awarded for solutions which are accompanied by cogent discussion of any peculiar features of the puzzle and its solution.

References

Morgan, J.P., Chaganty, N.R., Dahiya, R.C., and Doviak, M.J. (1991). Let's make a deal: The player's dilemma. *The American Statistician*, 45, 284-287.

Puza, B.D., Pitt, D.G.W., and O'Neill, T.J. (2005). The Monty Hall three doors problem. *Teaching Statistics*, 27(1), 11-15.

NOTICE

The Annual General Meetings of
The Statistical Society Of Australia Inc and
The Australian Statistical Publishing Association Inc. will
be held on Tuesday 5 July 2005 at 5.30pm at
University House, Australian National University, Canberra

SSAI Annual General Meeting — Agenda

1. Apologies and Proxies
Proxies must be given in writing as per form inserted in the May 2005 issue of *SSAI Newsletter*. Proxy forms must be received by the SSAI Executive Officer for passing to the Secretary no later than 24 hours before the time of the meeting.
2. Confirmation of the Minutes – Minutes of the meetings as circulated
3. Matters arising
4. Reports
 - 4.1 President
 - 4.2 Treasurer
 - 4.3 Branches
 - 4.4 Sections
5. Accreditation
 - 5.1 Report from Accreditation Committee
6. Conferences
 - 6.1 ASC 2004/IBC2004 and ISI2005
 - 6.2 ASC 2006 (joint with NZSA, in Auckland)
 - 6.3 ASC 2008
7. Election of Section Chairs
Nominations for Section Chairs should be received at the SSAI office no later than 28 June 2005. Nomination Forms have been inserted in each copy of the May issue of *SSAI Newsletter*. All nominations require a seconder and a statement from the nominee that she or he is prepared to stand.
8. Appointment of signatories
10. Other business
11. Time and place of next meeting.

ASPAI Annual General Meeting — Agenda

1. Apologies and Proxies
Proxies must be given in writing as per form inserted with May 2005 issue of *SSAI Newsletter*. Proxy forms must be received by the SSAI Executive Officer for passing to the Secretary no later than 24 hours before the time of the meeting.
2. Confirmation of the minutes – Minutes of the meetings as circulated
3. Matters arising
4. Presentation of the Annual Report by the Editor of the Australian and New Zealand Journal of Statistics
5. Presentation of the Annual Report by the Newsletter Editors
6. Treasurer's Report
7. Appointment of signatories
7. Other business
8. Time and place of next meeting.

Dinner Notice

Following the Annual General Meetings the Canberra Branch will host a presentation by Professor Raymond J Carroll of Texas A&M University on Semiparametric methods for gene-environment case-control studies when gene and environment are independent in population. An abstract provided by Professor Carroll appears on page 11.

A buffet dinner will follow Professor Carroll's presentation. A booking and payment slip for the dinner is included on the insert to this Newsletter with the proxy and Section Chair nomination forms.

Asymptotics and Nonparametrics Workshop



The School of Mathematics and Statistics at the University of Sydney held a two day workshop in March to mark the 65th birthday of Professor John Robinson who has been on staff at the university since 1964. The meeting was generously supported by the Australian Mathematical Sciences Institute.

30 people participated in the meeting including a number of John's current and former students. The speakers included Brenton Clarke, Peter Hall, Bingyi Jing, Andrzej Kozek, Spiro Penev, Marc Raimondo, Elvezio Ronchetti, Bob Staudte, Steve Stern, Michael Stewart, Qiying Wang, Alan Welsh, and Wang Zhou. John gave the final paper of the workshop. His talk was entitled *Empirical saddlepoint approximations in samples from a finite population*. John made it clear that although he had reached 65 he was having too much fun teaching and doing research to consider retirement.

Neville Weber

ACSPRI SHORT COURSES IN RESEARCH METHODS 2005 ACSPRI WINTER PROGRAM UNIVERSITY OF QUEENSLAND, 27 JUNE - 1 JULY 2005

The Australian Consortium for Social and Political Research Inc. was formed in 1976 as a national organisation of member institutions to enhance the use of machine-readable data. In support of its objectives, ACSPRI offers courses in research methods and research technology designed to serve a wide variety of needs for training and professional development within the academic, public and private sectors.

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- * Introduction to Statistics
- * Data Analysis in SPSS
- * Intro to *NVivo*: computer-assisted qualitative data analysis
- * Fundamentals of Multiple Regression
- * Factor Analysis
- * Data Analysis using *Stata*
- * Forecasting
- * Introduction to Structural Equation Modelling (*AMOS*)
- * Introduction to Structural Equation Modelling (*LISREL*)
- * Applied Structural Equation Modelling
- * Measurement in the Psychosocial Sciences
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FURTHER INFORMATION, COURSE APPLICATION FORMS AND ON-LINE BOOKINGS

ACSPRI: Telephone (02) 6125 2200 Fax: (02) 6125 4722

Website: www.acspri.org.au

Email: acspri@anu.edu.au

Presentation by Professor Raymond J. Carroll

Tuesday 5 July 2005, University House, Canberra, following the SSAI and ASPAI Annual General Meetings, commencing at 5.30 pm.

Semiparametric methods for gene-environment case-control studies when gene and environment are independent in the population.

Abstract

I will consider case-control studies of gene and environment interactions using prospective logistic regression models. After a brief tour of the relevant facts concerning retrospective studies, I will consider a particular case that arises often in case-control studies when one covariate is a genotype/haplotype, and the other covariates are environmental variables. In many such cases it is reasonable to assume that genotype and environment are independent in the population, possibly conditional on covariates to account for population stratification. In such a case, I will develop a simple, easily computed semiparametric likelihood approach for this problem, showing that it leads to much more efficient estimates of gene-environment interaction parameters and gene-main effect parameters than the standard approach. In addition, if the probability of disease is known in the population, we show additional efficiency gains for estimating gene-environment interactions, in contrast to the standard approach in case-control studies. Multiple extensions are discussed, including to missing genotype data, haplotype data, and family-based studies. Application to an important data set is discussed as a means of illustrating some of the subtleties of the proposed approach.

Raymond J. Carroll
Distinguished Professor
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carroll@stat.tamu.edu

Conferences

Recent Advances in Biometrics, Bioinformatics and Markov Chain Monte Carlo
7-8 July 2005, Sydney
biomcmc@maths.unsw.edu.au

20th International Workshop on Statistical Modelling
10-15 July 2005, Sydney
k.matawie@uws.edu.au

Stochastic Modelling of Complex Systems (SMOCS-05)
10-16 July 2005 Daydream Island, Queensland
www.conferences.unimelb.edu.au/smocs05

NZSA Conference, 4-6 July 2005, Dunedin, New Zealand
<http://www.maths.otago.ac.nz/nzsa2005/home.php>

2005 Joint Statistical meetings, 7-11 August 2005, Minneapolis, USA
<http://www.amstat.org/meetings/jsm/2005>

Mathematics/Statistics in Finance, 8-12 August 2005, Kruger National Park, South Africa
<http://www.mif.up.ac.za>

ISI2007, Lisbon, Portugal
<http://www.ine.pt>

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**Further contact details for
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Section Chairs can be obtained
by contacting the Society on
(02) 6249 8266**

Continued from page 3...

production are increasing with the tendency of educational authorities to now cover grades 1-12 with a single committee, but an example of the benefits of my longterm involvement and gaining trust and respect of teachers is the just-completed resource paper About Data for grades 1-10 in Queensland. The large challenge of Chance is mentioned above. The other major challenge finds tertiary teachers of introductory statistics or mathematics across disciplines "in the same boat" as teachers of mathematics and statistics in senior secondary schooling: the lack of understanding or commitment in middle schooling to the quantitative foundations necessary for progress in senior school and tertiary study.

And so we come to the relationships between mathematics and statistics, a topic that still seems to produce more hot air than genuine illumination. There appears to have been little research on the relationship, but emerging research is providing evidence of the strong association between statistical reasoning and mathematical capabilities and background. Statistics, like physics and engineering, is not a branch of mathematics, but would not exist without mathematical thinking and foundations. Important practical points include: (i) like mathematical thinking, statistical thinking requires coherent, steadily progressive development in which its power of transferability is manifest; (ii) as evidenced in English A levels and recent Scottish subjects, emphasis on formal statistical procedures in schooling can be detrimental to development. The term "mathematics teachers" has meaning only in secondary schooling, and mostly at senior level, and it is these teachers who are most interested in statistics as a discipline in itself that can be applied across all applications and contexts. It is of interest that UK teachers of other disciplines were against the proposal that they should be given the responsibility and lose time from their subjects to include elements of statistics.

So what were the two questions from young statisticians that prompted this brief article? *Why have statisticians declared open season on mathematics teachers – they're our best allies.* And *Why are statisticians behaving like sheep in wanting to do what every discipline wants – introduce their own subject at senior level. It doesn't do any good and just messes things up.*

Helen Macgillivray

The ABS's National Education Services Unit

In 1990 the Australian Bureau of Statistics (ABS) established the National Education Services Unit (NESU). The role of the Unit has evolved over time to the current aim of encouraging the development of statistical literacy in students and teachers, and promoting access, understanding and greater use of ABS statistics in the school sector.

Statistical literacy is the ability to understand, interpret and evaluate statistical information, and to appreciate its value in helping us interpret the world around us and to make sensible, informed decisions in the workplace, the community, or as individuals. Statistical understanding is becoming more important in everyday life as we are continually and increasingly faced with data we need to understand. It is also critical to government decision-making, and business management and industrial activities, which are increasingly dependent on the transformation of masses of data into timely, actionable and trustworthy information. School education should prepare students to make high quality decisions based on sound evidence in all aspects of their lives, and statistical literacy is critical to this.

The ABS, through the NESU, endeavours to ensure that school children develop a sufficient understanding and appreciation of how data can be acquired and used. It also aims to evoke in school students a sufficient interest and enthusiasm for statistics that they consider pursuing tertiary studies in this field.

The NESU provides a variety of resources free through the ABS web site to support teachers in introducing statistics into the classroom. From the ABS web site, teachers can use the STATPAK catalogue to select ABS publications which are relevant to Australian curricula and offered to schools at a 30% discount. There is also a range of curriculum related student activities which have proved very popular that can be integrated into the classroom in a range of ways. The maths activities use a range of

ABS datasets to explore statistical techniques. Other resources use statistics to focus on issues such as water, Indigenous Australians and Australian communities. These resources include a range of Excel datasets, specifically selected by teachers for the classroom, reference material on statistical concepts and research techniques, and links to free data on the ABS web site. There are also special on-line school publications such as 'Statistics – A Powerful Edge' and 'Measuring Australia's Economy', as well as flagship publications like 'Australian Social Trends', 'Measures of Australia's Progress' and the 'Year Book Australia' that are relevant to the curriculum. Lesson plans built around these publications are also provided to assist teachers to make use of ABS data in the classroom and enhance learning.

Teacher conferences and student seminars and expos are the focus of NESU's promotional activities. The NESU exhibits and gives talks to raise awareness of the education resources available on the web site. The NESU also publishes articles in the education media and assists text book publishers to include up-to-date and relevant ABS data in their publications.

The 2001 census provided an opportunity to distribute 'A Tale of Two Worlds', an interactive CD-ROM where students explore two worlds, one with data and one without. This highly successful and engaging product was designed especially for schools. To promote the 2006 census and support statistical education in Australian schools, the ABS is extending the internationally successful CensusAtSchool project to Australian teachers and students. CensusAtSchool is an engaging e-learning opportunity for young Australians enabling them to work with real data about themselves.

More information about ABS's initiatives to help students can be obtained by contacting Ms Soo Kong, National Education Services Unit, on 1800 623 273 or 03-9615 7360, or by emailing soo.kong@abs.gov.au

SOUTH AUSTRALIA

Spatial Statistics in Petroleum Reservoir Evaluation

Professor Henning Omre is from the Norwegian University of Science and Technology and is currently visiting the University of Adelaide. During the October 2004 meeting of the SA branch, he introduced the audience to the role of spatial statistics in petroleum reservoir evaluation.

Henning began the talk by introducing some key ideas in spatial statistics. Spatial statistics may be thought of as multivariate statistics in very high dimensions. There are three types of general random fields which may be used to represent spatial phenomena. Continuous random fields may be used to model geological horizons for example. Objects in space, such as stars in the sky, may be modelled by an event random field. Mosaic random fields are useful for modelling phenomena such as land use. Spatial statistics is challenging due to symmetries which must be modelled. Another challenge is that spatial observations are never independently and identically distributed, as observations will always be correlated. This challenge is also relevant in time series analysis. In the spatial setting however, observations have no order, unlike in time series analysis where observations have a clear order in time.

Following the discovery of oil in Norway several decades ago, there has been much need for statisticians to perform spatial statistical analysis of petroleum reservoirs. The data comes from logs in wells, seismic surveys and observed production history. The problem is then to use this data and work backwards to obtain the spatial phenomenon of interest which involves Bayesian inversion. Computational power is of key importance in this setting, since many iterations are involved in spatial analysis and the recent increase in computational power has led to much work being done in the field of spatial statistics in general.

A fully nonparametric test for one-way layouts

The final speaker for 2004 was Dr Ryan Elmore. After completing his PhD in Statistics at the Pennsylvania State University in 2003, he came to Australia to work as an ARC Research Associate at the Australian National University.

Ryan's research interests lie in the area of nonparametric statistics and his talk focused on a fully nonparametric test for one-way layouts.

The talk began with a review of the one-way layout. When interest lies in testing for a difference in location between groups, the F-test or the Kruskal-Wallis test may be used, provided the shape of the distribution is assumed to be the same for each group. A problem arises when the location may be the same for each group but the spread may differ between groups or when the shape of the distributions differ. These situations require a different test which can detect these differences, if they are present. In this case, if observations from a single group are drawn from an unspecified distribution, the null hypothesis of interest is that the distribution is the same for each group and the alternative is that at least one distribution is different. This can be used to test for differences in spread and shape, as well as differences in location.

In order to test the null hypothesis that all distributions are the same, r sample quantiles may first be calculated. In each group, the number of observations below the first quantile, between the first and second quantile etc. can be determined. A contingency table may then be formed and one option is to use a chi-squared test. An alternative is to assume that among the k different groups there are G different distributions. Since G is unknown, this is a model selection problem and the Bayesian Information Criterion (BIC) may be used to choose between competing models.

Ryan used two examples to illustrate how the different available tests compared. He concluded with some suggestions for future research in the area, including the problem of determining an optimal number of quantiles to consider and extending the test for use in the two-way layout case.

Sandra Pattison from the National Centre for Vocational Education Research (NCVER) spoke at the March meeting of the SA branch about a new survey for Indigenous Australians undertaking Vocational Education and Training. The aim of the survey was to measure the benefits of training for Indigenous Australians and determine what encourages them to begin and continue their training. The focus of the talk was on the challenges in developing and running this survey.

The survey was conducted in 2004 across 63 locations in Australia which were selected using a clustered sampling approach. A random sample of students was then selected from these locations for face-to-face interviews. It was important to consider cultural issues when conducting the survey and thus, Indigenous Australians were involved at each stage. In particular, Indigenous protocol managers were used in each location and their role included contacting students and organising an interpreter when necessary.

A major problem encountered during the survey was the low response rate. The quality of contact information for the randomly selected students was poor and many could not be contacted. Females, older people and those who had completed their training at the time of the interview were over-represented in the survey data. Since response bias was likely to be a major problem, the data were weighted during the final analysis stage.

The high level of interest in this topic was reflected by the many questions asked at the end of the talk. A full report on the findings of this survey will be available in July 2005.

Lisa Yelland

WESTERN AUSTRALIA

March 2005

The WA Branch kicked off the New Year with its first meeting of the year in March 2005. The speaker was Jo-Anne Morgan, an actuary from PricewaterhouseCoopers (PwC). A mathematics graduate of UWA, Jo-Anne is currently an Associate Director in the Retirement Incomes and Asset Consulting Division of PwC, and she is also an Adjunct Associate Professor at Curtin University and lectures in the actuarial science program. Her talk, entitled *Today's Actuaries*, aimed to demystify just what it is that modern actuaries do.

Most of us still have an image of actuaries poring over life insurance tables, but Jo-Anne's talk dispelled that outdated view. Indeed, actuaries have training and skills that are very similar to those that statisticians require, for example, technical training in statistics and risk analysis, knowledge about industry and business, and the ability to communicate technical issues effectively to non-

specialist audiences. These days, they are as likely to be assisting enterprises with financial, banking, and investment decisions as they are to be computing mortality tables, and they have also branched out into non-traditional areas such as assessing the impacts of climate changes and energy shortages. For example, the list of actuarial services that PwC offers is too long to list here, but it includes accident compensation, business planning and systems benchmarking, risk management, company valuation, data mining, dynamic financial modelling, retirement incomes and asset consulting, and a host of others.

Jo-Anne described in detail some of the complex dynamic financial models that are used to assist businesses with their forward planning. For the most part, these models are proprietary, and companies using them aim to answer questions such as:

- What could our financial position, earnings performance or cash flows be in the next 2–5 years?
- What could affect them, and by how much?
- Are there clusters of risks that we are not recognizing?
- Are there effective means of managing the risks?

As Jo-Anne pointed out, actuaries have always had a very strong sense of their profession, and entry is highly regulated. The profession dates back to at least 1693 when the astronomer Edmund Halley used a mortality table to work out how much money someone of a given age should pay to purchase a life-annuity. In Australia, the Actuarial Society of New South Wales was formed in 1897, an event which led many years later to the formation of the Actuarial Society of Australasia (now The Institute of Actuaries of Australia).

After Jo-Anne's talk many of us wondered if the history of the actuarial profession could provide some useful lessons for statisticians. After all, though many people with similar training could carry out the work of actuaries, they would not be entitled to call themselves *actuaries*. We mulled over these, and other, questions over a couple of glasses of wine and dinner at *Terraza* in Nedlands.

April 2005

Hyperspectral imaging, and in particular, the *unmixing* of hyperspectral images, was the topic of April's talk given by the WA Branch President, Aloke Phatak

of CSIRO Mathematical and Information Sciences. Hyperspectral imaging is an extension of conventional spectroscopy in which infrared spectra are measured on a regular grid over a "scene". The scene could be a large geographical area, which would be scanned by an airborne hyperspectral instrument, or it could be a section of a pharmaceutical tablet or piece of organ tissue, which might be imaged in a hyperspectral microscope. In all of these examples, the objective of unmixing the hyperspectral image is the same: to determine which pure components are present, and in what proportion they are present in each pixel. In the case of an image of a pain-killing tablet, for example, unmixing allows us to map the spatial distribution of its ingredients over the surface of the tablet.

As hyperspectral imaging technology is developed and refined, it is being used in large and diverse range of applications, from airborne exploration to quality control of pharmaceutical products to detection of the spectral signature of cancerous cells. In the manufacture of pharmaceutical tablets, for example, it is essential that all ingredients, especially the active pharmaceutical ingredient, be evenly dispersed throughout the tablet. The problem of mapping the spatial distribution of the ingredients over a planar surface of a tablet – or chemical mapping – can be solved using hyperspectral imaging, and Aloke showed an example of the unmixing of an image of a small section of a pain-killing tablet.

The model underlying spectral unmixing is straightforward: we assume that in each pixel the observed spectrum is a linear combination of the spectra of the pure components present in the scene plus some noise. The weights are given by the proportions of the pure components present in that pixel. Because the weights are non-negative and sum to one, this leads naturally to a convex geometry model, and hence unmixing amounts to fitting an M -dimensional simplex in a subspace of dimensionality $M - 1$. As Aloke discussed, however, this is often easier said than done! First, the linear mixing model is only an approximate one; second, it is sometimes the case that few, if any, pixels contain a large proportion of a subset of the pure components; and third, there is a considerable amount of pre-processing of the spectra that must be done before the simplex can be fitted. Aloke outlined one approach to simplex fitting, and then went on to discuss extensions that are required,

such as incorporating prior knowledge and satisfying additional constraints such as positivity of the estimated pure components.

Some of the members had additional ideas on how some of the problems discussed above could be overcome, and after the meeting, the discussion continued at *Terraza* in Nedlands.

Aloke Phatak

Young Statisticians Workshop

The 2005 Western Australian Young Statisticians Workshop will be held on Wednesday, 13th July 2005 at Tompkins Park, Alfred Cove, WA.

The workshop is a full-day program aided at "Young Statisticians" – recent graduates, graduate students, undergraduates contemplating a career in statistics and those who are new to a career in statistics.

The day will involve several guest speakers from varying backgrounds who will be sharing their experiences as statisticians. The workshop is aimed at developing, maintaining and improving contact and support amongst young statisticians.

Inquiries regarding the workshop can be directed to: April Rutkay, email: april@daa.com.au phone: (08) 9386 3304.

NEW SOUTH WALES

The Annual General Meeting of the NSW Branch was held on 17 March, 2005 in the Arcade Room at the University of NSW. The incoming council for 2005 is:

President: Alun Pope
 Immediate Past President: John Rayner
 Treasurer: Shelton Peiris
 Secretary: Neville Weber
 Membership Secretary: Jos Beunen

Continuing councilors: Caro Badcock, Frankie Chan, Petra Graham, Chris Howden, Fred Osman, Scott Sisson. The President thanked retiring councilor Ian Nivison-Smith for his contributions during his time on council.

After the presentation of the Annual Reports the President invited Professor William Dunsmuir from the University of NSW to deliver the 2005 H.O. Lancaster lecture. William's lecture was entitled "Modelling Dependence in Time Series of Counts". He motivated his talk by providing many examples of count time series including data on asthma attacks in NSW and blood alcohol studies from Minnesota and gave a review of

the current situation with regard to the analysis of such data. He focussed on the class of models which is an extension of generalized linear models where, conditional on a time series of state variables, the observation time series has an exponential family distribution. He compared the parameter driven dependence and observation driven dependence approaches and highlighted opportunities for future theoretical and computational research.

Neville Weber

From Public Policy to Particle Physics

This was the intriguing title of an address given by Professor Sir David Cox who generously agreed to fit a meeting of the NSW Branch into a crowded ISI 2005 schedule. As perhaps can only be done by a statistician of his prominence and experience, Sir David took us from a definition of statistics to the challenges facing the discipline today via some fascinating examples which illustrate the importance of statistics in the public arena.

Statistics, said Sir David, is the study of systems in which variation is not always systematic. The stages of this study include the design of experiments, the measurement of data and the analysis and interpretation of results, the overall aim being to provide accurate and timely information to guide action and public policy.

That proper statistical analysis of data is needed if conclusions are to be reliable was illustrated by the example of hospital "league tables". Such tables are published on a regular basis by health authorities in the U.K. and rank hospitals in the order of increasing percentage of readmission of patients. However, if one examines the variation of the number of patients readmitted with the total volume of patients, it appears that the percentage readmitted is essentially constant across all the hospitals in the study. Thus, league tables are more the result of random variation than an indication of hospital quality.

The design of statistical trials is frequently a multi-disciplinary effort. This point was compellingly made by the example of a study currently underway in the U.K. into the spread of bovine tuberculosis. This disease, which is similar to, though not the same as, the human and avian forms, occurs in both cattle and badgers. The key question is whether transmission between badgers

and cattle is a significant factor in the spread of the disease. A long-term case-control study has been designed to examine the effect of culling the badger population, thus providing policy makers with the information they need to decide whether this unpopular method of control ought to be adopted. The study has had to seek input from the fields of agricultural science (farm management practices), pathogenesis (the mechanism of disease transmission) and genetics (the possibly different distribution of variants of the disease in cattle and badgers). The trial commenced in 1998 and, though scheduled to run until 2007, has made a surprising preliminary finding: the reactive culling of badgers, i.e. culling in response to the discovery of diseased cattle, appears to have a *harmful* effect on the control of the disease.

From elementary particle physics came an example of the detection of rare events. According to current theory, the event (beta-beta neutrino-free decay) is impossible, but if it were to occur it should be seen at a well-defined particle energy. The statistical analysis of the data involved modelling the energy spectrum of observed decays by fitting a product of Poisson distributions to the rates of various component events using Bayesian parameter determination. Here, the complexity of the statistical analysis of the data made it difficult to accept the conclusion that a rate significantly different from random noise had been observed. What would a different method of analysis have concluded?

Sir David concluded by making some general observations which the statistics community would do well to keep in mind:

- Analysis of data must be integrated with information from the discipline from which the data come
- The trend to specialisation and fragmentation of the discipline is making it more difficult to see the unity of the subject and to maintain that "cross-fertilisation" which is so conducive to progress
- At a time when analyses are often too elaborate and field-specific, there is still a need for general techniques implemented in good software that is broadly applicable
- The younger generation of applied statisticians needs guidance on the strategy of analysis and especially in the use of software packages.

His advice to statisticians could, he said, perhaps best be expressed by adapting the advice given to applied mathematicians by Lord Rayleigh: in applying our discipline to the world we must neither seek nor evade complications!

That statistics does have its lighter moments became evident later over dinner. At a neighbouring table in the restaurant was a group of town planners who in the course of the evening began taking wagers amongst themselves on the occupation of those sitting at our table. When informed that we were statisticians, the jubilant winners magnanimously decided to donate their takings to our table!

Jos Beunen

CANBERRA

Overview of developments in statistical curriculum by Helen MacGillivray

At the monthly meeting of the Canberra Branch of the SSAI on Tuesday 22 February 2005 – hosted as usual by the Centre for Mathematics and its Applications (CMA) at the Australian National University (ANU) in Canberra – Professor Helen MacGillivray of the School of Mathematical Sciences, Queensland University of Technology, gave a talk titled "An overview of recent and current developments in statistics curriculum across educational levels". Helen was introduced by Professor Alan Welsh (CMA) who listed some of her many contributions to the statistical profession, in particular her deep involvement with educational issues in both the UK and Australia. Professor Terry O'Neill (School of Finance and Applied Statistics, ANU) also noted that, as well as being a past president, Helen is the first female honorary life member of SSAI, a distinction awarded at the joint statistical meetings in Cairns last July.

Helen began by acknowledging her first experiences as a statistics tutor, at the ANU in 1972. Much has changed since then, at national, international and local levels. The National Statement on Mathematics for Australian Schools in 1990 led to a major reorganisation of mathematics across all school levels, including the introduction of Chance and Data strands for Years 1 to 10, and more applied emphasis in statistics in Years 11 and 12 in all states except NSW. Helen has become increasingly involved

in statistics and mathematics education over the years whilst being instrumental in several advisory and developmental roles. For example, she is currently Chair of the Senior Mathematics Committee of the Queensland Studies Authority. She was recently asked to re-write the Data strand of the P-10 (Pre-School to Year 10) syllabus, in collaboration with the Maths Project Team of the Queensland Studies Authority. Some of Helen's recommendations were to focus more on the practicalities of real data that students can own (rather than lots of "clean little datasets", which tend to generate boredom), to avoid unnecessary jargon, and to develop concepts and awareness of variation. Helen's recommendations were followed but not all completely to her satisfaction.

Helen also spoke of changes that have occurred at tertiary level before discussing some of the conventions and workshops at the international level, including ICOTS6 (The 6th International Conference on the Teaching of Statistics), held in Cape Town, South Africa, in 2002, and The IASE (International Association for Statistical Education) Roundtable on Curricular Development in Statistics Education, held in Lund, Sweden, in 2004. The latter meeting, which was attended by approximately 26 invited persons from 10 countries, demonstrated the commonalities in challenges facing statistics curricula around the globe.

One of the major themes of Helen's talk was the acute need within schools for the sustained professional development of teachers in the field of statistics. This need has been enounced strongly by teachers themselves, with a complaint that the occasional half-day workshop is not enough. Another theme was the general lack of community awareness of the generic skills that come from mathematics and statistics. There is a call here for statisticians to become involved, both in helping to develop school syllabi and in mustering the resources for the ongoing training of teachers in statistics and statistical thinking.

Borek Puza

Canberra Branch AGM and talk on Sankhya by Ann Cowling

The 2005 Annual General Meeting of the Canberra Branch of SSAI was held on Tuesday 29 March. This AGM was the first in the history of the Branch at which an election needed to be held for the position of President (a two-year term). After short policy speeches by the

two candidates – Dr Brent Henderson of the CSIRO and Dr Borek Puza of the Australian National University (ANU) – the former was elected with 20 votes to 15. The AGM was immediately followed by a talk by Dr Ann Cowling – Previous President and Head of the Statistical Consulting Unit at the ANU – titled "Sankhya: Statistics and Indian Philosophy". The evening ended with a sumptuous barbecue.

Ann, who has some familiarity with yoga and had been to India recently, began her talk by quoting an invocation in Sanskrit whose translation reads: "May we be nurtured together..." *Sankhya* (or more properly *Sankhyā*) is also known as the *Indian Journal of Statistics* and publishes research articles in the broad areas of Applied Statistics, Mathematical Statistics and Probability. It ranks slightly above the ANZJS but not as high as the *Scandinavian Journal of Statistics*.

The word "sankhya" (or "samkhya" as it is sometimes spelt) has several different meanings. In Sanskrit the usual meaning is "number" or "enumeration", but the original meaning was "means of valid knowledge", including for example "reliable authority" but not "verbal testimony". The word refers to one of six schools of Indian philosophy and is associated with the spiritual path. Some of its other meanings are "insight" and "investigative understanding", and these can be found in the Rig Veda, the Bhagavad Gita (500 BCE - 500 CE) and the oldest Upanishads (c. 1500 - 800 BCE). The root of the word is "khyā", meaning "to perceive", "to view", "to be known", or "to make well-known", from which come the meanings "to add up", "to calculate" and "to estimate". In the 1933 editorial to Volume 1, Prasanta C. Mahalanobis wrote: "The history of the word *Sankhyā* shows the intimate connection which has existed for more than 3000 years in the Indian mind between 'adequate knowledge' and 'number.' As we interpret it, the fundamental aim of statistics is to give determinate and adequate knowledge of reality with the help of numbers and numerical analysis. The ancient Indian word *Sankhyā* embodies the same idea, and this is why we have chosen this name for the Indian Journal of Statistics".

Borek Puza

Statistical Methods in Government forum

Canberra Branch organized a "Statistical Methods in Government"

forum immediately following the 55th International Statistics Institute conference. The two invited speakers, Dr Ralf Münnich from University of Tübingen and Professor Seppo Laaksonen from University of Helsinki and Statistics Finland, in Australia to attend the ISI, spoke over two days on initiatives to prepare the European statistical system for the enlarged union. The first session at ABS House concentrated on the deliverables from the "Data Quality in Complex Surveys" – DACSEIS – project which wound up a year ago with recommendations to National Statistics Institutes (NSIs) contributing to European level policy statistics. The focus of this project was on accuracy, nonresponse and sampling errors. The centrepiece of DACSEIS was a large scale collaborative simulation study based on live official data from the German Mikrozensus (supplying labour force survey series data) that tested candidate methods for variance estimation, and treatment of missing data. The project aim was for standardised and harmonised variance estimation methods delivered in R-code with a Practice manual. For this to be acceptable to NSIs the investigations needed to be convincing, indeed needed to break ground in the scale and sophistication of testing procedures. The DACSEIS team drew together NSI and academic methodologists with fruitful collaboration on data access and theoretical fronts respectively. Ralf illustrated his talk on variance estimation using DACSEIS live test data from Saarland, population 1m, sufficiently small for the simulations to be feasible but with realistic spread. Advanced survey estimation methods tested included Taylor linearisation, Särndal-Lundstrom 2-phase calibration, GREG, Maximum Likelihood Raking, Delete-d-Jackknife, Bootstrap Rao-Sitter Raking, multiple imputation (Rubin-Rässler). New methods showed impressive improvements in reduced variance bias from established resampling (Jackknife) and linearisation methods, but not always practical. The best performing in terms of bias (Rao-Sitter) was far too slow to be recommended in practice. Results were sensitive to quality of auxiliary information and nature of stratification. While all methods addressed estimate bias, and most gave acceptably low bias in the variance when the target was numerous; in rare populations care was needed. Multiple Imputation proved superior where nonresponse rate was high but was not distinguished from



Justine Gibbings and Ralf Munnich

other methods at lower levels. The project allowed investigation into good practice with MI on official datasets, which is finally within reach of processing capacity. DACSEIS reports can be accessed on <http://www.dacseis.de/>

Development of techniques for imputing missing items in official surveys has been hampered by external pressures, lack of adequate time and capacity to test and disjointedness between theoretical work and practise. It has typically resulted in defending the method for dealing with missing data adopted by an office and since reinforced. DACSEIS recommendations could draw on an unusual collaboration between practising and theoretical methodologists, and adequate investigation resources, to deliver an imputation method 'trained' to the survey to which it is applied. As Professor Laaksonen explained, preceding the imputation task itself are steps to select training data and auxiliary variables; constructing the imputation model; and choosing criteria for selection. Calculating the component of estimate uncertainty due to imputation follows. Within this framework the relative qualities of current or historical methods can be discussed and sensible recommendations made free of confusion in terminology.

The second day of the forum held at the Department of Family and Community Services addressed more specific topics, drawn from current innovations in the European statistical system (but attracting attention elsewhere), data linkage – vital to efforts at developing purely administrative censuses and at reducing respondent load in household surveys – and composite indicators used to develop union-level economic policy. Data linkage was the subject of talks in health statistics and census context in ABS drawing on United States Bureau of the Census experience at this time, making Professor Laaksonen's synopsis topical. While the advantages of linking seem obvious, legal and methods barriers

have severely hampered development. By treating matching as a problem in missing data it is possible both to draw on the advances in missing data techniques and to emphasise the protective aspects that this approach stresses. The typology presented broke down this approach into manageable problems: pooling (population level); merging several files together – identifying mother-daughter (and grandmother-granddaughter) files; joining two or more files with different coverage (as developed most completely by Statistics Netherlands); matching at two or more levels (matched employer-employee or enterprise-client files, now in active development by NSIs including Australia and internationally). Various efforts could be drawn on – the European Community Household Panel requiring cross national harmonization, and between register and questionnaire based sources (examined in an earlier methods project CHINTEX); the International Wage Flexibility Project. Measurement errors attract attention (most severe in the case of panel studies) and problems after editing. The attraction of non-exact matching was in providing protection against microdata disclosure and in extending survey analytical capacity. Susanne Rässler – associated with DACSEIS – had reported on fresh results in statistical matching/data fusion earlier in the week in Sydney.

By contrast Ralf's paper on the knowledge economy indicators project launched last year by the European Commission tackles how to build reliable indicators out of faulty data spread across numerous collection systems. This picks up the vogue of indicator development from 20 years ago, but with now immediate cross national policy application. Out of this joint work novel methods of graphical analysis and representation are emerging. We were fortunate in having an early insight into the outcomes from this important study.

Stephen Horn



Seppo Laaksonen, Ken Brewer and Stephen Horn.

VICTORIA

A Special Workshop on Improving Survey Data Quality

Data quality is arguably the most critical issue in social surveys. The Victorian Branch was fortunate in securing Denise Lievesley, Director of Statistics, UNESCO, to present a full-day workshop on this topic on October 25. The list of Denise's credentials would hold even Gilbert and Sullivan in awe: apart from her demanding UNESCO role, she is currently President-Elect of the International Statistical Institute (ISI), a fellow of University College London, an honorary Professor at the University of Durham, a visiting Professor at City University and a visiting Professor at INRS in Montreal; and formerly she has been head of the sampling branch of the British Government Social Survey Division, Director of the ISI (1989 to 1991), Director of the UK Data Archive (1991 to 1999), President of the International Association of Official Statistics (1995 to 1997) and President of the Royal Statistical Society (1999 to 2001).



Two of the most enthusiastic workshop participants Helen Bartley and Kym Butler. Photo: Brian Phillips

Forty-two eager participants benefited from Denise's extensive experience. Topics covered included the definition of 'data quality', a survey of errors and how they arise, ways of reducing non-response, the principles of random sampling and the problems of asking sensitive questions. Denise conducted the workshop in a highly interactive way, encouraging questions at any stage and peppering her answers with pertinent real examples. The workshop was not intended for novices. It transpired that the registrants were quite heterogeneous, ranging from academics who knew the theory but had little real experience to



Denise Lievesley and Cliff Da Costa (RMIT) discuss some finer points of Survey Data Quality. Photo: Brian Phillips

others with considerable experience in conducting surveys but little formal training. It was a difficult hydra to slay, but Denise was able to provide all attendees with insightful advice.

In a workshop on improving Data Quality, it was imperative that other aspects of the meeting should also be of high quality. The food was sumptuous and plentiful. The workshop location, Training Room 1 in the Australian Bureau of Statistics (ABS) Offices in Melbourne, commanded thought-gazumping views of Telstra Dome and The Docklands. The chairs were comfortable and the acoustics excellent. It was a top venue,

and the organisers thank the ABS (and Bruce Fraser in particular) for offering to host the workshop. The organisers can only hope that the participants found the workshop instructions and materials to be equally satisfactory.

Instead of accepting a presenter's fee, Denise requested that the Victorian Branch sponsor some Young Statisticians to attend the ISI in Sydney in April 2005. The Branch advertised the 'Denise Lievesley Awards' in early November. The successful candidates were Tristan Barnett (Swinburne University, Student Award), Martin Donadio (Australian Bureau of Statistics), Derchieh Hung (University of Melbourne Statistical Consulting Centre) and Natalie Karavarsamis (Department of Primary Industry). We thank all applicants for their interest and the time they spent preparing applications. Denise has many friends in Australia, and her generous act bears witness to why. Thank you, Denise, for making the long trip from Montreal to present the workshop, and for your commitment to the future of statistics.

Kay Lipson and Geoff Laslett

Some work experiences of Young Statisticians in Victoria

The September meeting of the Victorian Branch was given over to the Victorian Young Statisticians Group. Three volunteers presented talks about their experiences as young statisticians.

The first speaker was Oleg Petrenko, whose interest in statistics was stimulated by work experience in market research.

His topic was credit rating modelling in the Ukraine. Most credit rating models are created in developed countries, and are based on direct financial information, such as registered properties, bank statements and official salary level. In developing countries this type of data may not represent the real ability of a client to repay a loan, or may simply be unavailable. Circumstantial variables such as a lifestyle, length of work in a particular area and personality traits are widely used in insurance, but much less so in lending services. The aim of the project undertaken by Oleg and his colleagues is to determine a suitable and extensive list of variables related to banking credit risk in developing countries, using information provided by one of the Ukrainian banks.



*Tracey McPhail
Photo: Brian Phillips*

The second speaker was Tracey McPhail, who told us how she became a statistician. While studying Health Science at university she came across subjects such as epidemiology, molecular biology and genetics that inspired her interest in statistics and medical sciences research. In the workforce she eventually found herself at the Alfred Hospital in the Infectious Diseases Department. Here two mentors provided her with positive guidance. In some significant HIV projects she was given responsibility for database management, statistical analysis and reporting at various levels. She saw that there was an opportunity for running a business catering for services of this type, and, by the end of the job, had drafted a business plan.

Tracey then moved to the Victorian Cancer Council, where she worked on a national and international study that was investigating the effects of mobile phone use on the development of brain tumours. Her duties included recruiting patients and matching them with a random sample of controls, coordinating a team of interviewers and liaising with network providers and a neuroradiologist.



Tristan Barnett



Martin Donadio



*Derchieh Hung Natalie Karavarsamis
The four Denise Lievesley Award winners*



Currently, at Monash Medical School, Tracey is engaged in a systematic review of laparoscopic band surgery which is used for morbidly obese people. She has also taken on several projects for the Young Statisticians: a newsletter about resources and opportunities; a network list of statisticians and their fields of expertise; and ways of promoting a positive image of statistics to allay people's fear of the topic.



Tristan Barnett
Photo: Brian Phillips

The third speaker was Tristan Barnett, a PhD student in Sports Statistics at Swinburne University. He described a model-based method of predicting the probability of a player winning a tennis match against his opponent, based on the data from a partially completed match and the statistics of previous encounters published by the Association of Tennis Professionals. He illustrated how the probability changed point by point in a match between Andy Roddick and Younes El Aynaoui at the 2003 Australian Open. Roddick eventually won the 'historic encounter' after a long fifth set: 4-6, 7-6 (5), 4-6, 6-4, 21-19.

The meeting was an interesting innovation. The talks attracted many questions, and those who attended clearly enjoyed the presentations. Future joint meetings between the Victorian Branch and the Young Statisticians are planned.

Derchieh Hung

The role of an international statistician

The annual Belz Lecture was inaugurated in 1969 to honour Professor Maurice Belz, the Foundation Professor of Statistics at the University of Melbourne, for his work in establishing and advancing the science of Statistics in Australia. It has become the premier event of the Victorian Branch Calendar, and in recent years it has taken on the additional status of a University of Melbourne Public Lecture. Accordingly each year the Victorian Branch Council seeks a high profile Lecturer who can present a thought-provoking and memorable address on a

statistical theme of interest to a general audience.

This year the Belz Lecture, held according to recent tradition on the fourth Tuesday in October, attracted a large audience of about 60 people. The drawcard was Professor Denise Lievesley, Director of the UNESCO Institute for Statistics. She is perhaps the world's most travelled statistician, and certainly the one under most diplomatic pressure, because she answers not only to the Director-General of UNESCO, but to all 190 UNESCO Ambassadors as well!



The 2004 Belz Lecturer
Professor Denise Lievesley

Professor Lievesley began by pointing out that there are many challenges facing statisticians in the international context. In particular, high-quality data are needed to ensure that international development strategies are pro-poor and pro-equity. The role of the UNESCO Institute for Statistics is to manage the collection and collation of data pertaining to education, science and technology, culture and communication from all over the globe. These data have enabled definitive statements to be made concerning the scale of the problems we face, such as the 103.5 million children who have no access to schooling and the 800 million people who are illiterate. These challenges must be seen within the context of broad global predicaments: half the world's population have to manage on less than \$2 a day; the world's population will grow from six to eight billion by 2025; and over 36 million people live with AIDS.

These problems may seem insurmountable, but Professor Lievesley was able to put them into a disquieting context: since 1945, US\$8 trillion has been spent on nuclear weapons – the estimated international public expenditure on

education is 0.5% of this; US\$7 billion is estimated as needed to get all children into school – the amount spent annually on cosmetics in the USA or on ice-cream in Europe; US\$1.45 billion, the price of one ballistic submarine, would double the education budgets of 18 poor countries.

Can these problems be solved by throwing technology at them? History proclaims not, because the infrastructure, equipment and training are not available. Can they be solved by encouraging developing countries to adopt the principles of the market economy? This strategy has fallen out of favour, to be replaced by one involving partnership, equity and coordinated aid. It is on this last point that the international statistician can help. Aid dispensed without good data on where to spend it can be aid misused, particularly when money is tight. But the role of data is wider. Cross-national data provides the global picture that on the one hand mobilises resources, engages donors and keeps governments accountable, and on the other provides benchmarks, acts as a catalyst for debate and helps countries learn from each other. In this context high-quality data is paramount, and Professor Lievesley argued that this is best achieved by working in partnership with countries, rather than by the imposition of external standards and methodologies.

Professor Lievesley believes that the profession can only accomplish these noble objectives if it adopts some recently formulated 'principles of international statistics' (to be debated at the forthcoming UN Statistics Commission to be held in March 2005 in New York). International statisticians should, as a body, act impartially, maintain professional ethical and technical standards and respect the confidentiality of sources of data while making them accessible. At the individual level statisticians should be aware of professional ethical responsibilities, maintain membership of professional bodies, respect the ideas and values of one's counterparts and devote resources to building mutual trust.

In summary, the international statistician faces some serious challenges. Statistics can benefit society, but may be used to maintain the *status quo* or even for oppression. The statistician needs to walk a tightrope that allows for open accountability while respecting national sovereignty. The push for globalisation is changing the way aid is delivered. The international statistician can only function by acting openly, and adopting

ethical frameworks, codes of practice and codes of conduct.

Maurice Belz was himself an international statistician. He was elected as a member of the International Statistical Institute in 1948, acted as a consultant to international companies, and was President of the France-Australia Association of Victoria for 27 years. A fellow francophile, he would have found much in common with the 2004 Belz Lecturer.

Geoff Laslett

Shape Understanding System: the application of statistical methods in designing a system with visual thinking capabilities

The November meeting was addressed by Magdalena Les and Dr Zbigniew Les from the Queen Jadwiga Research Institute of Understanding. Since 1996 they have been publishing conference reports and papers on a novel concept, their shape understanding system (SUS), in journals such as *Computers and Graphics*, the *International Journal of Shape Modelling* and the *International Journal of Pattern Recognition and Artificial Intelligence*. If robots, for example, are to interact consistently with their environment, they will need a robust method of recognizing and processing shapes. The authors claim, however, that image processing methods applied in visual systems often yield unsatisfactory results, mainly because a specific image processing method is applied to a broad range of shapes. SUS is an attempt to provide a better system. It recognizes that shape understanding is inherently complex, and this observation serves as a starting point for the new system.

A novel feature of SUS is its reliance on selected classes of shapes, for example the convex class, the concave class, the 'thin' class, the convex polygon class,

the convex curvilinear class, and the convex polygon-curvilinear class. The set of possible classes is based on *a priori* knowledge of the topological properties of shape, discernible properties of the figure and unique features of the figure. The Les innovation is to recognize that each *different* shape class requires a *different* sequence of processing methods for optimal results. The researchers have labelled this type of artificial intelligence 'visual reasoning'. Pattern recognition within their system uses Hidden Markov Models or Bayesian networks. The speakers illustrated their method of visual inference on several statistical problems, including curve identification, regression, cluster analysis and discriminant analysis.

Eddy Torr

QUEENSLAND

March 2005

The AGM and branch meeting was held on Tuesday, 29th March, 2005 at Queensland University of Technology. Bronwyn Harch welcomed all members and a member Miranda Mortlock was presented with her AStat Certificate. Miranda works at the Office of Economic and Statistical Research which is an office of Queensland Treasury.

At the AGM new officers were elected:

President – Professor John A. Eccleston of University of Queensland

Secretary – Helen Johnson from Queensland University of Technology.

Following the AGM Professor Kerrie Mengersen of Queensland University of Technology spoke on "Assessing the combined impact of smoking and asbestos on health".

Kerrie discussed methods to obtain a better understanding of the interactive effects of multiple environmental and industrial exposures on health for individual, corporate and public health decision-making. Several studies, providing published data on smoking and asbestos were presented. Data in this area of exposure to risks are usually available on individual exposures, and sometimes on the combined exposures. Using these studies, meta-analysis models were built to examine the type and degree of combined effect. The presentation described methods for undertaking meta-analysis for assessing whether the combined effect of smoking and asbestos exposure is additive or multiplicative. The results obtained showed them to be somewhere in between the additive and multiplicative.

Miranda Mortlock



Miranda Mortlock receives her AStat certificate from Bronwyn Harch.

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