Boston University Study Abroad
London

Boston University Study Abroad London
Introduction to Elementary Statistics
CAS MA 113 (Elective A)
Fall 2014

Instructor Information
A. Name Caroline Gautier

Course Objectives
Topics include methods of summarizing data, probability, statistical inference and regression. After completion of this course, the student will be able to demonstrate statistical literacy and statistical thinking by being able to:

1. describe techniques used to collect data to represent a given population
2. classify data by type, organize data into tables, and summarize data graphically
3. identify the common shapes associated with data distributions
4. compute and apply descriptive measures to characterize data
5. quantify the variability that occurs naturally in data sets
6. explore relationships between two variables with scatter diagrams, the correlation coefficient, and, when justified, linear regression analysis
7. use simulation to create a sampling distribution and characterize the shape of the sampling distribution
8. determine probabilities of events associated with a normal distribution
9. construct confidence intervals to estimate means and proportions
10. conduct and interpret a test of hypothesis for means and proportions

Course Overview
Every day we are inundated with information. Information comes from newspaper, magazines, books, television newscasts and the Internet. Statistics may be the most important branch of mathematics for the citizens in today’s society and it is important that all of us be confident consumers of statistics in both our professional and personal lives. Our goal in this course is to develop the ability to think critically about numerical information and to use it as a consumer to come to useful decisions and conclusions.
While good algebra skills are helpful, there is no prerequisite for this course.
**Course Methodology**

The course incorporates collaborative learning, oral and written reports and technology. You will need a scientific calculator, please bring one to each class. Some basic skills on Excel would be useful. Field trips and speakers will give you an idea of how statistics are used or has been used and influence decision-making.

**Course Assessment**

There will be two midterms exams and one final exam for the course. The quizzes will be held during lecture. The final will be cumulative. By pair or individually, students will have to use the new statistical abilities on a project and will have to present their results to the class.

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<thead>
<tr>
<th>Grading Criteria</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Quizzes</td>
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<td>Project and Presentation</td>
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<tr>
<td>Final Exam</td>
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<tr>
<td>Attendance &amp; Participation</td>
<td>10%</td>
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**Grading**

Please refer to the Academic Handbook for detailed grading criteria and policies on plagiarism: [http://www.bu.edu/london/current-semester](http://www.bu.edu/london/current-semester)

* Final Grades are subject to deductions by the Academic Affairs Office due to unauthorised absences.

**Attendance**

**Classes**

All Boston University Study Abroad London Programme students are expected to attend each and every class session, tutorial, and field trip in order to fulfil the required course contact hours and receive course credit. Any student that has been absent from two class sessions (whether authorised or unauthorised) will need to meet with the Directors to discuss their continued participation on the programme.

**Authorised Absence:**

Students who expect to be absent from any class should notify a member of Academic Affairs and complete an Authorized Absence Approval Form 10 working days in advance of the class date (except in the case of absence due to illness, for which students should submit the Authorised Absence Approval Form with the required doctor’s note as soon as possible). **Please note: Submitting an Authorised Absence Approval Form does not guarantee an authorised absence**

Students may apply for an authorised absence only under the following circumstances:

- Illness, supported by a local London doctor’s note (submitted with Authorised Absence Approval Form).
- Important placement event that clashes with a class (verified by internship supervisor)
- Special circumstances which have been approved by the Directors (see note below).

**The Directors will only in the most extreme cases allow students to leave the programme early or for a significant break.**
Unauthorised Absence:
Any student to miss a class due to an unauthorised absence will receive a 4% grade penalty to their final grade for the course whose class was missed. This grade penalty will be applied by the Academic Affairs office to the final grade at the end of the course. As stated above, any student that has missed two classes will need to meet with the Directors to discuss their participation on the programme as excessive absences may result in a ‘Fail’ in the class and therefore expulsion from the programme.

Lateness
Students arriving more than 15 minutes after the posted class start time will be marked as late. Any student with irregular class attendance (more than two late arrivals to class) will be required to meet with the Assistant Director of Academic Affairs and if the lateness continues, may have his/her final grade penalised.

Course Chronology

Session 1 - Monday 8th September: Introduction to Statistics, Distribution
- Population parameters (mean, weighted mean, median, mode, standard deviation, variance)
- Graphical methods (histogram, pie chart, scatter points, bar chart, stem and leaf plot)
- Case study London demography
Reading: Read chapter 1, chapter 2: 2.1, 2.2.3, 2.2.4
Reading: Read chapter 8, How to tell the liars from the Statisticians, by R. Hooke
HW: chapter 2: 2, 4e, 7, 16, 21ac, 22, 25

Session 2 – Tuesday 9th September: Location and quartiles
- Definition of quartile, percentile
- Outliers
- Box-whisker plot
- How to draw a box-whisker on Excel
- Case study London income versus Boston income
Reading: Read chapter 2: 2.2, 2.3
Reading: Read Introduction “the Roseto Mystery” from Outliers, the story of success by Malcolm Gladwell
HW: chapter 2: 1, 3, 5, 6, 8, 9, 13, 15, 18, 24

Session 3 – Monday 15th September: Quiz 1 - Probability, Binomial distribution
- Basic probabilities, addition rule, independent events, conditional probabilities, mutually exclusive events
- Tree diagram, two-way table
- Probability distribution, mean, variance
- Binomial distribution
Reading: Read chapter 3: 3.1, 3.2, 3.3, 3.4
HW: chapter 3: 1, 2, 3, 4, 5, 6, 7, 10

Session 4 – Tuesday 16th September: Field trip – Museum of transportation of London
HW: Finish worksheet on binomial distribution
Session 5 - Monday 22nd September: Normal distribution and central limit theorem
- Standard Normal distribution
- Normal probabilities
- Normal/binominal distribution
- Z-score
- Central limit theorem

Reading: Read chapter 3: 3.5, 3.6, chapter 4: 4.1, 4.2
HW: chapter 3: 24, 26, 29, 32, chapter 4: 1, 2

Session 6 – Tuesday 23rd September: Quiz 2 - Correlation and Regression
- Correlation analysis, correlation coefficient
- Simple linear regression – least square method
- How to use Excel for linear regression (Introduction to SPSS)
- Case study: smoking and cancers

Reading: Read chapter 10: 10.1.1, 10.2 (skip SAS examples)
Reading: Read chapter 55, How to tell liars from Statistician by R. Hooke
HW: chapter 10: 2

*Contingency Class Date: Friday 26th September. Students are obliged to keep this date free to attend class should any class dates need to be rescheduled.

Session 7 – Monday 29th September:
Guest speaker: TBC
Confidence intervals
- Confidence interval for the mean
- Confidence interval for the proportion
- Simulation on Excel

Reading: Chapter 5: 5.1.1, 5.1.2, chapter 7: 7.1 (up to page 296 included)
HW: Finish worksheet on confidence intervals

Session 8 – Tuesday 30th September: Hypothesis tests
- What is a hypothesis test?
- Hypothesis test for the mean
- Hypothesis test for the proportion
- Hypothesis test for the correlation coefficient

Reading: Chapter 5: 5.2, 5.3, chapter 7: 7.1, chapter 10: 10.1.2
HW: Finish worksheet on Hypothesis tests

Session 9 – Friday 3rd October
- Student presentations of their project
- Review
HW: Final exam from last term

FINAL EXAM Tuesday 7th October. Exam times and locations will be posted on the BU London website and in Student Newsletter two weeks before exam dates.

Please Note: Schedules and topics are subject to change, in which case announcements will be made in class as appropriate.
Readings

**Required reading** is noted above in the Course Chronology. It is essential that all students read and reflect upon the relevant reading **before** each class. Students will be able to purchase the required textbooks at the start of term book sale. All books listed below are available through the BU Study Abroad London Library.

*Introductory Applied Biostatistics* by Ralph B. D’Agostino, Sr., Lisa M. Sullivan, Alexa S. Beiser

**Supplementary and Secondary Reading:**
- *How to tell liars from statisticians* by Robert Hook
- *Outliers, the story of success* by Malcolm Gladwell

Additional readings and resources are posted on Blackboard: [https://lms.bu.edu](https://lms.bu.edu)

Current news articles will be given out in class.

**Terms & Conditions:** I expect students to be active and engaged participants. Students have to take all exams, and complete all coursework on time.