ENVIRONMENTAL DESIGN

Statistical Methods in Environmental Health (1594)

Supplementary Material

Allama Iqbal Open University
Autumn, 2013

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

(Department of Home and Health Sciences)

Course: Statistical Methods in Environmental Health (1594)

Semester: Autumn, 2013 **Level: Post-Graduate**

CONTENT LIST

The study pack for "Environmental Impact Assessment" includes following items:

1. Course Book
2. Course Outline (Units 1–9)
3. Study Guide
4. Assignments (1 & 2)
5. Assignments Forms
6. Schedule for Submitting the Assignments and Tutorial Meetings

Note: 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
Programme Coordinator/ Chairperson
Environmental Design Programme
Allama Iqbal Open University, Block 6,

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
- 2.4 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 population

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

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 distance learning system, belong to the built environmental of profession and have a variety of educational back grounds and experience like engineering, architecture and B.Tech. etc .

These students have very limited contact with their course mates and 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 local institutions (Regional Office, Karachi, Lahore, Islamabad main Campus). During the tutorial meetings, 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 discourage, 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 with in 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 three-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 main areas of the subject.

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

WARNING

1. **PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.**
2. **SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN "AIOU PLAGIARISM POLICY".**

Course: Statistical Methods in Environmental Health (1594) Semester: Autumn 2013
Level: Post- graduate Total Marks: 100
Credit: 3(3+0) Pass Marks: 40

ASSIGNMENT No. 1
(Units: 1 –5)
Note: 10 Marks for class attendance & participation.

Q#1 (a) A hand of cards at bridge contains: **10**

Heart:	K				
Spades:	A	2	7	K	
Diamonds:	Q	j	10		
Clubs:	A	K	8	2	4

If a player plays one card at random, what is the probability that the card played is:

i. A club
ii. A heart
iii. Not a court card (J,Q, K)

(b) if two fair dice are thrown, what is the probability of getting: **10**

i. A double six?
ii. A sum of 8 or more dots?

Q#2 (a) Graph the following data showing the areas in millions of square miles of the oceans of the world, using **10**

i. A bar chart
ii. A pie chart

Ocean	Pacific	Atlantic	Indian	Antarctic	Arctic
Area	70.8	41.2	28.5	7.6	4.8

(b) In a savings group, there are 400 members and the members of savings certificates held by them are shown in the following table. **10**

No. of certificate held	No. of members
1-50	10
51-100	15
101-150	30
151-200	40
201-250	100
251-300	85
301-350	50
351-400	42
401-450	28

Construct a histogram of the distribution of saving certificates.

Q#3 **(a)** Describe the general procedure for testing a hypothesis about a population parameter? **10**

(b) A random sample of 6 cows of breed A had daily yield in lbs. as 16, 15, 18, 17, 19 and 17. Another random sample of 8 cows of bread B had daily yields in lbs, as 18, 22, 21, 23, 19, 20, 24 and 21. Test if breed B is better than breed A at $\alpha = 0.05$. **10**

Q#4 **(a)** The time taken by a milkman to deliver milk to the GOR Estate is normally distributed with mean 12 minutes and standard deviation 2 minutes. He delivers milk everyday. Estimate the number of days during the year when we takes **10**

i. Longer than 17 minutes
ii. Less than 10 minutes
iii. Between 9 and 13 minutes

(b) 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, is this significantly different from 70, and if so, is this fact of any diagnostic value? **10**

Q#5 **(a)** A random sample of 80 light bulbs manufactured by company A had an average life time of 1258 hours with the standard deviation of 94 hours, while a random sample of 60 light bulbs manufactured by company B had an average lifetime of 1029 hours with a standard deviation of 68 hours. Because of the high cost of bulbs from company A. We are inclined to buy from company B unless the bulbs from company A will last over 200 hours longer on the average than those from company B. Run a test using **10**

$\alpha = 0.01$ to determine from whom we should buy our bulbs.

(b) The ages in months at which samples of 8 boys and 6 girls learned to walk were as follows: **10**

Boys	14	13	16	13	13	15	17	11
Girls	11	14	12	12	11	15		

Is there evidence to suggest that girls learn to walk at a significantly earlier age than boys? What factors should be considered in choosing these samples?

Assignment-II
(Unit: 6-10)

Q#1 **(a)** In July 1969, the first man walked on the moon. Armstrong Aldren and Collins brought back 64 rocks samples. The rocks had an average earth weight of 172 ounces. The sample variance was 299(ounces)^2. The moon rock population is known, however, to follow a distribution which is not normal. Find a 99% confidence interval estimate for the mean weight of rocks on the lunar surface. **10**

(b) A form of intelligence test was given to random samples of soldiers and sailors in a certain country. The following results were recorded. **10**

	Number in Samples	Mean Score	Standard Deviation
Soldiers	20	12.78	2.43
Sailors	16	12.99	2.48

Assume the population variance are identical and the population of scores to be normal. What conclusion should be drawn?

Q#2 **(a)** During a dental health campaign Dundee children were examined without warning and their oral hygiene was graded as: good, fair+, fair- or bad. The schools which they attended were classified by 'social grades' as bellow average, average and above average. Do the results in the table below provide evidence of an association between the state of oral hygiene in children and social grade of the school that they attended? **10**

Social grade of School	Oral hygiene			
	Good	Fair+	Fair-	Bad
Below average	62	103	57	11
Average	50	36	26	7
Above average	80	69	18	2

(b) A random sample of 250 men and 250 women were polled as to their desire concerning the ownership of television sets. The following data resulted. **10**

Classification	Men	Women
Want television	80	120
Don't want television	170	130

Test the hypothesis that desire to own a television set in independent of sex at the 0.05 level of significance?

Q#3 **(a)** 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 (Inc)	10	12	15	18	20	22	27	30	32	34

Find the regression equations appropriate for predicting

i. The length, given the weight on spring.
ii. The weight, given the length of the spring

(b) Calculate the correlation coefficient for the following data. **10**

$n = 25, \quad \sum x=3604, \quad \sum x^2=532832$

$\sum y =3676, \quad \sum y^2=555618, \quad \sum xy=5413120$

Q#4 **(a)** Explain in detail the situations, where the non-parametric tests are applicable and also describe their testing procedure in detail? **10**

(b) Ten young recruits were put through a strenuous physical training program by the army. Their weights were recorded before and after the training with the following results. **10**

Recruit	1	2	3	4	5	6	7	8	9	10
Weight Before	125	195	160	171	140	201	170	176	195	139
Weight after	136	201	158	184	145	195	175	190	190	145

Use the Wilcox on signed-rank statistic to test the hypothesis that the program affects average weights of recruits. Let $\alpha = 0.05$.

Q#5 **(a)** For a certain disease the mortality rate in five years after conventional therapy in 45%. A clinical trail of a new therapy is to be carried out, and it is considered that the new therapy would be useful if the mortality fell to 35%. How many patients are required for the trial? If the researchers only have resources to study 100 patients per group, what difference in mortality can be reasonably sure of detecting? **10**

(b) What are vital statistics? Describe the system for collection of vital statistics in Pakistan. Discuss its strong and weak points and suggest remedies. **10**