

# THE STATISTICAL CONSULTANT



## Logo:

The Section is looking for a new logo, and if you submit the winning design, you could win \$200.

See below for details!



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Section on Statistical Consulting  
Murray K. Clayton, Editor  
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American Statistical Association

## Logo Contest

The Statistical Consulting Section is looking for a logo. We want a symbol that uniquely expresses the importance of the role played by statistical consultants. The logo would be used on all printed materials of the Section.

To encourage those of you with artistic talent (or who know people with such talent), the Section is sponsoring a logo contest. The artist responsible for the winning logo would receive a \$200 award from the Section. Send your logo ideas as color drawings no larger than 4 inches by 4 inches to: Ron Wasserstein, Washburn University, Topeka, KS 66621. Drawings should be submitted by May 31, 1995. The winner will be chosen by the Executive Committee of the Section at the Chicago meetings next August, and the winner notified shortly thereafter.

If you work somewhere that has an art or graphic design department, pass the word about this along to them. Encourage students of all ages to participate. Someone out there has the perfect idea for us.

Of course, your winning logo will become the property of the Section, but you will receive lots of wonderful press about your work!

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## A Message from the 1995 Section Chair

**Sandra S. Stinnett**

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In 1995, the statistical consulting section became more active as evidenced by several accomplishments. One of the major accomplishments was the excellent survey of members that was carried out by Janice Derr and her staff at Penn State University. The results of the survey were reported by Janice in the Summer 1995 issue of *The Statistical Consultant*. The responses and comments by the membership have provided an abundant source of ideas for those on the executive committee and will be used in future planning. The extensive lists of those volunteering for activities also will be most helpful as we expand our section activities. In addition, the instrument caught the attention of several people in the ASA for use as an example for other sections. Thanks to those of you who participated in the survey!

The meeting of the section executive committee at the ASA meetings in Orlando went on for nearly three hours this year. A good portion of the discussion involved the prioritized list of activities resulting from the survey and who would lead in spearheading them. It was decided that it would be good to have a "contact" member on the executive committee involved in each activity, but that non-executive committee members of the section would be asked to lead certain activities, starting with the "Top Ten" in the rankings.

Other discussions in the executive committee involved developing a section logo, distinguished achievement medals for members making special contributions to consulting, nominations for ASA fellows from the section, topics and proposals for continuing education to be sponsored by the section, and developing a

consulting registry. You will hear more about these in the future.

The executive committee voted to contribute \$500 toward the electronic communications project of the Council of Sections and \$1500 to the annual data analysis contest for undergraduates.

Another accomplishment was the combination business meeting/mixer at the meeting in Orlando. With lively discussion, wonderful food and great door prizes, it was a huge success; over 50 people attended. John Dixon, Marcia Gumpertz and Steve Arndt worked with me in planning this event. A good time was had by all!

We had several excellent technical sessions at the meetings organized by Diane Miller, our 1995 Program Chair. Thanks to her for these efforts. John Dixon is Program Chair for 1996 and has the plans for Chicago well underway.

Since the meetings, Brian Yandell has created a home page for the section on the World Wide Web. This will be used as an additional means of disseminating information to the section members.

It's been a pleasure for me to participate with you and the energetic executive committee this year. I look forward to continuing work on these projects and seeing new ones develop under the leadership of Marcia Gumpertz in 1996.

## Comments from the 1996 Section Chair

**Marcia L. Gumpertz**

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First I want to thank you all for giving me the opportunity to chair the Section on Statistical Consulting. I view the Consulting Section as a tremendous pool of statisticians, almost 1500, with a common interest in the practice of

statistics. The Section can facilitate communication among its members, provide information, promote consulting education, and champion excellence in statistical consulting. My goals this year are to increase communication among members, to put people in touch with others who have similar interests and areas of expertise within the area of statistical consulting, to increase the amount of information that the section provides, and to make the the annual meetings more useful to members of our Section.

Last year's survey of members identified several types of information that members want: consulting tips, information about business aspects of consulting, information about educational resources, book and literature reviews, resources for teaching statistical consulting, and information on statistical methods. Our most important medium for providing information is this newsletter, so our newsletter editor, Murray Clayton, has a clear challenge ahead, and a clear mandate. John Dixon, 1996 Program Chair, is organizing three sessions of invited papers for the annual ASA meeting that will address practical aspects of consulting and topics in applied statistics. There will also be two new offerings sponsored by our Section at the ASA meetings this year: (1) two roundtable discussions, one on consulting in social sciences and one on communicating with the client, organized by Barry Moser, the 1997 Program Chair, Deborah Rumsey, executive committee member, and Patricia Wozniack; and (2) a consultants' forum on logistic regression organized by Linda Young, 1995 Secretary–Treasurer, and myself. More information about all of the events planned for the ASA meeting in Chicago in August will be appearing later in the Spring.

In addition to our traditional methods of communication, we now have a couple of electronic means of communication. First is our home page (<http://www.amstat.org/sections/consulting.html>), created by Brian Yandell, 1996

Secretary–Treasurer. The home page contains information about our section and has links to lists of consulting courses offered around the country, consulting facilities around the world, useful books and journals, and statistics-related newsgroups (see especially the newsgroup called `sci.stat.consult`). The consulting section has also established a listserver for those interested in issues affecting non-PhD statisticians. It can be accessed from the Consulting Section home page, or by sending the message “`subscribe asacnslt-nonphd yournamehere`” (where “`yournamehere`” should be replaced by your own name) to the e-mail address `listserv@jse.stat.ncsu.edu`. In the future we can establish a listserver for the Consulting Section in general or for particular sub-groups, such as consulting education or business aspects of consulting, if there is interest. Please send comments on this suggestion to me at `gumpertz@ncsu.edu`.

I am looking forward to this year as chair of the Statistical Consulting Section. The most wonderful thing that I've learned by becoming involved in this organization is that it is really driven by members' ideas.

## Missing Data: A Bayesian Type Estimation Procedure

**Paul Johnson**

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One of the problems asked of a statistical consultant time and time again is: I have missing data, what should I do? This is one of the questions asked of me while working on a Health and Stress study project. At the University of California San Francisco (UCSF), School of Medicine a study is underway to examine how acute and chronic stress affects the immune system. A repeated measures analysis of covariance, of the 200 subjects, is to be carried out. I was to provide for an accu-

rate method to estimate missing data for the acute and chronic stress arena, duration and ratings sequences of data points to be found in any acute stressor, chronic stressor and immune parameter health project under study.

The UCSF database was reviewed for completeness, and suspect data (i.e., unrealistic or impossible values probably resulting from data entry errors) were deleted from the database. Specific database fields were assigned a missing code (as distinct from a value of zero) when the data were unavailable due to inadvertent omission, non-collection, non-applicability, etc. Any fields with a missing code and values that had been deleted, and hence considered as missing, were subjected to a missing data analysis. This analysis involves a 4-step iterative procedure.

One of the steps is to examine highly correlated variables and fit stepwise linear regression models for these variables. These linear models can then be used to impute missing values. The second step is to examine each variable with its own lagged column of values. Any significantly large correlations found indicate the presence of a first order autoregressive AR(1) time series model effect, since the immune values that are immediately adjacent in time are often found to be strongly correlated within persons. This information together with the first step aids in establishing an algorithm to impute missing values. The third step looks at the chronic stress, acute stress, optimism and immune values in terms of columns of discrete data. The data also contains information if looked at in terms of rows of information. This is often found to be true when the rows of information represent data that has been collected on a weekly basis for each subject within the study. This can be considered as transposing the matrix of values and repeating the analysis as done earlier on the original columns. By looking at the rows of information patterns can be seen to develop which enhance the estimation process. The rows in this case are the week data for each subject. The fourth and final

step is to examine each group of arena, duration and ratings variables as a set sequence of numbers. This sequence is then weighted depending upon where the sequence is in relation to the missing data point. These weights are based upon prior information from the investigator. Hence a Bayesian type of method is used to estimate missing data points that fall into this type of category analysis. The weights are to be greatest if the location of the sequence is close to that of the missing data point. The largest weight is to be found if the sequence is in the same week as that of the missing data point. As the sequences move away from the central location of the missing data point the associated weights become lower and lower in value and weight. These methods are carried out separately for each subject.

By following the analysis set forth missing values were estimated and examined carefully. The method has a test-retest validation reliability measure of 0.89 for the acute and chronic stress arena, duration and ratings codesheets. This measure was provided for by randomly deleting known value points from the database and then using the above described methods to estimate the unknown points.

I am interested in any other ideas readers of the Statistical Consultant may have in regards to this problem.

## Letter to the Editor

### The Expanding Role of Statisticians

**Ronald D. Snee**

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I am responding to your article on "Extremes in Client Types" which appeared in the Spring 1995 issue of *The Statistical Consultant* (Vol. 12, No. 2, pp. 2-3). The article included a reprint of Gerald Van Belle's table of 15 client types, their characteristics, and the

associated expected consultant types.

While the depiction is consistent with my experience, I believe that it misses a very important point. The statistician's role is expanding in many areas from one of interacting one-on-one with a client as addressed in the article to working with an organization to improve its performance.

When the statistician's focus is on individual clients the role of the statistician depends on whether the statistician and the client are active or passive. The result is roles for the statistician of crusader, helper, and colleague, as shown in Table 1.

Table 1. The Old View of the Statistician's Role.

Statistician	Client	The role of the statistician:
Passive	Passive	None
Active	Passive	Crusader
Passive	Active	Helper
Active	Active	Colleague

From Snee (1991); adapted from Hunter (1981).

This old view of the statistician's role is passing. Statisticians are being asked to take a more active role in the future of the organization for which they work. A new variable — the needs of the organization — has en-

tered the scene. This new situation produces additional roles for the statistician: teacher, leader, data blesser, and collaborator as shown in Table 2. Table 2 may stretch to make the point but the roles are fairly portrayed. In the passive organization the statistician can aim to be a colleague of the client. In the active organization the statistician can aim to be a colleague of the entire organization. In the resulting roles the statistician is involved in how the organization works.

It is important to note that the active organization produces roles for statisticians *in addition* to those present when the organization is not active; hence, the role of the statistician expands. This will mean greater job opportunities and greater influence in the organization. The result will be greater job satisfaction for statisticians.

This expanding role of the statistician also has implications for the mission of *The Statistical Consultant*. Recognizing the role of statisticians in improving the performance and contribution of organizations of all types: public, private, profit, non-profit, is an objective worthy of consideration.

Table 2. The New View of the Statistician's Role.

If the statistician is:	And the client is:	And the organization is:	The statistician's role is:
Passive	Passive	Passive	None
Active	Passive	Passive	Crusader
Passive	Active	Passive	Helper
Active	Active	Passive	Colleague
Passive	Passive	Active	Teacher
Active	Passive	Active	Leader
Passive	Active	Active	Data blesser
Active	Active	Active	Collaborator

From Snee (1991).

Additional discussion of the role of statisticians can be found in the following references:

Anon. (1988), "The Statistician's Role in Quality Management," *Quality Progress*, January 1988, 28-33.

Hoerl, R. W., Hooper, J. H., Jacobs, P. J., and Lucas, J. M. (1993), "Skills for Industrial Statisticians to Survive and Prosper in the Emerging Quality En-

vironment," *The American Statistician*, 47, 280-292.

Hunter, W. G., (1981), "The Practice of Statistics: The Real World is an Idea Whose Time has Come," *The American Statistician*, 35, 72-76.

Snee, R. D., (1991), "Can Statisticians Meet the Challenge of Total Quality?" *Quality Progress*, January 1991, 60-64.

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## Tips for Beginning Consultants

### Richard Browne

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- You don't have to be the *best*, just *good enough*. While you may not be the brightest or most knowledgeable statistician you ever knew, that should not dissuade you from talking to potential clients. Consulting is not an awards ceremony, but a request by someone in need to get answers to certain questions. Often, the level of skill needed to solve the problems you will see is much less than you might imagine. Sometimes, you'll want to say, "Is that the whole problem??" but that may be a big problem to them. So, the issue is not whether you are the best, but whether you are good enough to do what is needed.
- Don't put yourself down when interviewing with a potential client. The client *wants* to believe that you can solve his problem, not that you are a modest and nice person. Conversely, don't exaggerate your talents to the extent that you can't make good on your claims. But it is far more common for new consultants

to minimize their abilities, for whatever reason.

- Be *sure* you know what is needed and expected from you and from client before a meeting comes to an end. It is far better to sound a little dumb and get the facts nailed down than to act like you understand, when you don't. Confusion on the issues of who is doing what and by when can make for a quick disaster, despite all your hard work. They will more quickly forget that you asked a lot of questions and got very specific than that you spent valuable time and money coming up with excellent answers to the wrong questions.
- When talking to potential clients, look for the MAD (Money, Authority, Desire) person. If the person lacks any one of the three, you are likely wasting your time.
- When you are thinking about going into consulting full time, people will tell you that they would love to have you consult with them. Be aware that talk is cheap and some (most) will not pan out in the end (see the item above about the need to be talking with the MAD person). Incidentally, I have been in full-time consulting twice and this happened both times.
- You will get most of your clients by word-of-mouth recommendations, not slick ad-

vertising. If you need car repair, what do you do? You ask a friend who he/she thinks could do the best job of fixing the problem with your car. The same holds true even in the highest levels of business with regards to finding a consultant. You need to make yourself known by doing work, and doing it well. You would be better off to take a bunch of small jobs at first and do them well (and even lose money on them!) to just get your name out there as a can-do person.

- As a new consultant, you will be tempted to use the most sophisticated, high-sounding methods you can to impress your client. You may want to do that as part of your own closet analysis of the data. But before you present your report, find out what the level of statistical sophistication of your client *really* is. Be aware that many people have difficulty with anything more sophisticated than averages and percentages. You are so used to working with people in your field who are familiar with ridge regression, bootstrap methods, posterior distributions, etc., that you may forget how *little* the average person knows. In a class action employment discrimination suit, we used a very sophisticated linear model to prove our case. The opponent used averages and percentages. The judge said, “I understand what the other fellow said, but I don’t understand what you said.” As a result, the judge found for the other side. While the opponent’s analysis might not have thrilled your major professor, it did the trick because it was pitched at the level of the person for whom it was intended. Be aware that you may need to illustrate percent and percent change in simple terms in your report so that you can be assured that you and the client mean the same thing when you use those terms. In other words, never assume any level of statisti-

cal sophistication in your client; check it out and be aware that vanity may cause them to pretend they understand, when they really don’t.

- What your client says s/he wants and what s/he really wants are most often two different things. Clue: the reason a study was run (or is being suggested) is to make a decision or formulate a new strategy. The real goal or purpose may be veiled in the act of gathering a mound of statistics. For example, the client may say, “We want to tabulate some statistics (age, education level, etc.) on our customers, so we want to send out a survey.” After talking at length with the client, it becomes apparent that the real question is whether the customers would react favorably or unfavorably to the future introduction of a new line of merchandise. Your recommendation then might be to scrap the proposed survey and send out a simple postcard-response survey asking what their reaction would be (never be afraid to ask the question point-blank; it saves a lot of second-guessing). The moral is to direct your investigation to *directly* answer the burning question of the day for your client.
- When you write up your report, include an Executive Summary (ES) as the first page. The ES should include a brief recap of the major problem, the primary findings of the study, and *most importantly* your recommendations as a result of those findings. What clients really want is a succinct take-home message, one or two lines that give them the bottom line for the whole study. Quite often, clients aren’t sure what to make of a large, complex study and, because they are not expert at data analysis, are looking for someone to pull it all together in a simple conclusion and recommendation. Even if they ultimately disagree with your recommendation, they

will appreciate the fact that you didn't just leave them hanging with a bunch of numbers on endless pages. Remember, they are faced with a daunting problem and are looking for someone to lead the way. Otherwise, why did they hire you? Diplomacy is important, but wishy-washiness impresses no one.

- The ES should be less than a page, though a two-page ES is permissible. Most executives are very busy people and don't have time to read a 30-page report. In fact, most will ignore much of the report and just turn to the conclusions anyway. They presume you knew how to do the analyses and are not there to grade your report. The ES is highly desired as something quick and simple to refer to, rather than wading through 5 or 10 pages of conclusions. If you don't bother with an ES, don't be surprised if they ask for one, or ask, "So, what does it all mean, anyway?" You will look more professional by including an ES in the first place. In writing one, pretend you are on the elevator with the company president and s/he asks, "So, what did the study tell us of value, anyway?" You have 60 seconds or less to say it. What would you say? In academia, we tend to be verbose, whereas in industry brevity is much more appreciated.

## The Business of Consulting

**Richard Jarrett**

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I have now run consulting units in two different Universities. From 1987-90, I ran the Statistical Consulting Centre at the University of Melbourne and, since 1991, I have run a group at the University of Adelaide. The comments below apply to my experience in Australia, and I would be interested to see whether

they are similar to people's experience elsewhere.

In each case, the work has been a balance between external work and work within the University. My experience with a number of staff is that if you work a 35 hour week, then the work directly attributable to clients averages at about 25 hours a week. The rest "disappears" into various overheads — meetings, learning new computer software, refereeing papers, etc. Of those 25 hours, about 22 would generally be "chargeable," since some time is lost talking to potential clients who decline the offer of our services, or preparing tenders that are unsuccessful. The result is that, after allowing for holidays, conferences etc., there are about 1000 hours per year that can be billed to clients. As a rough rule of thumb, many organisations use an hourly charging rate that is the person's total cost for the year (i.e. salary plus other costs like superannuation, insurance etc.) divided by 500. Thus, if a staff member costs \$50,000 per year, you would charge \$100/hour or \$700/day.

While this may appear excessive at first sight, the costs of office space, secretarial support, computing equipment, the non-chargeable time spent managing and promoting the service, all eat into that margin. (I recently heard the story that in legal firms, the rule often used is that each person has to earn three times their salary — one for themselves, one to run the office and one for the partners.) Many Universities take a percentage of the moneys earned externally, as a contribution towards their expenses in terms of professional indemnity, providing space, hiring staff, and managing payroll and other financial aspects of the service.

There are two points I would make here: (i) I believe it is unethical for Universities, or staff at those Universities, to use their situation to offer cheaper rates than bona fide statisticians who are working as private consultants. (ii) It is clearly untenable to charge these rates within Universities, since the capacity to pay is just not there. In a number of Australian

Universities, the central administration pays for at least part of the cost of statistical support, so that staff and students can get some free advice and then pay at lower rates (generally about half the commercial rate) for any extra work.

## Notes from the Editor

A variety of issues to bring to your attention:

- This issue is a combined one: it includes both Volume 12 No. 3 and Volume 13 No. 1. This should help us get back onto a regular publication schedule.
- With a little luck, I hope to put this and future issues of *The Statistical Consultant* up on our World Wide Web server. It seems that the printed version of the newsletter is mailed by surface mail, and thus takes some time to reach our overseas members. Having the newsletter up on the Web should help to address that.
- My many thanks to this issue's contributors. Thanks to Richard Browne and Richard Jarrett for responding to last issue's requests for consulting tips and for comments on the business aspects of consulting. If you have additional comments on these topics please forward them to me.

Thanks, too, to Paul Johnson and Ronald Snee for submitting their articles. I hope you found them thought-provoking.

And, finally, thanks to our past and present chairs for their comments about the state of our section.

- Last issue I asked readers to make comments about the business aspects of consulting — in particular, if you are consulting on your own, how do you go about setting fees? I've received some response to this query, and would like to hear from more of you in this regard.

- For some of you, your consulting activities are conducted primarily within the wall of a university, corporation, or government agency where setting fees is not necessarily the main issue. I am planning a series of articles that describe the consulting operations at different institutions. Does your consulting operation charge per hour, per project, or off the top? Is it primarily a drop-in service, or run more on an appointment basis? Who are your clients? Anyone in the organization? Or some particular subgroup? Who staffs it? PhD-level statisticians? MS-level statisticians? Students? Are most projects long term, or do they tend to be resolved after a few visits? How is computing support provided? Do you tend to run most analyses yourself, or is there a separate computing group to help you?

If you're willing to jot down a page describing your consulting operation, I'd be most grateful. (And I'm grateful, too, to Marcia Gumpertz, for suggesting this topic.)

- "Us and Them." I have a nomenclature problem that has been plaguing me for a while: what should we call ourselves and the people we work with? I'm not wild about the terms "client" and "consultant" because, for me, they conjure up the image of a relationship that is strictly a business one, with very carefully defined and rigid roles. In that image, the parties do not function as equal partners: rather, the "client" is the person with the money and the "consultant" is a hired gun ready to provide answers (for a fee). My view of consulting is that it should be more of a collaborative, team effort, with each party contributing their expertise to accomplish something that neither one could do alone.

But that raises the question of what to call the parties. I can't really think of

good substitutes: “scientist” and “statistician” will work, except that I think statisticians are scientists, too. Also, in some situations, the “client” is not a scientist in the formal sense, but perhaps a marketing executive, city mayor, librarian, and so on.

If you have suggestions for suitable labels, please let me know. As always, you

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