UNDERGRADUATE COURSES IN DENTAL STATISTICS IN BRITAIN AND IRELAND[1]

NIGEL SMEETON
King's College London
nigel.smeeton@kcl.ac.uk

SUMMARY

Despite the recommendation of the General Dental Council that statistical methods and data analysis should form part of the curriculum of undergraduate dental degrees, little is known about the teaching of statistics in dental schools. This informal study was carried out to obtain information on the methods of teaching and assessment used in dental schools in Britain and Ireland.

Keywords: Teaching; Assessment; Dentistry; Undergraduates; Survey; Statistics education research

1. INTRODUCTION

Historically, the teaching of statistics in dental courses in Britain and Ireland, if conducted at all, has had a very minor role. However, in 1990 the General Dental Council published recommendations for dental training, one of which sought to rectify this (General Dental Council, 1990, p.10):
'The teaching should introduce the student to the principles of scientific thought and argument including the evaluation of scientifically established facts, experimental design, statistics and the analysis of data, and place the clinical instruction in the scientific context'.

Although dental schools have sought to address the lack of statistical teaching, apart from a paper on the teaching of statistics to dental students at the former United Medical and Dental Schools of Guy's and St. Thomas's Hospitals, London (Smeeton, 1996) little is known about the content of the British and Irish courses that have been established. In April 2001 I attended a committee meeting at which one of the dental staff made an unsubstantiated remark about the increasing importance of computer aided self-directed learning in the teaching of statistics in UK dental schools. I had no idea whether or not this remark was correct but was curious to find out the answer, hence this investigation.

2. METHOD OF INVESTIGATION

A listing of the dental schools in Britain and Ireland was obtained from the Dental Education Resources on the Web site (http://www.derweb.co.uk/main/dentsch.html). Information on the teaching of dental statistics, including timetables, lectures, exercises and assessment where possible, was obtained from dental school web sites. A request for information was sent through the international dental education e-mail group. Personal acquaintances involved in statistics teaching within medical and dental schools were contacted by e-mail. This led to a dental statistics teaching e-mail group (DENTSTAT) being established and publicized in the Royal Statistical Society (RSS) News. These sources yielded detailed information on around two-thirds of the relevant dental schools.

In addition, a series of questions was sent by e-mail to members of the organizers' circulation list for the 2002 annual conference for UK teachers of medical statistics at Burwalls, Bristol (held from 10th-12th April) asking about:

(1) The number of dental students admitted per year.
(2) The years in which dental statistics teaching takes place.
(3) Whether they are taught statistics together with medical students or not.
(4) Approximate number of hours of teaching/ revision, for lectures, tutorials and practicals separately
(5) Details of in-course assessments, if any.

(6) Details of written examinations, if any.

(7) Use of statistical packages and computer aided / internet learning.

I emphasized the importance of receiving feedback from all dental schools including those institutions about which I had no information at that time. To promote interest further, I agreed to lead a session on the topic at the 2002 medical statistics teachers' meeting. Prior to giving the talk, I revisited the dental school web sites for updated information.

3. RESULTS

Detailed information about statistics teaching for the academic year 2001/02 was collected from all fourteen dental schools in Britain and Ireland (Belfast, Birmingham, Bristol, Cardiff, Dublin, Dundee, Glasgow, Leeds, Liverpool, London – King's College, London – Queen Mary's, Manchester, Newcastle and Sheffield). Apart from one telephone conversation all contact was by e-mail. The annual intake of students ranged from 35 (Dublin) to 140 (King's College, London) with a median of 60. Teaching was organized by statistics staff at 9 (64%) of the dental schools, with dental departments taking responsibility at the other institutions (Table 1).

Table 1. Specialties responsible for the teaching of statistics to dental students

Specialties	Number
Statistics	9
Clinical dental sciences	2
Oral biology	1
Physiology	1
Restorative dentistry	1

The Bachelor of Dental Science (BDS) degree entails a five-year course with an optional extra year for the in-depth study of a particular aspect of dentistry leading to a BSc degree. The additional qualification is commonly referred to as an 'intercalated' degree. Traditionally the first two years have emphasized basic dental sciences whereas the later years have focused on clinical practice. Vertical integration is now being introduced with themes such as dental public health extending throughout the whole five years. From this investigation, statistics teaching took place in years 1 and/or 2 in seven dental schools. In three schools the teaching came in the later years of the course with teaching in both early and later years at four institutions. In all but two dental schools students were taught statistics separately from medical students. Separate teaching took place at all schools where dental staff were responsible.

Table 2 shows the range of face-to-face teaching methods in use. The lecture was an important component of teaching at most dental schools. All but one of the courses involved lectures, with 10 or more hours of lectures being timetabled at four. Tutorials were arranged in four schools and in one they were the only face-to-face classroom teaching. Small group sessions were commonly based around discussion of recent articles taken from high profile dental journals.

Table 2. Range of face-to-face teaching in use

Lectures only	7
Lectures and computing sessions	3
Lectures and tutorials	1
Lectures, tutorials and computing sessions	2
Tutorials only	1

Textbooks were mentioned by staff from four institutions: Bulman and Osborn (1989) (2), Bland (2000) (2) and Dunn and Everitt (1995) (1). Two schools specifically recommended a text. The use of statistical packages

was mentioned at nine schools, SPSS (5) and Minitab (3) being the most commonly used. Statistics practical classes involving computing featured in five of the courses.

Statistics revision classes, made available to all students prior to formal assessments, were offered at five dental schools, with a range from 1 to 4 hours of teaching on offer. These involved the discussion of sample examination questions, in which the tutor explained the main points with students asking for clarification as required.

Project work was set on three dental courses and two courses involved in-course assessment exercises. Four dental schools indicated the use of computer aided self-directed learning. One school used QUERCUS (McCloskey et al., 1997), another Statistics for the Terrified (Morris et al., 1997) and two others had developed in-house computer aided learning material. A further dental school classified one-to-one statistical consulting for student projects as self-directed learning. The institutional intranet featured in four courses; two used it for lecture notes, three for course exercises, three for past examination questions and one for discussion between students and staff. Only two of the four institutions provided access to outside users enabling me to check information given by staff.

Formal assessment of statistical understanding was conducted at ten of the schools. Institutions used a range of assessment methods including multiple-choice questions, short answer questions, longer structured problems and the analysis of a provided data set. Examination papers devoted to statistics were uncommon; questions usually featured as a section in multi-disciplinary papers.

A comparison of the courses organized by statisticians and those run by dental staff showed that five of the former provided revision classes. In contrast, revision classes did not feature in any of the statistics courses arranged by dental departments. The courses featuring use of the internet were all run by statistics departments.

One of the more substantial courses, at Belfast, involved four hours of lectures with a one-hour tutorial in Year 1 and eight hours of lectures with two hours of tutorials in Year 2. There were no computing sessions as such. Nevertheless, project work was a central aspect of the course; there were two projects to be completed in each of the first two years. These were designed, among other things, to encourage students to gain skills in the use of the statistical packages Minitab and SPSS. In-course assessment involved use of the local intranet, where the course notes and past examination papers could also be found (restricted access). Four one-hour revision classes were available although most students only attended one of these as they covered similar material.

4. DISCUSSION

These findings reveal that, at most establishments, use of the traditional methods of course delivery such as lectures and tutorials is common. The lack of revision classes on courses run by dental staff could cause some concern. In my experience, statistics teachers tend to view the teaching of dental students as arming the students with skills for the interpretation of dental papers and their own analysis of data from laboratory practicals. Some dental staff, on the other hand, prefer an 'on the job' approach to the teaching of statistics, where the data are confronted first and only then are the statistical tools provided for the analysis. There is certainly evidence of these alternative views from the e-mail comments that I received. The merits and problems of these approaches deserve frank discussion between the two sides.

Computer based activities mainly took place in statistics practical sessions using well-known packages. In answer to the question that initiated this investigation, only four courses used specific self-directed computer assisted learning tasks. However, the self-directed seeking out of ad hoc statistical advice for projects may have been underestimated if the time spent with tutors in this way went unrecorded. As far as the internet is concerned, again only around one-third of courses had begun to incorporate such material. Some of the staff indicated that intranet teaching was either in preparation or under active consideration. The development of such material is very time intensive and may require dedicated staff to be recruited for these tasks. However, some of the variation between institutions could well be due to a difference in teaching philosophies, where the development of computer based activities is regarded by some, but not all, as a high priority. It would be interesting to repeat this exercise in three or four years time to see whether these proposed advances have materialized.

Information about dental statistics teaching in other parts of the world is sparse. Harraway and Sharples (2001) give a detailed description of a biostatistics course at the University of Otago, Dunedin, New Zealand that is designed for health sciences students before they commence their professional courses. This course is based around the provision of skills for laboratory practicals, including statistical computing, and the critical appraisal of research papers. Some of these students then proceed to dental school.

The discussion following my conference talk considered the benefits and pitfalls of increasing the proportion of computer-based teaching and the effectiveness of 'on the job' statistical teaching. There was also some debate on the role of statistics staff in the teaching of dental statistics. In the U.K. there is increasing pressure on academic staff to concentrate on their research output at the expense of teaching. The impact of this has not always been negative; at Guy's Dental School (now part of King's College London) an increase in the involvement of clinically trained dental staff as tutors has enabled statistics to be seen as more relevant by students. However, at some dental schools there has been a total transfer of responsibility for dental statistics teaching from statistics to dental staff. Reassuringly, in general the previous organizers remain available to advise those who have taken on this task.

Inter-professional teaching, along the lines developed by Harraway and Sharples (2001) has not as yet received serious consideration in the U.K. Some academics believe strongly that the teaching of statistics should be delivered with the future professional roles of the students in mind, on the basis that this will make courses more relevant and interesting. However, with the constraints on staff teaching time, inter-professional education may need to be examined carefully. The greater efficiency in the use of teaching resources would result in larger student groups but this would be preferable to relinquishing the overall responsibility for teaching statistics altogether.

The alternatives for the future can only be examined meaningfully in the light of findings from carefully conducted research into teaching effectiveness. Informal surveys based on personal contacts, such as the one described here, run the risk of being incomplete and biased. An increase in adequately funded formal collaboration between academic institutions is required.

ACKNOWLEDGEMENTS

REFERENCES

Bland, M. (2000). *An introduction to medical statistics*. 3rd Edition. Oxford: Oxford Medical Publications.

Bulman, J.S. & Osborn, J.F. (1989). *Statistics in dentistry*. London: BDA.

Dunn, G. & Everitt, B. (1995). *Clinical biostatistics*. London: Arnold.

General Dental Council. (1990). *Recommendations concerning the dental curriculum.* London: General Dental Council.

Harraway, J. A. & Sharples, K. J. (2001). A first course in biostatistics for health sciences students. *International Journal of Mathematical Education in Science and Technology 32*, 873-886.

McCloskey, M. M., Blythe, S. & Robertson, C. (1997). *QUERCUS: Statistics for bioscientists*. London: Arnold.

Morris, S., Szuscikiewicz, J. & Preston, M. (1997). *Statistics for the terrified.* Abingdon: Radcliffe.

Smeeton, N. (1996). Open wide: teaching statistics to dental students. *The Statistician 45,* 517-520.

NIGEL SMEETON
Department of Public Health Sciences
King's College London
Guy's, King's and St. Thomas' Hospital Medical School
Fifth Floor, Capital House
42 Weston Street
London SE1 3QD
UK