THE STATISTICAL CONSULTANT

Statistical Consulting Section
Tzu-Cheg Kao, Editor

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IN THIS ISSUE

Call for Invited Sessions for JSM 2006

The Statistical Consulting Section is recruiting organizers for invited sessions at the 2006 Joint Statistical Meetings in Seattle, August 6-10. The section expects to be awarded up to four invited sessions at those meetings.

Prospective organizers are encouraged to contact Todd G. Nick, Program Chair-elect for JSM 2006, to discuss an idea and to contact potentially interested speakers before February 2005. Sessions addressing technical issues of broader interest are of particular interest.

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Thanks to Donors of JSM 2004 Door Prizes

The annual Business Meeting of the Statistical Consulting Section at JSM concluded in Toronto this year with drawings for many door prizes. Prizes were contributed generously from book publishers and software vendors. Many of them donated multiple books and copies of software, which were greatly appreciated by our section members. We would like to thank the following donors:

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Survey of Members of the ASA Consulting Section: A Brief Report

Nancy Berman, Statistical Research Associates[1]
Christina M. Gullion, Kaiser Permanente Center for Health Research[2]

Introduction

There are few articles on statistical consulting that report empirical data regarding what statistical consultants do, such as might be obtained through survey research or systematic time and motion studies. In 2000, the Statistical Consulting Section of the American Statistical Association (ASA) commissioned a survey of its members in order to gain a better empirical database regarding the activities and employment situations of this subpopulation of statistical consultants.

The specific aims of the survey were to

- Profile the characteristics of the working consultants who are members of the section, including demographics, education, type of employer, and insurance coverage
- Describe the activities the respondents carry out in their work
- Describe the factors that go into setting consulting fees

The Executive Committee of the Statistical Consulting Section plans to use the information gained from this survey to aid in planning section services and activities that are important for the members. In addition, it is hoped that educators of statistical consultants will find this information of value in preparing students for a career in this area.

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Method

Instrument

The questionnaire was developed by the authors with input from members of the Executive Committee of the Statistical Consulting Section and was revised in response to comments from members of the ASA Survey Review Committee and the ASA Executive Board, both of which approved the questionnaire.

The final instrument consists of three parts: background, salaried consulting, and self-employed consulting. Part 1 asks for sex, age, highest educational degree, field of training, years of paid consulting experience, source of health insurance coverage, current employment status, attendance at the Joint Statistical Meetings in the previous five years, and membership in the Statistical Consulting Section.

Respondents who had done no paid statistical consulting work in the last 12 months completed only Part 1. Others were asked for the primary employment context of their consulting work in the past 12 months (salaried, self-employed, or both). Based on their primary type of consulting work, they were asked to complete Parts 2 or 3. We refer to those who work in both contexts as "dual career."

Part 2, for respondents who reported salaried consulting, asked about the type of current or last employer and whether the employer was not-for-profit. Respondents were asked to identify up to 4 subject areas on which they consulted in the previous 12 months from the list of 48 subject areas identified by the ASA.

We asked what percentage of salaried time in the past 12 months was spent in consulting activities, and then to assign percentages of this time to a list of 11 activities often carried out by statistical consultants. Respondents were also asked to indicate what aspects of "statistical practice" they gave advice on or did in the context of salaried consulting in the past 12 months.

Finally, we asked which items from a list of 18 choices were covered in any budget for a consulting contract prepared during the past 12 months. Examples included client delays, learning content area of client, programming, and benefit costs.

Part 3, for self-employed consultants, contained the same types of questions as Part 2, but the questions were rephrased to address self-employed consulting. In addition, the respondent could indicate up to four types of employers their clients came from. Also, there was an additional question about the basis for charging as a consultant on projects.

Analytic Methods

We did simple descriptive summaries (cross-tabulations, means and standard deviations) on most questions. Questions that elicited multiple responses were summarized using disjoint cluster analysis in order to identify subgroups of respondents with distinct patterns of responding. The questions subjected to cluster analysis were subject areas, consulting activities, aspects of statistical practice, budget items, and (for self-employed consultants) clients and methods of charging. We give a brief summary of the key results here. The complete results will be presented in a pending publication.

Results

ASA records showed 1,411 members of the section as of August 30, 2000, while the section's secretary/treasurer reported 1,533 members at the 2000 Joint Statistical Meetings (JSM) and 1,397 at the 2001 JSM.

Questionnaires were returned by 526 respondents, of which 485 (92.2%) reported that they were current members of the Statistical Consulting Section. These members comprise the respondent sample reported here. Thus, we believe our response rate is in the range of 31 to 36 percent of the membership.

There were inconsistencies between responses regarding employment status and context in Part 1 and which section(s) they filled out, so we used the sections completed to determine our sample sizes for currently working and for salaried, self-employed, or dual-career. There were 64 members who reported no paid consulting work in the past 12 months and completed only Part 1, while 421 members completed more than Part 1. In this latter group of 421, 226 (53.7%) completed Part 2 only, 95 (22.6%) completed Part 3 only, and 100 (23.8%) completed both Parts 2 and 3 (i.e., reported a dual-career).

Part 1: Background

Of the 485 self-identified members, 65% had a doctoral degree and 31% had no more than a masters degree. About 76% of the degrees were in statistics or biostatistics, followed by quantitative psychology and mathematics (3.3% each).

In the same group, 84.5% were employed as statisticians, whereas 9.9% were employed but not as statisticians. This number rises to 18.1% in the self-employed group. Only 1.2% of the respondents reported themselves as unemployed, and another 3.5% of the respondents were "retired."

Males comprised 69% of the member group. Female respondents were younger than male respondents (42.3 years $\pm$ 10.3 vs. 48.4 years $\pm$ 10.2) and had fewer years of consulting experience (9.8 years $\pm$ 8.5 vs. 14.3 years $\pm$ 9.8). (Both comparisons had $p < 0.0001$ by t-test.)

Self-employed consultants and those in dual careers were older than salaried-only consultants (both about age 49 years). The gender distribution was more similar between salaried and dual-career respondents (about 32% female) vs. self-employed (20% female). Not surprisingly, self-employed consultants also have the most years of experience (16 years $\pm$ 9).

Attendance at the JSM varied by context. Among salaried respondents, 35% had attended no JSMs in the previous five years; that figure jumped to over 57% among self-employed only. Approximately 22% (across contexts) had attended one JSM, and the balance is fairly uniformly distributed over 2-5 meetings.

Part 2: Characteristics of Salaried Consultants

This analysis was based on responses from 326 members of the section who completed Part 2 of the questionnaire.

Overall, these respondents reported that an average of 64% of their time was spent in consulting activities. The largest number (44%) were employed in university or colleges, the second largest number (11%) by medical/health care centers.

Six clusters were found in the subject area data. The largest single cluster (30%) combined biopharmaceutical/clinical trials and medicine. The second largest cluster (21%) was a composite of business, market research, surveys, and education. Epidemiology and public health form a cluster (17%), and several life sciences areas (agriculture, ecology, environmental, etc.) formed the fourth cluster (15%). The other clusters contained members working in manufacturing/quality/productivity (8%) and computing (8%).

Eight clusters accounted for time allocated to job activities. The largest cluster was defined by people who spent most of their time (75% on average) on *statistical practice* (54%). The next largest cluster (26%) appeared to be generalists, who spend about 40% of their time on *statistical practice* but also do a variety of other things, including *training and management.*

The other clusters were small, made up of people who spent most of their time doing things other than statistical practice. Four individuals heavily involved in Institutional Review Board (IRB), Independent Ethics Com-

mittee, or related activities formed one cluster. Others spend most of their time on *management*, *training*, *computer-user support*, or *data management applications development*.

Responses to aspects of statistical practice produced four clusters. There was a common core of activities (*data analysis*, *review/interpret analytic results*, and *analysis planning*) that did not differentiate the clusters.

A second group of activities (*study design*, *power analysis*, and *write for publication*) were endorsed by most of the persons in three of the clusters, but very few in the fourth (24%). In the largest cluster (33%), *questionnaire design*, *survey design*, and *writing reports* were endorsed in addition to the two core sets of activities, whereas a second large cluster (22%) instead endorsed *protocol review* and *statistical research*. The persons in the final cluster (21%) endorsed the two core sets of activities and were more involved in *data audits* than the other groups.

Only 137 respondents doing salaried consulting provided data about budget items. Of these, 43% fell into a cluster defined by *actual time spent* and/or *reasonable time*. A small group (9%) had endorsed virtually all the items in the list. The other clusters focused on *programming*, including *learning new software*, *debugging*, *redo following client error* and time (21%) or *programming* plus time and office and administrative costs (27%).

Part 3: Self-employed respondents

The subject clusters were similar to those for the salaried subjects, but there were eight rather than six.

Biopharmaceutical/clinical trials again formed the largest cluster (26%), followed by public health, education, and psychology (19%). Surveys/market research separated from business to form a distinct cluster including 19% of the self-employed respondents.

The primary clients' sites for self-employed consultants were university or college (33%) followed by pharmaceutical companies (24%) and businesses (23%).

The largest cluster for job activities, as for salaried respondents, was *statistical practice* (80% of time), which includes 68% of the respondents. There were five small clusters defined by people who spent less than half their time on *statistical practice* and concentrated on other activities. The largest of these (12%) was defined by generalists spending 8 to 10 percent of their time on various activities, including *management*, *financial* and *training*. Consultants in other smaller clusters focus on *IRB activities*, *computer-user support*, *data management applications development*, and *training of non-statistical personnel*, respectively.

There were six clusters in the aspects of statistical practice. Similar to our results for the salaried consultants, *data analysis* did not distinguish clusters; it was endorsed by 93% overall.

A core of activities (*review analytic results*, *analysis planning*, *study design*) characterized three clusters. One of these three was distinguished by concentration on *questionnaire/survey design* (19%), another by *power analysis* (20%), and the third by *writing for publication*, *research*, and *reviewing protocols* (19%). Unlike the salaried consultants, here the smallest cluster involved *data analysis* alone, with only 8% of the subjects.

Only 147 of the 195 respondents reported preparing a budget in the last 12 months and of these only 138 provided usable data. The largest cluster in these data (33%) included only actual time in their budgets. Other clusters also included actual time, but endorsed other items as well, such as *learning content and methods* and *redo following client errors* (28%).

In three clusters, respondents were more likely to charge *reasonable time* than *actual time*; one of these (21%) was characterized only by charges for *reasonable time*. Interestingly, responses to the question, "How did you charge on projects?" fell into five clusters, one

for each of the four responses and one that encompassed all responses. The largest cluster (56%) reported *time by the hour only*, 11% reported charging a *flat fee*, 12% reported *time plus costs*, 6% reported *time by the day only*, and 15% reported using all four methods.

Discussion

Respondents spent the largest amount of their time in statistical practice, and the largest number of respondents was in biomedical statistics.

The interests and activities for the salaried and self-employed respondents were very similar. Statistical practice, particularly data analysis, is the primary activity of all statistical consultants, but many respondents were also involved in statistical research, management, writing, and training both statistical and non-statistical personnel.

In the data reported here 100 respondents answered both parts, and to the extent that they work similarly in both contexts, they may inflate the apparent similarity. We will examine their impact in a detailed publication which is in preparation.

The difference between males and females in age and years of experience seems consistent with the fact that women began entering technical fields in large numbers only in recent decades.

The self-employed subjects are older and more experienced than the salaried-only subjects. This also seems reasonable, because the ability to attract clients probably rests in part on having an established reputation and a record of completed projects with which to impress clients. This age and experience differential also manifests itself in the increasing ratio of males to females from salaried to self-employed. It would be interesting to repeat this survey after several years to see if gender differences still remain.

There were some differences between the salaried and self-employed consultants on budgeting. Only 43% of the salaried respondents had prepared a budget in the past 12 months, whereas 72% of the self-employed consultants had done so. The latter number is lower than expected, but perhaps some respondents had long-term contracts from their clients.

Given the response rate and diversity of responses, we believe this survey presents a good overview of the areas of interest and the tasks of statistical consultants, and hope the information will be useful to the members of the Statistical Consulting Section and to the section's Executive Committee. For instance, the realization that only a small proportion of the section members attend JSM has already led to efforts to reach them through other means, such as the round-table conference calls the section has recently initiated.

Comments from the Chair

Jane Pendergast, University of Iowa

For some reason, fall is often the time during which I reflect on "the bigger picture." Maybe it is because it is getting colder and the days are getting shorter and the end of the year seems too much closer.

The presidential elections are over, and we experienced unprecedented engagement by Americans. As we watched poll after poll try

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to predict the winner, it occurred to me that more and more Americans were being pushed to become a bit more knowledgeable about statistical concepts, such as "margin of error." That's a good thing.

We were reminded about the importance of solid communication skills, skills that we as consultants must possess. That's a good thing, too.

We were asked to worry about our future and the direction of the country. I sometimes worry about the future of our profession, but mostly I am encouraged with the wealth of opportunities out there for us. Our challenge is to build interest in statistics among those who will follow us (or work with us) and bring their ideas and creativity into our professional world. As the world is becoming more quantitative, we see more and more opportunities for statistical consultants. The demand will be there. Will we be able to fill it?

This has been an exciting year in the section.

Thanks to many of our section volunteers, we had a great program at the JSM in Toronto and were thrilled to see so many of our members at the annual business meeting of the section. We are also very grateful for the donations we received from the vendors for the door prizes.

The round-table conference call program was initiated this year, and it has been more popular with our members than we imagined it would be. We have more to do on that program, but we learn as we proceed, and we are confident that we will improve it. Perhaps some of the other sections will start initiating similar programs, which would be great for the membership.

As I reflect on the past year, I am also very excited about the coming year. Susan Devlin will be moving into the role of chair and has some great ideas for the section. The process of putting together a solid program for the 2005 JSM has been going strong.

The newsletter and website are our strongest modes of communication with you and are under dedicated and competent leadership. We are working to cut costs in the section so that you will know that you are getting your money's worth out of your dues. In a continuing effort to keep the section strong and serving your needs, we would welcome any and all suggestions for how we might do things differently. Thank you for your support of this section.

Notes from the Editor

Tzu-Cheg Kao, Uniformed Services University of the Health Sciences

Special thanks to Nancy Berman and Christina M. Gullion who were willing to share with us part of their work on survey of members of the Statistical Consulting Section conducted in 2000.

We are recruiting a volunteer to be the editor for *The Statistical Consultant* beginning in 2006, since my term as the editor will expire at the end of 2005. If you are interested, please let me know as soon as possible. As soon as the volunteer is available, I would like to invite him or her to serve as a co-editor with me in 2005. Then, in 2006, he or she will be the editor. I believe this will help the transition.

As always, we would like to encourage our section members to share with the ideas or topics that are interesting to our members. I am eager to hear your suggestions and ideas. Feel free to contact me about writing an article for *The Statistical Consultant*. Submission deadlines for future issues are February 1, May 1, and October 1 for the spring, summer, and winter issues.

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