STATISTICS EDUCATION IN SOUTH AFRICAN MEDICAL TRAINING INSTITUTIONS

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South Africa, a country presently with approximately thirty eight million inhabitants, has seven well-established medical schools. These provide undergraduate and postgraduate degree programmes in dietetics, medicine and surgery, medical sciences, nursing, occupational therapy and physiotherapy, among others. The country also has twelve technical colleges several of which offer degree programmes in medical technology. In the majority of these programmes, a statistics module is offered as a prerequisite for research-oriented topics such as community nutrition, clinical research methods, epidemiology, psychology, etc. In this paper we provide an overview assessment of the statistics service courses offered in this regard across South Africa's medical training institutions mentioned above.

INTRODUCTION

Although statistics education has been a concern of the statistical community for over a century now, it was only following the establishment of the Educational committee within the International Statistical Institute at the end of 1948 that active efforts began to stimulate international research and debates on its nature and needs. A detailed survey of how this enormous challenge had been keenly take up by the committee and its recent successor, the International Association for Statistical Education, appears in Vere-Jones (1995).

As part of the various contributions to the continuing debate, we examine in this paper the statistics education offered to trainees in various health-care professions in South Africa. These include trainees pursuing undergraduate and postgraduate degrees in medicine, dentistry, pharmacy, epidemiology, physiotherapy occupational therapy, dietetics, nursing, and medical technology. We begin with a general outline of the role played by statistics in the activities of health-care professions in modern societies. We then proceed to identify key areas of statistics which we believe should feature prominently in training programmes of any of the above professions. Against this background, we survey the nature of statistics education as presently taught in health sciences in South Africa and identify the strengths and weaknesses.

Throughout the paper, the term "statistics" when used as a collective singular noun or as an adjective qualifying education, refers to the scientific method dealing with the

theory *and* practice of data collection and data analysis; and the same word when used as plural refers to numerical data that exhibit random variation.

ROLE OF STATISTICS IN THE HEALTH-CARE PROFESSION

In health sciences, statistics plays vital roles in two broad areas: health research and health management.

Health Research

Statistics provides a scientific methodology for *acquiring* and *communicating* new knowledge and understanding in most disciplines of study. This perhaps explains why many professionals associate statistics only with research. Research in health-care can be broadly classified into two categories: experimental and observational.

(a) it is experimental if a researcher can deliberately manipulate the biological conditions of subjects in order to assess the effect of intervention. Included in this category are clinical trials and animal laboratory studies;

(b) it is observational if all that the investigator wishes to do is to collect data e.g. from subjects afflicted with a communicable disease with aim of e.g.:

  (i) determining the distribution and extent of the disease in the subjects;

  (ii) identifying the causes of the disease and any interrelations among these causes and the relative magnitudes of their effects;

  (iii) making available these results for the purpose of the treatment/prevention/control of the decease.

As a vehicle for communicating new ideas, statistics is also increasingly finding use in medical journals. It is a common practice nowadays for editors of medical journals to insist on the use of statistical techniques in many of articles the consider for publication. Professionals who read these journals must therefore be at least reasonably familiar with the common statistics vocabulary and methods used to communicate research findings in their areas of competence.

Health Management

Also important but perhaps not as widely appreciated, especially in less developed countries is the role which statistics plays or could play in health management or in the delivery of health-care services. Regular and reliable statistics are of fundamental importance in the planning, administration, monitoring and evaluation of health-care programmes. Yet many health-care managers often pay little attention to the information requirements of their job, only seeing statistics collection as a mere routine exercise demanded of them by higher authorities for accounting purposes.

TEACHING PROGRAMME EMPHASIS

Given the research and management functions mentioned above, it is our view that medical statistics programmes which are offered in tertiary institutions should emphasise the following areas, depending on whether their trainees require a research-oriented programme or a general purpose programme intended to enhance their ability to comprehend published material or their managerial capabilities or both.

General Purpose Programme (GPP)

In this programme, important topics that need good coverage include:

- Data management. Here we mean both manual and computer systems for generating, collecting, recording, and retrieving statistical data;
- Descriptive techniques, which summarise raw data, usually in simple ways, as prelude to their presentation;
- Relative frequency definition of unconditional and conditional probabilities and their respective interpretations as rates (or percentage) and specific rates;
- The concepts of odds and odds ratio;
- Construction of confidence intervals using pivotal statistics.
- Standard parametric and non-parametric hypothesis-confirming techniques.

Research-oriented Programme

- As in general purpose programme;
- Types and defining characteristics of numerical data that commonly arise in health-care research;
- For each data type: beside defining characteristics, further attention should focus

on popular methods of their generation, popular questions of research interest and the different (if any) approaches to dealing with these questions;

Strong emphasis in all aspects should be placed on illustrations which guide trainees as to how they should proceed in practice

STATISTICS EDUCATION IN SOUTH AFRICA'S MEDICAL TRAINING INSTITUTIONS

In South Africa two kinds of institutions offer medical training at undergraduate and postgraduate levels: these are the universities and the technikons (polytechnical colleges).

One third of the country's twenty-one universities offer bachelor and higher degree programmes in health sciences. These include degree programmes in medicine and surgery, occupational therapy, physiotherapy, nursing and dietetics. Also several of the twelve technikons in the country offer degree programmes in community nursing and medical technology. In all of these programmes students are required to take a statistics course.

The objectives of the various statistics courses offered at these institutions may be summarised as follows:

- to teach students basic data management and data analysis skills using common computer software packages e.g. BMDP and SAS;
- to acquaint students with basic descriptive and inferential statistics concepts;
- to enable students to understand the relevance of statistical methods in epidemiological research with particular emphasis on the interpretation and critical appraisal of published studies.

These objectives appear to serve the needs of trainees who require the GPP as we outlined earlier.

In keeping with the above objectives, the course content in all the syllabi we have examined lean very heavily toward the topics outlined under the GPP and very little is addressed in respect of research-oriented methods.

It is, however, commendable that the majority of these institutions have seen it fit to offer their own tuition rather than outsource it, as the former has the advantage of

accommodating programme flexibility, when needed.

CONCLUDING REMARKS

In concluding this short paper, it is to be noted that although this paper was originally intended primarily to be an extensive survey of statistics teaching at South African medical institutions consideration has switched to what *should* be taught in their statistics programmes. The reason for this switch of emphasis is that during our investigation we found that little is being taught in South Africa's medical training institutions to prepare students to avoid the pitfalls of using statistical methods wrongly or of appraising statistically-based studies uncritically. Space limitations, in view of the conference requirements, do not allow me to elaborate on this in detail. However, for anyone interested Alfman (1991), especially chapter 16, gives an excellent review of what we have in mind. Also, for an example of what we regard as good research-oriented programme, see the core programme of the London School of Hygiene and Tropical Medicine (University of London) Medical statistics course.

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