ENVIRONMENTAL DESIGN

STATISTICAL METHODS IN ENVIRONMENTAL HEALTH (1594)

Supplementary Material
Autumn, 2012

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
Department of Home and Health Sciences

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(Department of Home and Health Sciences)

Course: Statistical Methods in Environmental Health (1594)   Semester: Autumn, 2012
Level: Post-Graduate

CONTENT LIST

This study pack includes the following items:

1. Course Books
2. Course Outline
3. Tutor Guide
4. Assignment 1 & 2
5. Marking Guide
6. Assignment Forms
7. Schedule for submitting the assignment and tutorial meeting

If any of the above mentioned material is missing in your pack, please contact at the following address:

Mailing Officer
Services and Operations Block
Allama Iqbal Open University
H-8 Islamabad

Or

Dr. Nomana Anjum
Chairperson
Program Coordinator
Department of Home and Health Sciences, Block 6,
Allama Iqbal Open University
H-8, Islamabad

COURSE OUTLINES
STATISTICAL METHODS IN ENVIRONMENTAL HEALTH

Reference Book:
Statistical Methods in Environmental Health J.C.G. Pearson and A. Turton

Unit.1. Introduction
- 1.1 The Role of Statistics
- 1.2 The Application of Statistics

Unit.2. Statistical Reasoning and Hypothesis Testing
- 2.1 The Method of Statistical Reasoning
- 2.2 Rejection of hypothesis
- 2.3 Research Design
- 3.4 Testing the Hypothesis

Unit.3. Basic Statistics
- 3.1 Summarizing Data
- 3.2 Scales of Measurement
- 3.3 Techniques for Summarizing Data
- 3.4 Diagrammatic Presentation of Data
- 3.5 Distributions
- 3.6 Standard Deviations in Sample and in pop

Unit.4. Hypothesis Testing
- 4.1 Sampling Variation
- 4.2 Use of Standard Statistic

Unit.5. The Normal Distribution, Probability and Hypothesis Testing
- 5.1 Probability and Area Under Frequency Curves
- 5.2 Probability and the Normal Distribution
- 5.3 Normal Distribution and Hypothesis Testing
- 5.4 Tests Involving Means

Unit.6. Estimation and Confidence Limits
- 6.1 Estimation
- 6.2 Summary
- 6.3 Tests Involving Percentages

Unit.7. Correlation and Regression
- 7.1 Introduction
- 7.2 Regression
- 7.3 Correlation

Unit.8. Non Parametric Statistics
- 8.1 Studies with Paired Observations
- 8.2 Studies Without Pairing of Observations
- 8.3 Correlation
- 8.4 Estimation of Sample Size

Unit.9. Vital Statistics, Sources of Statistical data
- 9.1 Rates
- 9.2 Special Rates
- 9.3 Comparison of Rates

Tutor Guide

Dear tutor,

Students enrolled in M. Sc. Environmental Design, offered through the open distance learning system, belong to a number of professions and have a variety of educational background and experience.

These students have very limited contact with their coursemates and the part time tutors, it is therefore, important to keep in mind that some of the distance-learning students have had no links with education during the past few years after completing their formal education. Therefore they might lack confidence. Secondly, distance-learning students are involved in studying during their spare time, probably after office hours. You are therefore, requested to guide and help the students, while keeping these issues in mind. Some students may need help in developing professional attitudes as well as understanding the facts about creating child friendly care environmental sustainability.

Study Center

The main purpose of establishing the study center for distance learning students is to provide help and guidance for the difficulties faced by the students while studying at home. The study centers have been established in registered local institutions (Regional office Karachi, Hyderabad MUET, Lahore, Rawalpindi & Islamabad Main Campus). During the tutorials it is required to provide guidance to the students to sort out their problems.

Assignments

In the distance learning system, studying the course units has its own importance but assignments and workshops are the major source of link between tutor and the student. Therefore it is important to offer your comments through these assignments. Express your views in such a way that the student is not discouraged, hurt or feels depress after going through your comments.

You are also expected to guide on issues like methods of solving assignments, effective methods of studying and methods to improve study habits and working hard.

It is anticipated that the student will submit their assignment in time according to the prescribed schedule.

You are therefore requested to mark the assignments within 15 days and return these with detailed comments within the scheduled dates.

Marking Guides are provided to you. You are expected to follow the instructions and make full use of these guides while marking the assignments. The students are expected to avoid giving unnecessary details and try to be brief and comprehensive. While marking the assignments the tutor has to assess whether the students have followed the instructions provided to them or not.

Workshop

A two-day workshop will be arranged for the students for each course in their respective study center. You will be intimated before time, as your presence in the workshop is necessary.

During the workshop the experts will deliver lectures focusing on the main areas of the subject.

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Course: Statistical Methods in Environmental Health (1594)
Level: M. Sc. Environmental Design   **Semester: Autumn, 2012**
Total Marks: 100   **Pass Marks: 40**

ASSIGNMENT No. 1
(Units: 1–5)

Q. 1 (a) In a bag 9 red balls, 3 white balls, 4 black balls and 4 green ball. A ball is drawn at random from the bag; what is the probability that the ball is:
    i) Not red   ii) Not blue **(10)**

(b) Draw a pie-diagram and also a simple bar-diagram for the following data. **(10)**

Item	Expenditure in Rs:
Food	190
Clothing	64
Rent	100
Medical Care	46
Other Items	80

Q. 2 (a) What do you know about the scales of measurement? Discuss in detail. **(10)**

(b) Construct a frequency distribution for the below, indicate the class boundaries and class limits clearly and also suggest the suitable diagram. **(10)**

41.78	29.32	31.47	35.35	32.82	39.42
61.65	28.31	44.63	22.78	44.44	48.12
81.71	33.47	50.35	29.19	51.26	50.32
26.84	18.95	48.19	43.72	43.89	47.15
60.20	44.43	41.17	37.50	22.35	29.17

Q. 3 (a) The length of life for an automatic dishwasher is approximately normally distributed with a mean of 3.5 years and a standard deviation of 1.0 years. If this type of dishwasher is guaranteed for 12 months, what fraction of the sales will require replacement? **(10)**

(b) Write down the general format for carrying out a statistical test of hypothesis? **(10)**

Q. 4 (a) Assume that the normal adult pulse rate is distributed normally with mean 70, and standard deviation 8. If a group of 50 people suffering from a certain disease have an average pulse rate of 75, in this significantly different from 70, and if so, is this fact of any diagnostic value? **(10)**

(b) Ten soldiers' visit the rifle range on two consecutive weeks. The first week their scores were 67, 24, 57, 55, 63, 54, 56, 68, 33, 43. The next week their scores, in the same order, were 70, 38, 58, 52, 56, 67, 68, 77, 42, 44 was there a significant improvement? Why is it necessary to know that the scores are in the same order each week? What difference would it have made if this information had not been given? **(10)**

Q. 5 (a) The two samples A and B detailed below were taken from normal populations of standard deviation 2.5. Decide whether the difference of sample means is significant at the 0.05 level of significance. **(10)**

A. 16 18 23 26 19 24 25 23 21 22
B. 20 21 23 25 25 27 24 26 24 28

(b) Eight pots, growing three barley plants each exposed to a high tension discharge while nine similar posts were enclosed in an earthed wire cage. The number of tillers (shoots) in each pot were as follows: **(10)**

Caged: 17, 27, 18, 25, 27, 29, 27, 17
Electrified: 16, 16, 20, 16, 21, 17, 15, 20

Discuss whether electrification exercises have any real effect on tillering.

ASSIGNMENT No. 2
(Units: 6–9)

Total Marks: 100   **Pass Marks: 40**

Q. 1 (a) The scores of the groups A and B in the same test were. **(10)**

A	16	21	24	20	16	22	29	6	-	-
B	19	22	27	31	25	21	27	38	22	33

Estimate the mean score for each group giving 95% confidence limits for the estimates. Can group A reasonably be supposed to come from a population with mean 24? Can A and B be supposed to came from the same population? Give 95% confidence limits for the difference between the populations represented by sample A and B.

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(b) In a certain experiment to compare two types of sheep food A and B, the following results of increase in weights were observed. **(10)**

Sheep No	1	2	3	4	5	6	7	8
Food A	49	53	51	52	47	50	52	53
Food B	52	55	52	53	50	54	54	53

i) Assuming that the two samples of sheep are independent, can we conclude that food B is better than food A?

ii) Examine the case when the same set of eight sheep were used in both the foods.

Q. 2 (a) A random sample of 65 bolts from a shipment had a mean diameter of 0.51 inches and a standard deviation of 0.16 inches. Construct a 99% one sided confidence interval for the maximum mean diameter of the population. **(10)**

(b) The manufacturer of a patent medicine claimed that it was 90% effective in relieving an allergy for a period of 8 hours. In a sample of 200 people who had the allergy, the medicine provided relief for 160 people determine whether the manufacturers claim is legitimate at the $\alpha = 0.01$ level. **(10)**

Q. 3 (a) A certain drug is claimed to be effective in curing colds. In an experiment on 164 people with colds, half of them were given the drag and half of them were given sugar pills. The patient's reactions to the treatment are recorded in the following table. Test the hypothesis that the drug is not better than sugar pills for curing colds, let $\alpha = 0.05$ **(10)**

Category	Helped	Harmed	No. affect
Drug	52	10	20
Sugar	44	12	26

(b) In a study to determine whether or not the proportions of defectives produced by workers was the same for the day, evening or night shift worked, the following data were collected. **(10)**

Shift	Day	Evening	Night
Defective	45	55	70
Non Defective	905	890	870

Test the hypothesis at the 0.025 level of significance, that the proportion of defectives is the same for all three shifts.

Q. 4 (a) Find the product moment coefficient of correlation between traffic density and accident rate from the following information available and interpret the coefficient. **(10)**

Traffic Density	30	35	40	45	50	60	70	80	90
Accident Rate	2	4	5	5	8	15	24	30	32

(b)   In an experiment to measure the stiffness of a spring, the length of the spring
      under different loads was measured as follows: **(10)**

Loads (lb)	3	5	6	9	10	12	15	20	22	28
Length (in)	10	12	15	18	20	22	27	30	32	37

Find the regression equation appropriate for predicting.
i)   The length, given the weight on the spring.
ii)   The weight, given the length of the spring.

Q. 5 (a)   Two varieties of tomato were experimented with concerning their fruit-
            producing abilities, measured in pounds. The following data were obtained. **(10)**

Location	1	2	3	4	5	6	7	8	9	10
Variety A	3.03	3.10	2.35	3.86	3.91	1.72	2.65	2.30	2.70	3.60
Variety B	2.28	3.63	2.17	3.56	3.73	1.85	1.48	1.86	2.76	2.68

Apply (i) the sign test (ii) the Wilcoxon singed rank test at the 0.05 level of
significance, to test the hypothesis that there is no difference in fruit-producing
abilities of the two varieties.

(b)   A colleague hopes that a new rodent treatment will increase the total
      eradication rate for treated buildings from 40% to 60%. He intends to carry
      out a study on the 100 buildings he expects to have to treat during the coming
      year. What advice would you give him?   **(10)**

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