



SILVER STATE-ISTICS

NEVADA Chapter of American Statistical Association



Nevada Chapter News Letter

Vol. 5 No. 1

*We Wish You All a Very Merry
Christmas and a Happy New Year!*

🕯️🕯️ Seasons Greetings 🕯️🕯️

*Read on for information on what our Chapter has
been up to and what we are planning for the future.
Please keep an eye on our website
for more details on future events.*

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📅 FUTURE EVENTS 📅

Be on the lookout for announcements of future NV-ASA events:

- Career Day in Reno, aimed at college and high school AP students.
- Nevada K-12 Poster Competition.
- International Science and Engineering Fair, Reno, May 2009.
- Dinner meetings with speakers on diverse topics.
- Annual Meeting in Reno or Carson City, October 2009
- And more, including **Elections!**

President's Message

Charles Davis

In my last message of this sort (Spring-Summer Newsletter, 2007) I remarked that the NV-ASA Chapter was turning five years old in October of 2007 and that it had done some truly amazing things for such a young chapter during its first five years. But there was also a warning of significant challenges faced by the Chapter, in particular that of increasing the numbers of people actively involved in organizing, planning, and carrying out the mission of the chapter. We have been successful in recruiting the services of a few new key people. We particularly appreciate the contributions of Kaushik Ghosh (UNLV Math Sciences) who is serving as Treasurer through 2010 and Amei Amei and Hokwon Cho (also UNLV Math Sciences) who have provided assistance during events during 2008.

Of course, thanks are due to those who have continued to be active on our behalf during past years: Deb Stiver (UNR Economics), Chapter Representative, Alicia Hansen (NV Health Division), Secretary, Alejandra Livingstone (NV Dept. of Corrections), Northern Vice President, Andy Chance (formerly of Harrah's Entertainment), Southern Vice President (re-elected 2008), and Dave Thiel (Clark County School District), organizer of the Poster Competition. Alicia also takes care of our website.

Still, we will need more active people to carry out the activities that lie ahead. The ISEE (see the related article) will require a large number of judges. We always need volunteers willing to talk about their work during events and career days, and we always enjoy hearing of the considerable variety of activities that we as statisticians find ourselves in.

And we need new officers! In particular, our Constitution does not allow a President to be nominated for a successive term as President without serving at least one term as Past President. However, last year nobody

My other concern has to do with memberships. For many years Paul Nakayu (Univ of Nevada Computer Systems) kept excellent track of membership, as well as maintaining our communications systems, and we have had considerable difficulty filling his shoes. We will be trying during the next month to contact all members and potential members to get back into smooth operation in this regard. Our Chapter has a noble mission in support of our profession in Nevada, and your support is needed!

Charles B. Davis

The first presentation was by Dr. George Fernandez, Director of the Center for Research Design and Analysis at University of Nevada, Reno titled “Advanced Analytic Methods.” Dr. Fernandez presented an overview of new and improved statistical tools useful for descriptive modeling, data mining, forecasting, experimental design, and demonstrated a few of them using SAS. Such tools aid in the collection, classification, analysis and interpretation of data to reveal patterns, anomalies, key variables and relationships, leading ultimately to new insights for guided decision making.



On conclusion of intellectual feasting, the participants continued their discussions over lunch. NV-ASA gratefully acknowledges financial support provided by the UNLV Mathematical Sciences Department. ❖

The 2008 K–12 Poster Competition took place in late Winter. Three hundred sixteen posters were entered by 415 students from 26 schools. First, second, and third place prizes were awarded in each grade category (K–3, 4–6, 7–9, and 10–12), along with a number of Honorable Mentions.



Which Pan Thickness is Best for Different Substance Textures?

?

Speed of Substance Rise

Substance	1mm	2mm	3mm
Smooth	0.2	0.8	0.4

Speed of Substance Rise

Substance	1mm	2mm	3mm
Smooth	0.3	0.4	0.1

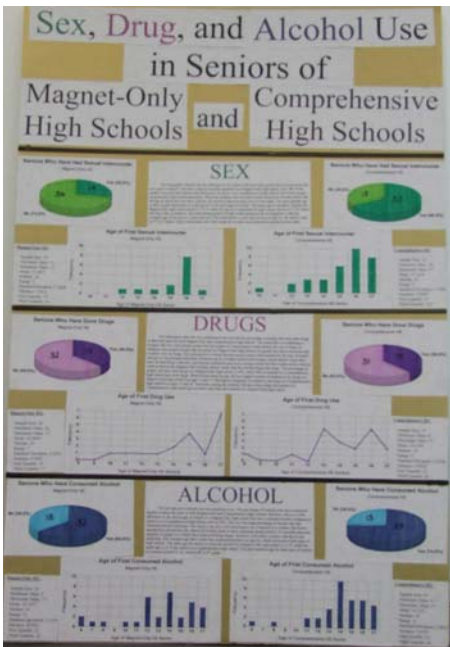
Speed of Substance Rise

Substance	1mm	2mm	3mm
Smooth	0.1	0.4	0.05
Bumpy	0.2	0.3	0.1
Sticky	0.1	0.2	0.05

Speed of Substance Rise (unit: 100%)

Pan Thickness (mm)

Legend: Smooth (dark blue), Bumpy (light blue), Sticky (yellow)



Advanced Technologies Academy, 10–12 Divison).
These are the three shown here. ♥

Fall Symposium in Las Vegas

The first speaker was Dr. Evangelos (Angelo) Yfantis of the School of Computer Science of UNLV. His talk provided insight into the testing of random number generators. Random number generators are used extensively in science and engineering in computer simulations, in statistical inference in both bootstrapping and Markov Chain Monte Carlo evaluation of Bayes estimators, and of course in the gaming industry as the foundation of all electronic gaming devices. Dr. Yfantis discussed various methods for testing random number generators and various criteria, the first but only the first being that the random numbers should have the intended distribution. Additional criteria (of particular interest in gaming) are that various patterns (pairs, triples, etc.) and waiting times should also satisfy their theoretical expectations. He gave an anecdote about a casino that discovered that the generator being used for a particular game would never produce a particular pattern, and then proceeded to advertise an extremely large payout to anyone getting that pattern!

Finally, Dr. Charles Davis of EnviroStat gave “A Brief Exposé of Detection Limits: Science, Politics, and Public Relations”. One often thinks of “detection limits” for chemical analyses of environmental (food, tissue, etc.) samples as having been settled decades ago, but that is not the case. Rather, there are many statistical issues involved in determining when one should decide that a toxic substance is “detected”, or whether a given analytical method has sufficient sensitivity to “detect” and “quantitate” substances at adequately low concentrations. The talk explored numerous issues involved, many of them statistical. Dr. Davis reports that he has recently been invited to provide professional peer review for pilot studies related to the U.S. EPA’s court-ordered (in 1999) review and revision of the detection limit concepts it published in 1981! ♦

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A Bayesian Dilemma

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Charles B. Davis

Here's a puzzle regarding non-informative prior distributions, specifically the Jeffreys prior for the Beta-Binomial-Beta situation. This was brought to my attention by a very sharp laboratory chemist who is interested in saving taxpayer money.

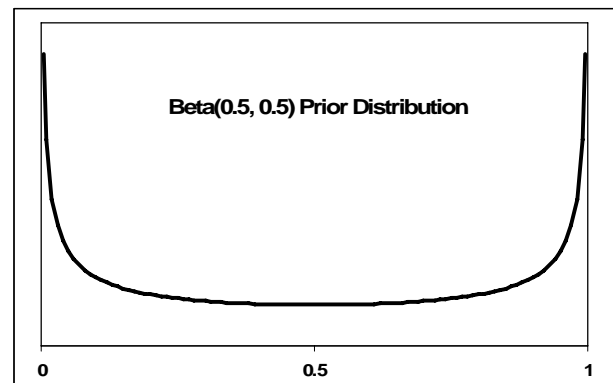
In a sampling situation common in industrial hygiene one wants measurements of a toxic material to be less than a Regulatory Criterion (RC) with at least 95% probability. If this is not so, one must perform more targeted sampling or clean-up (possibly both), which can be expensive. So let θ be that probability. If we consider only whether measurements exceed RC or not, this is a binomial sampling situation. We want to reject $H_0: \theta \leq 0.95$ in favor of $H_A: \theta > 0.95$. This test is commonly done at a 5% significance level. This is a regulatory situation, one of those cases where subjective informative priors are suspect.

To perform a frequentist hypothesis test, we can take an IID sample of n items, of which x have measurements less than RC. If have $x = n = 59$, and using the worst-case H_0 value $\theta = 0.95$, our p -value is $0.95^{59} = 0.0485$, so we reject H_0 at the 5% significance level and declare the facility to be acceptable. But if we have one fewer observation ($x = n = 58$), the p -value is $0.95^{58} = 0.0510$, and we have to conclude that we have not yet shown that the facility is OK, since our p -value exceeds the conventional 5%.

But now I put on a Bayesian hat and use the convenient and conventional conjugate prior family with the uniform non-informative prior $\text{Beta}(1,1)$. With sample $x = n = 59$, the posterior distribution of θ is $\text{Beta}(60,1)$. The 0.05 point of that posterior distribution is 0.9513. Since this lower Bayes Credible (Confidence) Limit is above the 0.95 criterion, I would declare that the facility is acceptable. With $x = n = 58$, the 0.05 point is 0.9505 (OK); with $x = n = 57$, it is 0.9407 (not quite OK). So this non-informative Bayes analysis lets us get away with one fewer samples, but is basically behaving the same as the frequentist procedure, which is what we expect from Bayesian analysis using non-informative priors.

Then Jim the chemist comes along and tells me that I am cheating my customers. He says that I really should be using the Jeffreys non-informative prior since it saves a whole lot of money in sampling and analytical cost. Starting with the Jeffreys prior $\text{Beta}(0.5,0.5)$, if $x = n = 38$, the Jeffreys posterior has 0.05 point 0.9510, already above the desired 0.95. At \$100 per observation, Jim saves \$2000 or maybe \$2100 by using a different "non-informative" prior.

My interpretation is that his Jeffreys prior is not at all "non-informative", but rather reflects a prior belief that θ is more likely to be close to 0 or to 1 than in the middle; see the picture of the PDF of the $\text{Beta}(0.5,0.5)$ distribution. If I think about the qualitative idea behind a "non-informative" prior, it is that one should choose parameters so that the data quickly overwhelm the choice of prior distribution. In the Beta-Binomial-Beta case, this usually means that one wants the prior $\text{Beta}(\alpha,\beta)$ to have both α and β small, since the posterior is $\text{Beta}(\alpha+x, \beta+n-x)$. But if all the data are "yes", as in this case ($x = n$), the small β remains regardless of how big n gets, and that accelerates the posterior distribution toward $\theta = 1$!



So should I use the uniform non-informative prior, which gives results very nearly the same as the frequentist analysis as expected of non-informative priors and spend \$5800 or \$5900 per facility on analytical costs, or believe Jim and the Jeffreys prior, spend only \$3800, and save the taxpayers at least \$2000 per facility?

I'll be interested in hearing your thoughts on this puzzle. Email them to me, and I'll tell you what Brad Carlin's response was! ➔

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### ASA Traveling Course: Introduction to Bayesian Methods for Data Analysis

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This one-day course was presented by Brad Carlin of the Division of Biostatistics, School of Public Health, Univ. of Minnesota at UNLV Saturday, October 4. Brad presented an overview of much of the material in his best-selling book *Bayes and Empirical Bayes Methods for Data Analysis* (with Thomas Louis), followed by a tutorial involving hands-on analyses of data using WinBUGS.

Dr. Carlin emphasized biostatistical models and studies in his examples, as befits his "home" position and also his sabbatical visitor position at the M.D. Anderson

Cancer Center in Houston, TX. His text for the traveling course bears the title *Hierarchical Bayes Methods and Software for Data Analysis*; Brad noted that Bayesian hierarchical structures nicely support the analysis of longitudinal data. (We have a few copies of that text left, by the way.)



By way of background, the ASA Council of Chapters sponsors the Traveling Course program. Each year (well, most years) the COC solicits suggestions for several courses, from which it selects a few to offer for the coming year. The list is published (on the ASA website www.amstat.org, among other places) and chapters submit their requests.



The COC then allocates the courses among chapters with any eye to spreading the courses out both spatially and temporally. The COC supplies air fare and texts; the Chapter covers the instructor's local lodging and other expenses and provides an honorarium for the instructor. The NV-ASA Chapter last had a course during April 2003. This year Brad gave his course to our Chapter and the Portland, OR Chapter on successive days. ☺



From our Constitution:

“The purpose of this Chapter is to be a state and local area leader in promoting all aspects of sound statistical science and practice, including the advancement of statistical education, professional practice, and research.”

“The Chapter shall sponsor educational, professional and scientific activities that benefit professional statisticians, students, and users of statistics. The Chapter shall promote effective unified action amongst all groups having an interest in or concern with statistics and probability. The Chapter shall foster communication between the statistical community, other scientific organizations, and the media for the enlightenment of the general public and enhancement of the general welfare. The Chapter shall promote the proper application of statistics in all fields, shall work for the improvement of statistical education at all levels, and shall seek opportunities to advance the statistics profession and professional work opportunities.”

Member Directory Update

Our Member Directory was published initially July 4, 2007, and is due for an update. We've revised the member information form to better agree with the information for the directory; please download the new form from the website, complete it, and send it to Kaushik Ghosh. ☼



NV-Chapter Current Officers

President: Charles B. Davis (~2010)
 Past President: Charles B. Davis (~2010)
 Southern Vice President: Andy Chance (~2010)
 Northern Vice President: Alejandra Livingston (~2009)
 Secretary: Alicia Chancellor Hansen (~ 2009)
 Treasurer: Kaushik Ghosh (~ 2010)
 Chapter Representative &
 Publicity Committee Chair: Deb Stiver (~ 2010)
 Education Committee Co-Chair: David W. Thiel
 Unofficial Webmaster: Alicia Chancellor Hansen
 Unofficial Historian and Photographer: Dorothy Wilson

For contact information, please see our website
<http://www.nevada.edu/~nvasa/> ♣

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Check our website:

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