

**eHealth 705
Statistics for eHealth
Winter 2014 Course Outline**

**MSc eHealth Program
McMaster University**

COURSE OBJECTIVE

This course covers basic statistical concepts and techniques as they apply to the analysis and presentation of data in eHealth practice. Students will learn and apply concepts and techniques to typical problems that arise in eHealth studies, and develop an awareness and understanding of published studies in eHealth-related journals.

INSTRUCTOR AND CONTACT INFORMATION

Monday 2:30pm – 5:20pm
Dr. Ken Deal
 Instructor
 deal@mcmaster.ca
 Office: DSB 204
 Office Hours: before class
 Tel: (905) 525-9140 x23971

Student Name(s)
TA Assistance
 MACID@mcmaster.ca

Office:
 Tel: (905) 525-9140
 Ext. YYYYYY

Class Location: MUMC 1A3

Course Website: <http://avenue.mcmaster.ca>

COURSE ELEMENTS

Avenue:	Yes	Leadership:	Yes	IT skills:	Yes	Global view:	Yes
Participation:	Yes	Ethics:	Yes	Numeracy:	Yes	Written skills:	Yes
Evidence-based:	Yes	Innovation:	Yes	Group work:	Yes	Oral skills:	Yes
Experiential:	Yes	Guest speaker(s):	1-2	Final Exam:	No		

COURSE DESCRIPTION

This course covers basic statistical concepts and techniques as they apply to the analysis and presentation of data in eHealth practice. Extensive use is made of the statistical software packages R, Deducer and SPSS. The course includes research design, data collection, data cleaning, data visualization, descriptive statistics, probability distributions, null hypothesis statistical testing (z-tests, t-tests, and non-parametric methods), statistical inference, confidence intervals, bootstrapping, power analysis, ANOVA, contingency tables, simple and multiple regression and correlation, logistic regression and survival analysis. Students will analyze data gathered from previous statistical studies in eHealth and will review examples drawn from published studies relating to eHealth and health in journals such as the Journal of Medical Internet Research (JMIR) and the Journal of the American Medical Informatics Association (JAMIA).

LEARNING OUTCOMES

Upon completion of this course, students will be able to complete the following key tasks:

- Review proposals relating to the collection and analysis of data;
- Detail implementation plans for modeling and analyzing specific data sets.
- Decide on appropriate statistical techniques (e.g. parametric or non-parametric) for analyzing data;
- Define suitable models for data analysis (e.g. linear regression or ANOVA);
- Review and clean data sets before analyzing the data they contain;
- Determine whether statistical estimates are significant or not;
- Write reports that provide suitable results that support decision makers in making appropriate decisions; and
- Find suitable published papers and review their findings critically, and make suggestions for related studies in specific environments.

REQUIRED COURSE MATERIALS AND READINGS

Avenue registration for course content, readings and case materials
<http://avenue.mcmaster.ca>

Statistics for the Health Sciences, Dancey, Reidy, and Rowe (Sage) 2012
Purchase a copy at the bookstore

R software, RStudio, Deducer, SPSS Software. R, RStudio and Deducer are open source and free. SPSS will be accessible through the university Citrix network.

Deal, Ken (2009). *A Guide to PASW (SPSS) Statistics 18.0*. [Available free for reading from <http://www.chuckchakrapani.com/StepByStep/Order.asp>. The book can be purchased for printing at \$4.95 for the complete book.]

OPTIONAL COURSE MATERIALS AND READINGS

Essex-Sorlie D. <i>Medical Biostatistics & Epidemiology</i> , London: Prentice-Hall International, 1995.	
Machin D, Campbell M, Walters S. <i>Medical Statistics: A textbook for the health sciences</i> . 4 th edition. West Sussex, England: John Wiley & Sons Ltd. 2007.	
Lock x 5. <i>Statistics: Unlocking the power of data</i> . Hoboken NJ: John Wiley & Sons, Inc. 2013.	
Crawley M. <i>The R Book</i> . West Sussex, England: John Wiley & Sons Ltd. 2008.	

EVALUATION

Learning in this course results primarily from in-class discussion and participation in the analysis of statistical problems, with data provided. The balance of the learning results from lectures on statistical methodologies, relevant readings from the literature on statistical applications in eHealth, and working in teams to analyze and present findings from data sets. The individual term project will be comprised of analysis and write-up of the analysis of a data set. The team term project will be similar. Final grades will be calculated as follows.

Components and Weights

Assignments 13 @ 3%		39%
Midterm		20%
Individual term project	Written report	20%
Presentation	Team Exercise (group)	5%
Written Report	Team Exercise (group)	16%
Total		100%

NOTE: The use of a McMaster standard calculator is allowed during examinations in this course. See McMaster calculator policy at the following URL:

<http://www.mcmaster.ca/policy/Students-AcademicStudies/examinationindex.html>

Grade Conversion

At the end of the course your overall percentage grade will be converted to your letter grade in accordance with the following conversion scheme.

LETTER GRADE	PERCENT
A+	90 - 100
A	85 - 89
A-	80 - 84
B+	77 - 79
B	74 - 76
B-	70 - 73
F	00 - 69

Communication and Feedback

Students that are uncomfortable in directly approaching an instructor regarding a course concern may send a confidential and anonymous email to the respective Area Chair or Associate Dean:

<http://www.degroote.mcmaster.ca/curr/emailchairs.aspx>

Students who wish to correspond with instructors or TAs directly via email must send messages that originate from their official McMaster University email account. This protects the confidentiality and sensitivity of information as well as confirms the identity of the student. Emails regarding course issues should NOT be sent to the Administrative Assistant.

Instructors are encouraged to conduct an informal course review with students by Week #4 to allow time for modifications in curriculum delivery. Instructors should provide evaluation feedback for at least 10% of the final grade to students prior to Week #8 in the term.

ACADEMIC DISHONESTY

It is the student's responsibility to understand what constitutes academic dishonesty. Please refer to the University Senate Academic Integrity Policy at the following URL:

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>

This policy describes the responsibilities, procedures, and guidelines for students and faculty should a case of academic dishonesty arise. Academic dishonesty is defined as to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. Please refer to the policy for a list of examples. The policy also provides faculty with procedures to follow in cases of academic dishonesty as well as general guidelines for penalties. For further information related to the policy, please refer to the Office of Academic Integrity at:

<http://www.mcmaster.ca/academicintegrity>

In this course we will be using Turnitin.com which is a plagiarism detection service. Students will be expected to submit their work electronically to Turnitin.com so that it can be checked against the internet, published works and Turnitin's database for similar or identical work. Turnitin also has the function of being able to review and compared statistical analyses across student papers. If a student refuses to submit his or her work to Turnitin.com, he or she cannot be compelled to do so and should not be penalized. Instructors are advised to accept a hard copy of the assignment and grade it as per normal methods. The assignment can be subjected to a Google search or some other kind of search engine if the instructor wishes. To see guidelines for the use of Turnitin.com, please go to:

<http://www.mcmaster.ca/academicintegrity/turnitin/students/index.html>

MISSED ACADEMIC WORK

Missed Mid-Term Examinations / Tests / Class Participation

Where students miss a regularly scheduled mid-term or class participation for legitimate reasons as determined by the eHealth Program Director, the weight for that test/participation will be distributed across other evaluative components of the course at the discretion of the instructor. Documentation explaining such an absence must be provided to the eHealth Director within five (5) working days upon returning to school.

Students unable to write a mid-term at the posted exam time due to the following reasons: religious; work-related (for part-time students only); representing university at an academic or varsity athletic event; conflicts between two overlapping scheduled mid-term exams; or other extenuating circumstances, have the option of applying for special exam arrangements. Such requests must be made to the eHealth Program Administrator at least ten (10) working days before the scheduled exam along with acceptable documentation. Instructors cannot themselves allow students to unofficially write make-up exams/tests.

If a mid-term exam is missed without a valid reason, students will receive a grade of zero (0) for that component.

Missed Final Examinations

A student who misses a final examination without good reason will receive a mark of 0 on the examination.

All applications for deferred and special examination arrangements must be made to the eHealth Program Administrator. Failure to meet the stated deadlines may result in the denial of these arrangements. Deferred examination privileges, if granted, must be satisfied during the

examination period at the end of the following term. There will be one common sitting for all deferred exams.

Failure to write an approved deferred examination at the pre-scheduled time will result in a failure for that examination, except in the case of exceptional circumstances where documentation has been provided and approved. Upon approval, no credit will be given for the course, and the notation N.C. (no credit) will be placed on the student's transcript. Students receiving no credit for a required course must repeat the course. Optional or elective courses for which no credit is given may be repeated or replaced with another course of equal credit value.

Requests for a second deferral or rescheduling of a deferred examination will not be considered.

A request for a deferred examination privilege must be made in writing to the eHealth Program Administrator within five business days of the missed examination.

Special examination arrangements may be made for students unable to write at the posted exam time due to compelling reasons (for example religious, or for part-time students only, work-related reasons):

- Students who have religious obligations which make it impossible to write examinations at the times posted are required to produce a letter from their religious leader stating that they are unable to be present owing to a religious obligation.
- Part-time students who have business commitments which make it impossible to write examinations at the times posted are required to produce a letter on company letterhead from the student's immediate supervisor stating that they are unable to be present owing to a specific job commitment.

In such cases, applications must be made in writing to the eHealth Program Administrator at least ten business days before the scheduled examination date and acceptable documentation must be supplied.

If a student is representing the University at an academic or athletic event and is available at an overlapping scheduled time of the test/examination, the student may write the test/examination at an approved location with an approved invigilator, as determined by the eHealth Program Administrator. In such cases, the request for a deferred examination privilege must be made in writing to the eHealth Program Administrator within ten business days of the end of the examination period.

STUDENT ACCESSIBILITY SERVICES

Student Accessibility Services (SAS) offers various support services for students with disabilities. Students are required to inform SAS of accommodation needs for course work at the outset of term. Students must forward a copy of such SAS accommodation to the instructor normally, within the first three (3) weeks of classes by setting up an appointment with the instructor. If a student with a disability chooses NOT to take advantage of an SAS

accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. The SAS website is:

<http://sas.mcmaster.ca>

POTENTIAL MODIFICATIONS TO THE COURSE

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

RESEARCH USING HUMAN SUBJECTS

Research involving human participants is premised on a fundamental moral commitment to advancing human welfare, knowledge and understanding. As a research intensive institution, McMaster University shares this commitment in its promotion of responsible research. The fundamental imperative of research involving human participation is respect for human dignity and well-being. To this end, the University endorses the ethical principles cited in the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans:

<http://www.pre.ethics.gc.ca>

McMaster University has mandated its Research Ethics Boards to ensure that all research investigations involving human participants are in compliance with the Tri-Council Policy Statement. The University is committed, through its Research Ethics Boards, to assisting the research community in identifying and addressing ethical issues inherent in research, recognizing that all members of the University share a commitment to maintaining the highest possible standards in research involving humans. If you are conducting original research, it is vital that you behave in an ethical manner. For example, everyone you speak to must be made aware of your reasons for eliciting their responses and consent to providing information. Furthermore, you must ensure everyone understands that participation is entirely voluntary. Please refer to the following website for more information about McMaster University's research ethics guidelines:

<http://www.mcmaster.ca/ors/ethics>

Organizations that you are working with are likely to prefer that some information be treated as confidential. Ensure that you clarify the status of all information that you receive from your client. You **MUST** respect this request and cannot present this information in class or communicate it in any form, nor can you discuss it outside your group. Furthermore, you must continue to respect this confidentiality even after the course is over.

COURSE SCHEDULE

eHealth 705 Statistics for eHealth Winter 2014 Course Schedule

WEEK	DATE	CLASS TIME & LEARNING	READING & ASSIGNMENTS
1	Monday 06jan14	Class Outline, Schedule, Expectations, Participation, Courseware, Assignments, Term Projects Lecture: <ul style="list-style-type: none"> ➤ The research process – Research questions, research design & hypotheses ➤ Data – where does it come from & what should you I do with it? ➤ Statistical tools – R, RStudio, Deducer, SPSS ➤ Data sets ➤ Basic data exploration – tables & graphs ➤ Descriptive statistics 	Dancey: Ch. 1, Ch. 2, Ch. 3 Assignment for Week 2
2	Monday 13jan14	<i>Workshop on Week 2 assignment.</i> Experiments, populations & samples, sampling, sampling error. Measures of central tendency and variation, visualization of survey and research data, building intelligence using Deducer & SPSS. Probability and distributions, statistical sampling, null hypothesis significance testing (NHST), Chi square test, confidence intervals, effect, bootstrapping, effect size, statistical power.	Dancey: Ch. 3, Ch. 4, Ch. 9 Assignment for week 3.
3	Monday 20jan14	<i>Workshop on Week 3 assignment.</i> Continued from week 2.	Dancey: Ch. 3, Ch. 4, Ch. 9 Assignment for week 4.

4	Monday 27jan14	<i>Workshop on Week 4 assignment.</i> Epidemiological concepts and measures, prevalence, incidence, relative risk, odds ratios. Data cleaning, missing values, data manipulation	Dancey: Ch. 4, Ch. 5, Ch. 6 Assignment for week 5.
5	Monday 03feb14	<i>Workshop on Week 5 assignment.</i> Differences between two groups: Independent & paired t-tests, z-test, Man-Whitney U test & Wilcoxon signed rank test, power	Dancey: Ch. 6, Ch. 7 Assignment for week 6.
6	Monday 10feb14	<i>Workshop on Week 6 assignment.</i> NHST among several groups -- analysis of variance (ANOVA)	Dancey: Ch. 7, Ch. 8 Assignment for week 7
	17feb14	Reading week	
7	Monday 24feb14	<i>Workshop on Week 7 problems.</i> Chi-square test; Contingency tables/cross-tabs, effect size, correlation	Dancey: Ch. 9, Ch. 10 Assignment for week 8
8	Monday 03mar14	Midterm (1.5 hours) <i>Workshop on Week 8 problems.</i> Correlation, simple linear regression	Dancey: Ch. 10, Ch. 11 Assignment for week 9 Term projects assigned.
9	Monday 10mar14	<i>Workshop on Week 9 problems.</i> Simple linear regression, multiple linear regression	Dancey: Ch. 11, Ch. 12 Assignment for week 10
10	Monday 17mar14	<i>Workshop on Week 10 problems.</i> Multiple regression, dummy variables, logistic regression	Dancey: Ch. 12, Ch. 13 Assignment for week 11
11	Monday 24mar14	<i>Workshop on Week 11 problems</i> Interventions, randomized controlled trials	Dancey: Ch. 14; Assignment for week 12 Individual projects due.

12	Monday 31mar14	<i>Workshop on Week 12 problems</i> Survival analysis	Dancey: Ch. 15 Assignment for week 13
13	Monday 05apr14	<i>Workshop on Week 13 problems</i> Student group presentations and discussions	
	Friday April 09	Written group reports due	

eHealth 705 - WINTER 2014
CASE GROUP EVALUATIONS
INSTRUCTIONS:

1. You are to assign to each person in your group an amount of money which represents each individual's contribution to the case.
2. Your total budget to distribute among the people in your group is \$1,000 * (the number of people in your group).

For example, if there are 3 people in your group, then pretend that you have $\$1,000 * 3 = \$3,000$ to pay out to the group.

3. If everyone contributed equally to the case, then pay each person \$1,000.
4. Adjust the fee to each person according to your honest personal assessment of the value of each person's contribution. In our example, the fee could be as low as \$0 or as high as \$3,000.
5. Your evaluation is to be done by you with no consultation with others in your group or from other groups.
6. In most cases, these evaluations will be valuable input to your professor in allocating marks. However, your professor might decide not to use the evaluations for some groups under unusual circumstances.
7. TREAT THIS EVALUATION SERIOUSLY.
8. MAKE SURE THAT THE FEES PAID ADD TO \$1,000 * GROUP SIZE.

YOUR NAME: _____

GROUP NAME: _____

CASE: _____

GROUP MEMBER (alphabetical order)	FEE
_____	_____
_____	_____
_____	_____
_____	_____

eHealth 705: Statistics for eHealth

Case Team # ____

Team Members: **email addresses,** **phone numbers**
(very clearly write you email addresses)

1. _____

2. _____

3. _____

4. _____

5. _____

And you are ... ?

Name: _____

Address: _____

City: _____

Phone: _____ email: _____

Current or most recent job: _____

Next previous position: _____

Undergraduate degree: _____

Undergraduate university: _____

Other graduate degree: _____

Which of the following courses have you taken or are you taking currently?

Took	Taking	
Previously	Currently	
<input type="checkbox"/>	<input type="checkbox"/>	eHealth 724, Fundamentals of eHealth & Cdn Health Care System
<input type="checkbox"/>	<input type="checkbox"/>	eHealth 736, Management Issues in eHealth
<input type="checkbox"/>	<input type="checkbox"/>	eHealth 757, Modern Software Technology for eHealth
<input type="checkbox"/>	<input type="checkbox"/>	eHealth 701, Research and Evaluation Methods in eHealth
<input type="checkbox"/>	<input type="checkbox"/>	711, Health Economics & Evaluation
<input type="checkbox"/>	<input type="checkbox"/>	723, Data Mining & Business Intelligence
<input type="checkbox"/>	<input type="checkbox"/>	6DB3, Databases
<input type="checkbox"/>	<input type="checkbox"/>	730, machine Learning & Data Mining
<input type="checkbox"/>	<input type="checkbox"/>	750, Model-based Image Reconstruction