Indira Gandhi
National Open University
School of Sciences

# MST-002
# DESCRIPTIVE STATISTICS

Block

4

## THEORY OF ATTRIBUTES

## Curriculum and Course Design Committee

Prof. K. R. Srivathasan
Pro-Vice Chancellor
IGNOU, New Delhi

Prof. Parvin Sinclair
Pro-Vice Chancellor
IGNOU, New Delhi

Prof. Geeta Kaicker
Director, School of Sciences
IGNOU, New Delhi

Prof. Jagdish Prasad
Department of Statistics
University of Rajasthan, Jaipur

Prof. R. M. Pandey
Department of Bio-Statistics
All India Institute of Medical Sciences
New Delhi

Prof. Rahul Roy
Math. and Stat. Unit
Indian Statistical Institute, New Delhi

Dr. Diwakar Shukla
Department of Mathematics and Statistics
Dr. Hari Singh Gaur University, Sagar

Prof. Rakesh Srivastava
Department of Statistics
M. S. University of Baroda, Vadodara

Prof. G. N. Singh
Department of Applied Mathematics
I. S. M. Dhanbad

Dr. Gulshan Lal Taneja
Department of Mathematics
M. D. University, Rohtak

**Faculty members of School of Sciences, IGNOU**

**Statistics**
Dr. Neha Garg
Dr. Nitin Gupta
Mr. Rajesh Kaliraman
Dr. Manish Trivedi

**Mathematics**
Dr. Deepika Garg
Prof. Poornima Mital
Prof. Sujatha Varma
Dr. S. Venkataraman

## Block Preparation Team

**Content Editor**
Dr. Soubhik Chakraborty
Department of Applied Mathematics
Birla Institute of Technology Mesra, Ranchi

**Language Editor**
Dr. Nandini Sahu
School of Humanities, IGNOU

**Secretarial Support**
Mr. Deepak Singh

**Course Writer**
Dr. Meenakshi Srivastava
Institute of Social Sciences
Dr. B. R. Ambedkar University, Agra

**Formatted By**
Dr. Manish Trivedi
Mr. Prabhat Kumar Sangal
School of Sciences, IGNOU

**Programme and Course Coordinator:** Dr. Manish Trivedi

## Block Production

Mr. Y. N. Sharma, SO (P.)
School of Sciences, IGNOU

**Acknowledgement:** We gratefully acknowledge to Prof. Geeta Kaicker Director, School of Sciences for her great support and guidance.

December, 2011



ISBN-978-81-266-



Further information on the Indira Gandhi National Open University may be obtained from University's Office at Maidan Garhi, New Delhi-110068 or visit University's website http://www.ignou.ac.in

Printed and published on behalf of the Indira Gandhi National Open University, New Delhi by the Director, School of Sciences.

Laser Typeset by : Tessa Media & Computers, C-206, A.F.E.-II, Okhla, New Delhi

Printed at :

# THEORY OF ATTRIBUTES

You have studied quantitative techniques in Block 1. The purpose of those techniques is to make you aware of the measures of Central Tendency, measures of Dispersion and measures of Skewness and Kurtosis which describe a set of quantitative data. The concept of statistical relationship between two variables is discussed in Block 2. The concepts of regression analysis are elaborated in Block 3.

The statistical methods discussed in these three blocks are based on the data whose actual magnitude can be measured. However, in some situations, data might be such that it may not be possible to measure their actual magnitude. One can only study the presence or absence of a particular quality or attribute. The statistical methodology for the analysis of such type of data will be slightly different. The present block is mainly concerned with the qualitative characteristics and analysis of qualitative data. Such type of data arises when a sample from some population is classified with respect to two or more qualitative variables. We may then "count" the number of individuals in each category.

This block contains four units. In Unit 13, we shall commence by defining various terms, introducing nomenclature and describing how such kind of data arise. The consistency of the data, independence of the attributes and the condition of independence are discussed in Unit 14. Unit 15 deals with the association of attributes, types of association and the methods to measure the association of attributes. Unit 16 is primarily concerned with the concept of the contingency tables and general notations for higher dimensional contingency tables. This unit also introduces Chi-Square Test for investigating the degree of association between two qualitative variables.

## Suggested Readings:


1. Agrawal, B. L.; Basic Statistics, New Age International (P) Ltd. Publishers, New Delhi, 3rd edn., 1996
2. Agrawal, B. L.; Programmed Statistics, New Age International (P) Ltd. Publishers, New Delhi, 2nd edn., 2003
3. Ansari, M. A., Gupta, O. P. and Chaudhari S. S.; Applied Statistics, Kedar Nath Ram Nath & Co., Meerut 1979.
4. Arora, S. and Bansi Lal; New Mathematical Statistics, Satya Prakashan, New Delhi, 1989.
5. Chaturvedi, J. C.; Elementary Statistics, Prakash Brothers, Agra, 1963
6. Elhance, D. N.; Fundamentals of Statistics, Kitab Mahal, Allahabad, 1987.
7. Everitt, B. S.; The Analysis of Contingency Tables, Chapman and Hall Ltd. London, 1st edn. 1977.
8. Garg, N. L.; Practical Problems in Statistics, Ramesh Book Depot, Jaipur 1978.
9. Goodman, L. A. and Kruskal,W. H.; Measures of Association for Cross Classification, Springer – Verlag, Berlin, 1979.
10. Gupta, S. C. and Kapoor, V. K.; Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11th edn. 2002.

## Notations and Symbols

| | | |
|---|---|---|
| A | : | Presence of attribute A |
| B | : | Presence of attribute B |
| C | : | Presence of attribute C |
| AB | : | Presence of attributes A & B |
| ABC | : | Presence of attributes A, B & C |
| $\alpha$ | : | Absence of attribute A |
| $\beta$ | : | Absence of attribute B |
| $\gamma$ | : | Absence of attribute C |
| (A) | : | Positive class frequency of attribute A |
| $(\alpha)$ | : | Negative class frequency of attribute A |
| $(A\alpha)$ | : | Contrary class frequency of attributes A and $\alpha$ |
| $(AB)$ | : | Positive class frequency of attributes A and B |
| $(AB)_0$ | : | Association of attributes A and B |
| Q | : | Yule's coefficient of association |
| $\gamma$ | : | Coefficient of colligation |
| $(A_i)$ | : | Number of persons possessing the attribute $A_i$ |
| $\sum A_i = N$ | : | Total frequency |
| $\chi^2$ | : | Chi-square |
| $\phi^2$ | : | Mean square contingency |
| C | : | Karl Pearson's coefficient of mean square contingency |