CHAPTER 5

The Training of Statisticians in Jordan

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5.1 INTRODUCTION AND SUMMARY

Training of statisticians and statistical education in Jordan started some twenty years ago. Formal training of statisticians began in 1964 with the establishment of The Statistical Training Centre within The Department of Statistics, a governmental statistical body. The centre offers short and long term training courses for government employees engaged in statistical work. The establishment of the Faculty of Science at the University of Jordan in 1965 marks the beginning of formal statistical education in Jordan. Prior to that, Jordanians interested in statistics received their statistical education abroad, either in neighbouring Arab Universities or in British or American Universities. During the last decade, the Ministry of Education resolved that modern mathematics be introduced progressively in secondary education. This step lead to the introduction of statistics instruction at the secondary school level.

In this chapter, we shall describe the present status of statistical instruction and training in Jordan. The relationship between theory and practice is critically examined. The difficulties encountered in the development of statistical education and training are identified. Finally, some practical recommendations are made to overcome these difficulties and to improve the quality of statistical instruction in Jordan.

5.2 THE EDUCATIONAL SYSTEM IN JORDAN

Proper understanding of statistical teaching and training in Jordan requires a brief description of the educational system at large. General education in Jordan follows a (6–3–3) system, that is, six years of elementary education, three years of preparatory education, and three years of secondary education. The nine years of elementary and preparatory education correspond to what is termed compulsory education. Secondary education may follow one of two programs: academic (two streams: literary, scientific) or professional (5 streams: industrial, commercial, agricultural, nursing, postal). By the end of the final year of secondary education (12th grade), all students sit for the examinations of The Ministry of Education for the General Secondary Education Certificate. The students' performance in these examinations is used as the criterion for admission to higher education.

Higher education may be pursued at either two-year community colleges or universities. Higher education in Jordan follows the credit-hour system. Community College programs lead to a diploma which requires 75 credit-hours. At the university level, a B.Sc degree requires 123–178 credit-hours depending on the area of specialisation. The M.Sc. degree requires 30–36 credit-hours including writing a thesis.

5.3 STATISTICAL EDUCATION AT THE SCHOOL LEVEL

Statistics is introduced for the first time at the third preparatory class (ninth grade). The syllabus consists of elementary descriptive statistics, namely, presentation of data and calculation of measures of central tendency. Besides this an introduction to probability is included in the syllabus. In the three years of secondary education, the syllabus varies from one stream to another. It consists of the following:

a) *Descriptive Statistics*: Organisation and presentation of data, measures of central tendency, measures of dispersion, correlation, and regression.
b) *Probability*: Sample space and events, axioms of probability, conditional probability, independence, Bayes' Theorem, random variables, probability mass function, expectation, binomial distribution and normal distribution.

The emphasis on part (a) or (b) or both depends on the stream in which the student is enrolled. For example, the commercial, the nursing and the literary streams place emphasis on the descriptive statistics, while the scientific stream concentrates on both parts (a) and (b).

The difficulties at this level of Statistical education may be summarized in the following:

i) Shortage of well-trained teachers who have studied Statistics formally at University level
ii) Statistical education at this level is carried out in isolation, that is, it is not related to the real world
iii) Teachers and students are not fully familiar with the symbolism used
iv) Lack of visual aids which are essential for helping students in understanding new concepts and methods
v) Lack of good textbooks in Arabic.

5.4 STATISTICAL EDUCATION IN COMMUNITY COLLEGES

Statistics taught at community colleges may be classified in two levels. The first level is a course of descriptive statistics which is a college requirement for all students. Its syllabus is the same as in 5.3 (a) above, but with more details. The second level is a course required for specialisa-

tion. For example, if the student's field of specialisation is mathematics, he is required to study an introductory course of mathematical statistics, which includes probability as in 5.3 (b) above, some discrete distributions, continuous distributions, sampling distributions, estimation, and hypothesis testing. But if the field of specialisation is commerce or accountancy, the required course consists of: probability, normal distribution, correlation and regression, index numbers, time series, and vital statistics. The aims of these courses are:

a) To familiarise the student with the concepts and basic ideas of statistics which enable him in collecting, organising and analysing data.
b) To help the student observe and understand social and economic phenomena and give him statistical tools to describe, analyse and draw conclusions regarding such phenomena.

Again the difficulties at this level are very much similar to (i) through (v) in section 5.3.

5.5 STATISTICAL EDUCATION AT THE UNIVERSITY LEVEL

5.5.1 *University of Jordan*

Established in 1962, the University of Jordan presently includes thirteen Faculties with a total enrolment of above 11,500 students. Statistical instruction is offered in four Faculties:

i) *Faculty of Science*
Students enrolled in the B.Sc. program in mathematics study several required and elective courses in statistical methods, applied statistics, mathematical statistics, probability, statistical inference, sampling, analysis of variance and experimental design. The department of mathematics also offers a program of study leading to an M.Sc. degree in mathematics. In this program, some students elect to take graduate-level courses in statistics and hence write an M.Sc. thesis on a statistical topic. The mathematics department also offers statistics service courses for students in the Faculty of Agriculture, the Faculty of Engineering and Technology, and Faculties of Medical Sciences.
ii) *Faculty of Economics and Administrative Sciences*
The Department of Economics and Statistics within this faculty offers a program leading to a B.Sc. degree in Economics and Statistics. The statistics courses offered in this program include: descriptive statistics, probability distributions, sampling, applied statistical inference, decision making, multiple regression and analysis of variance.
iii) *Faculty of Education*
Statistics courses offered by the Faculty of Education are designed for students majoring in psychology, sociology or education. These courses

stress statistical methods pertaining to data analysis and decision-making in relevant areas of application.

iv) *Faculty of Arts*

The Department of Population Studies within the Faculty of Arts offers a program of study leading to a minor in population studies. A student electing this minor receives statistical instruction in introductory statistics and statistical methods relevant to demographic analysis. The department has recently introduced a new program leading to a M.Sc. degree in population studies, in which students take advanced courses in demographic analysis and write a thesis which is the result of analysing real-life data related to population studies.

5.5.2 *Yarmouk University*

Established in 1976, Yarmouk University presently includes ten Faculties with a total enrolment of about 14,500 students. The Department of Statistics was established in the academic year 1977/78 offering a few service courses and a program leading to an undergraduate minor in statistics. In 1980/81, the Department began offering three programs of study leading to either a B.Sc. degree in statistics, or a B.Sc. with statistics as a major, or B.Sc. with statistics as a minor. In 1982/83, the Department introduced a graduate program leading to an M.Sc. degree in statistics.

The department offers theoretical and applied courses in statistics and requires its students to study mathematics and computer science courses. The department requirements for a B.Sc. degree in statistics consist of 15 obligatory courses (45 credit-hours) and 3 elective courses (9 credit-hours). These courses include introductory statistics, probability theory, distribution theory, stochastic processes, applied probability, sampling, statistical inference, decision theory, time series, sequential analysis, analysis of variance and experimental design, and multivariate analysis.

For an M.Sc. degree in statistics, the students are required to complete successfully eight graduate courses in statistics, in addition to writing a thesis. The department also offers statistics service courses for students in the Faculty of Commerce and Business Administration, the Faculty of Engineering and the Faculty of Medical Sciences.

In addition to statistics offerings by the Department of Statistics, the Faculty of Education at Yarmouk University offers a few courses in educational statistics emphasising statistical methods used in the analysis and interpretation of educational data.

5.6 STATISTICAL EDUCATION AT THE STATISTICAL TRAINING CENTRE

In 1949, the Department of Statistics was established as a governmental statistical body responsible for the collection and analysis of official statistical data and hence for providing the relevant governmental offices

with information necessary for planning and decision making. In 1964, The Department of Statistics established The Statistical Training Centre which was made basically responsible for training government employees engaged in statistical work. The Centre started by offering short term evening training courses which employees could attend after office hours. In 1966, the centre developed its program into a two-year day program, which government employees could attend while on leave with full pay from their respective ministries. Since 1980, the Centre admitted each year a limited number of employees from the private sector in Jordan and from the public sector in neighbouring Arab Countries. The total number of graduates during the period 1966–1983 is 415, which includes 40 from the private sector in Jordan and 36 from neighbouring Arab Countries.

The two-year training program consists of 72 semester credit hours distributed among four semesters. The statistical content of this program consists of 40 credit hours. During the fourth semester, a student is required to carry out and report a project which is based on analysing the results of some aspects of official statistical surveys or censuses in an area relevant to the student's work. This project carries 8 hours. The remaining 32 hours in statistics fall in the following areas: statistical methods (8 hours), demographic analysis (10 hours), applied statistics (2 hours), statistical analysis (8 hours), sampling and design of experiments (4 hours). The non-statistical 32 hours of the two-year program fall in the following areas: mathematics (8 hours), computer science (8 hours), principles of economics (2 hours), principles of administration (2 hours), census methods (2 hours), national income (2 hours), and English Language (8 hours).

Finally, it should be mentioned that in addition to the two-year training program described above, the Statistical Training Centre offers some specialised short training courses which may last from two to eight weeks. Such courses are either local or regional. Local courses are organised in cooperation with Jordanian establishments for the purpose of refreshing and developing statistical knowledge of their employees. During the period 1967–1982, fourteen such courses were held with an average enrolment of about 25 employees. Regional courses are held in cooperation with Arab or International Statistical Organisations, with participants coming from several Arab Countries. During the period 1981–1983, twelve such courses were held at the Centre with an average enrolment of about 20 participants.

5.7 SOME CONCLUDING REMARKS

At the present stage of development in Jordan, proper awareness of the value of statistics as an effective tool in decision-making is still rather limited, especially on the part of the private sector. A positive change in attitudes towards the usefulness of statistical analysis is expected in the new 1986–1990 five-year development plan. Such change will increase the demand on statistical instruction and training. Hence, institutions in-

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volved in statistical training should be prepared to improve their offerings quantitatively and qualitatively.

Provision of scholarships for post-graduate work at well-established statistical centres will help prepare additional staff to cope with the expected expansion in statistical offerings. Short statistics courses should be initiated at Jordanian Universities to provide school mathematics teachers with information and training which they need for effective teaching of the statistical part of the mathematics curriculum. Finally, the establishment of an exchange program between Jordanian statisticians and their colleagues in international statistical institutions and centres will be of great value in the development of statistical man-power in Jordan.

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CHAPTER 6

The Training of Statisticians in Morocco

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6.1   THE EDUCATION SYSTEM

Primary and Secondary education last 12 years and access to higher education is possible for those who successfully pass the National Examination of the 'Baccalaureat' (proportion 30%). Enrolment at the University is open to 'Bac' holders but this qualification is not enough for entering some institutions for higher learning (Engineering schools or 'Grandes Ecoles'). Indeed a special entering test is required and competition can leave no more than one percent chance of succeeding. The field of statistics is among those which require such entering tests.

At the University level, training lasts 4 years for a B.S degree or 'Ingenieur d'Application' and 2 additional years for an M.S degree or 'Ingénieur d'Etat'. There is a two year program leading to a college degree called 'Adjoint Technique' but holding the baccalaureat is not necessary for this shorter route.

The language of instruction is Arabic at the primary and part of the secondary level (by 1990 the baccalaureat will be in Arabic) but at the University level the teaching is done mainly in French in the scientific and technical branches. There are a few exceptions since statistics is also taught in Arabic in a section parallel to the French one (at the National Institute of Statistics and Applied Economics).

Education is essentially free throughout the education system. There are even scholarships paid to University students. Professional and vocational education is also available at an early stage (at the end of elementary or pre-high schools).

6.2   STATISTICS AT AN ELEMENTARY LEVEL

By the age of 16 or 17, students have had enough algebra and other mathematical tools to be introduced to ideas of probability and statistics. Some high school text-books give statements and formulae that are sometimes a little advanced for a high school student. Generally combinatorics and descriptive statistics are well covered in the classroom at a first level. Probability concepts are the most difficult to become comfortable with at this level.