Editorial Address: Dr. Mary H. Regier, Department of Mathematics and Statistics, Case Western Reserve University, Cleveland, Ohio 44106, USA. Telephone: 1 216 572 2710; Fax: 1 216 368 5163; E-mail: mhr@cwru.edu
President of the Society: Prof. David Vere-Jones, Mathematics Department, Victoria University, Private Bag, Wellington, New Zealand.
Telephone: 64 4 4721000; Fax: 64 4 4712070; E-mail: DVJ@TORU.ISOR.VUW.AC.NZ

The following report on the role of the ISI at the 1992 Winter Conference of the American Statistical Association (ASA) was written by Professor Richard Scheaffer of the University of Florida, who organized the ISI-ASA sessions. The conference was held in Louisville, Kentucky, USA, on January 3-5.

ISI'S ROLE IN THE 1992 ASA WINTER CONFERENCE

Statistical Education, the theme of the ASA Winter Conference, was viewed from an international perspective in the two sessions co-sponsored by the ISI. Peter Moore's paper (read in his absence due to the illness of his father) addressed the theme of increasing skill requirements of workers around the world which produces a need for greater statistical skills among broad classes of workers. Statistics is being treated as a specialist subject when it should be part of the general education of all, and should play a key role in all decision making.

On a similar theme, Ken Bryson pointed out the paradox that, at a time of great need for statistical data, public confidence in statistics and statisticians is on the decrease. Two suggested responses to this situation are to focus efforts on educating data users and to improve the profession of statisticians by employing Total Quality Management with its emphasis on customer needs and expectations.

Giitiro Suzuki pointed out the efforts being made in Japan to emphasize statistical theory and methods at all levels of education, including CAI efforts that are now just beginning. Judith Singer gave attention to one teaching model that has students actively involved in using real data within the context from which the data arose. This approach may help more students to learn analytical skills so as to possibly alleviate the situations described by Moore and Bryson.

ASA President Katherine Wallman and ISI President Fred Mosteller led the discussions in these sessions. Both pointed out the importance of improving the image of statistics among the general public and improving the data analytic skills of all. The ASA has an Office of Scientific and Public Affairs to help deal with these issues and the ISI has an Ad Hoc Committee on the Role of Statistics and Statisticians to discuss what might be done in this area.

FOURTH INTERNATIONAL CONFERENCE ON TEACHING STATISTICS (ICOTS 4)

As was previously announced, ICOTS 4 will be held in Marrakesh, Morocco, in August of 1994, upon the invitation of the Moroccan Government. The Programme Committee for this conference was recently set up and includes the following members, in addition to the Director of the Moroccan National Institute for Statistics & Applied Economics (INSEA), Mr. Abdulaziz El-Ghazali:-

Jamal-Eddine Baddou
Yves Escoufier (Chair)
Anne Hawkins
Marie-Jeanne Laurent-Duhamel
David Moore
David Ospina
S.M. Shen
Sam Tulya-Muhika
David Vere-Jones

The following article on teaching statistics at a medical school in Oman was contributed by Dr. D.Y. Downham of Liverpool University, UK. It was coauthored by K.M. Abdelbasit, S. Carson and J.P. Musgrove, and acknowledges helpful advice from S. McFarlane and D. Ashby.

AN APPLIED APPROACH TO TEACHING MEDICAL STATISTICS

Introduction

The medical services in the Sultanate of Oman developed rapidly and effectively since 1970, when Sultan Qaboos bin Said came to power. The only medical school in Oman opened in 1986 as one of the initial six colleges in Sultan Qaboos University. From the start, the annual enrolment has been about 50 medical students.

In their first year medical students must take, and pass, the Foundation Science Course. Students must also pass an English language course, as English is the language of instruction. In the second year, medical students study Behaviourial Science, Chemistry, Family and Community Health, Physics, and Statistics.

The need for medical students to learn statistics is well known - a need that is often more apparent to the lecturer than to the student! Anticipating a reluctance to learn statistics, we devised a course that meshed with other parts of their studies, illustrated the relevance of statistics to Oman, and accommodated the special needs of a developing country.

A common feature of a developing country is a dearth of reliable data. Part of the responsibility of a doctor in a developing country is the rectification of this dearth - less important for the doctor in a developed country. In the former, doctors should know how to collect data, realise the necessity for reliable data, and possible pitfalls in the collection procedure.

Assuming that the medical statistics course in a developing country is similar in length to that in a developed country, some important topics must be omitted or dealt with in less time. The emphases are likely to be different: for example, in developed countries substantial time is often devoted to probability distributions and clinical trials, topics that are possibly less necessary in developing countries. As it is important to stress vital statistics so that the future doctors can play their part in constructing the basic epidemiology of the country, we are forced to treat clinical trials and distributions in a cursory way. We do not attempt the impossible by diminishing the importance of the missing topics, but priorities are somewhat different.

Content

To read, understand and be critical of the general medical literature, a doctor should be familiar with standard descriptive statistics, point and interval estimation, and hypothesis testing. Students have met descriptive methods at school. As mathematics forms a substantial part of the Foundation Science Course, algebraic expressions provide little difficulty. Taking the above points into consideration, we devised the following syllabus:

Scope of medical statistics. Population, sample and ideas about inference. Use of random numbers to obtain a random sample. Data types - qualitative, ordered, discrete and continuous. Graphical representation - histograms, stem-and-leaf diagrams, scattergrams, etc. Summary statistics - mean, median, mode, variance. Introduction to regression and correlation. Point and interval estimation. Simple form of Central Limit Theorem. Normal and t-tables. Simple hypothesis testing. Report writing. Computers in Biostatistics.

The topics are introduced in this order. At first sight this syllabus is similar to many others, but the organisation is different.

Organisation

Statistics is given in three sections in the second half of the second year. Two 2-hours sessions are allotted weekly for seven weeks, roughly half lecture and half examples class, when interval estimation is reached. The students then undertake a two-week community study run by the Department of Family and Community Health. On returning to Statistics, there are two sessions per week for three weeks: the inference topics are covered and one of the 12 hours is allotted to report writing. Finally, there are three days, supposedly from 8:30 am until 4 pm, when students prepare reports and are introduced to a statistical program package and to other uses of computers in medicine: two and a half of these days are allotted to report writing and a half day for the applications of computers.

The two-weeks study run by the Department of Family and Community Medicine consists of lectures, demonstrations, role-playing and a field study. Eye diseases, in particular Trachoma, and dental health are considered. Knowledge from the lecture room is applied in the field study to a nearby village. Each annual intake of students is identified with a particular village, which is revisited throughout their undergraduate medical training. Students work in groups of four. They examine every member in a selected household and record data, which is later entered into a personal computer using dBase.

Statistics is an integral part of the second-year field study with students learning:

(i) how to use random numbers to obtain simple random and cluster samples;
(ii) the difficulty of obtaining good reliable data;
(iii) the use of descriptive methods, estimation and testing - for example, estimating the prevalence rate of Trachoma;
(iv) how to develop an argument with each group writing a statistical report about Trachoma.

At the end of the first section of seven weeks, the students are given a one-and-a-half hour examination that tests topics such as the calculation of means and variances for both grouped and ungrouped data, the difference between rounded and truncated data, and cumulative frequency and stem-and-leaf diagrams. One question is more substantial than the others: the final question of the 1988 examination asked the students to form a scattergram from a set of data, to determine the linear regression line, to predict a value, and to sketch the line on the scattergram. Students can use calculators in the examination, with obvious benefits in time.

Five assignments are considered in the examples classes, with the answers prepared at home.

At the start of the two and a half days allotted to the report, each group of four students is given a computer printout of its own data together with summary tables of the data for all the groups. Each group discusses the data, methods of summarising them, parameters to be estimated and hypotheses to be tested; and assigns the evening tasks for each member. The two statistics professors move between the groups answering queries and ensuring that the work is progressing. The report for each group is assessed, and each student must defend the report in an oral examination.

Discussion

Statistics is often unpopular with medical students, and so the method of teaching it must be examined. It is often taught in isolation of other medical courses - sometimes by mathematical statisticians without an active interest in medicine. The unfamiliar language, compounded by an (almost pathological) antipathy, can negate a lecturer's efforts at showing its relevance.

How can its relevance be shown? In the developed world, clinical trials have been the source of many examples. The priorities in the developing world are different. Thus we include examples from preventive medicine at the expense of examples from curative medicine.

The approach of using the students' own data is particularly helpful with inference, which often causes difficulties. The lectures about the limitations and the interpretation of significant results, and the desirability of random samples, begin to have real meaning, and so are more likely to be remembered long after the last-minute swot for the medical statistics examination.

When visiting the villages, students work in groups of four of mixed sexes. The first intake of students found the prevalence rate of Trachoma to be greater than envisaged a priori, and so were stimulated to find what could be inferred from their data; the initial stimulation was due to several students shown signs of Trachoma, found when they were learning how to identify the disease.

In discussing their results, students see that a study can ask more questions than it answers: some groups asked whether significant differences in prevalence rates reflected genuine differences, perhaps related to water supply or economic factors, or whether they were an artifact. Groups that considered the age distribution of Trachoma were startled to see that 80% of people 50 years or older had signs of the disease. Several groups noted that the results had to be treated with caution, as there were few men aged 20-50 years in the villages; the better groups noted that, when testing the independence of Trachoma and sex, significance might be an artifact. During their discussions, several groups considered how to mount a health education campaign.

This course is demanding in lecture time, and would not be possible if the lecturers were not active and committed to medical statistics. Statisticians should give the lectures, supervise the classwork, and observe the fieldwork. To implement such a Statistics course, a university must be willing to assign sufficient time to lecturers with suitable expertise.

Dr. D.Y. Downham
Department of Statistics & Computational Mathematics
Victoria Building, Brownlow Hill
Liverpool University, P.O. Box 147
Liverpool, L69 3BX, UK.