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June 8, 2007

To : Members of the Faculty of Health Sciences Graduate Policy and Curriculum Committee

From : Medy Espiritu
Assistant Secretary & SynApps System Administrator

The next meeting of the Faculty of Health Sciences Graduate Policy and Curriculum Committee will be held on **Wednesday, June 13, 2007** at **10:00 a.m.** in **MDCL-3024**.

Listed below are the agenda items for discussion.

If you are unable to attend this meeting, please notify me at extension 24204 or email espiritu@mcmaster.ca

A G E N D A

I. Minutes of the meeting of April 19, 2007 *(unavailable)*

II. Curriculum Revisions

Health Research Methodology
- M.Sc. Curriculum Requirements
- New courses:
  - *750 – Practical Bayesian Design and Analysis in Clinical Studies
  - *759 – Survival Analysis in Health Research
- Change in course title and description:
  - *702 – Introduction to Biostatistics
- Course cancellation:
  - *701 – Introduction to Biostatistics
- Comprehensive Examination Booklet – *for information*

Course cancellation: CHS *730 – Determinants of the Health of Populations

Nursing
- Change to nursing graduate program guide
- Discussion concerning Ph.D. defense policy – *no material*

Fields Initiative – MSc Curriculum Requirements

(May 18, 2007)

		FIELDS OFFERED AT THE MSc LEVEL[1]									
		HRM Classic		Clinical Epidemiology		Health Services Research		Population & Public Health		Health Technology Assessment	
	DEGREE REQUIREMENTS[2]	Thesis-based	Course-based	Thesis-based	Course-based	Thesis-based	Course-based	Thesis-based	Course-based	Thesis-based	Course-based
MSc	**COURSEWORK**	*		721 & 702							
	Common Courses										
	Field Specific Courses			743 730 *or* 751	743 730 *or* 751	762	762	751	751	787 737	787 737 743
	Elective(s)	3	5	1	3	2	4	2	4	1	2
	RESEARCH INTERNSHIP	Research Internship		Research Internship is appropriate for field							
	RESEARCH PAPER	Thesis	Scholarly Paper	Scholarly Paper/Thesis topic is appropriate for field							

[1]Fields offered at the MSc level include: HRM Classic, Clinical Epidemiology, Health Services Research, Population & Public Health and Health Technology Assessment; Biostatistics is not offered at the MSc level (only PhD).

[2]MSc Level Degree Requirements include:

- Coursework (thesis-based = 5 courses; course-based = 7 courses)
  - two required courses across all fields, 721 and 702 or their equivalents
  - no more than 2 field specific courses are required for a thesis-based MSc
  - no more than 3 field specific courses are required for a course-based MSc

- Research Paper (thesis-based = thesis; course-based = scholarly paper)
  - the thesis or scholarly paper topic must be approved by the supervisor and field leader (topic is appropriate for the field)

- Research Internship -the research internship must be approved by the supervisor and field leader

*HRM Classic course-based also requires the completion of 730 *or* 751 & one of: 713, 714, 723, 727, 737, 743 *or* 745.

McMaster University

SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING COURSES

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM	Health Research Methodology			
COURSE TITLE	Practical Bayesian Design and Analysis in Clinical Studies			
COURSE NUMBER	750	**COURSE CREDIT**		
		FULL COURSE ( )	**HALF COURSE (x)**	**QUARTER (MODULE) ( )**
INSTRUCTOR(S)	Eleanor Pullenayegum & Lehana Thabane			
PREREQUISITE(S)	HRM 702, HRM 723, or by permission of instructor			

NATURE OF RECOMMENDATION ***(PLEASE CHECK APPROPRIATE BOX)***

NEW COURSE	x	**DATE TO BE OFFERED:** Fall 2007	**WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL?** No **IF YES, PROVIDE THE DATE:**

WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? No **IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.**

CHANGE IN COURSE TITLE		**PROVIDE THE CURRENT COURSE TITLE:**				
CHANGE IN COURSE DESCRIPTION		**600-LEVEL COURSE** ***(Undergraduate course for graduate credit)*** ***Please see #4 on page 2 of this form***				
CHANGE TO FULL COURSE		**CHANGE TO HALF COURSE**		**CHANGE TO QUARTER COURSE**		
COURSE CANCELLATION		**PROVIDE THE REASON FOR COURSE CANCELLATION:**				
OTHER		**EXPLAIN:**				

BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description *(maximum 6 lines)* to be included in the Graduate Calendar.

The intention of the course is both to introduce students to Bayesian ideas and to equip them to design, analyse and interpret clinical studies from a Bayesian perspective. Instruction will consist of both seminars and computer labs using WinBUGS. WinBUGS is not "point-and-click" software, so students will need to write short sections of code. Examples will be provided, and an instructor will be present in the lab sessions to provide advice.

CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.

Objectives:

1. To discuss the differences between Bayesian and frequentist methods, and understand the challenges and advantages of each
2. To introduce the key Bayesian ideas
3. To introduce the basic principles used in selection of prior distributions
4. To learn how to conduct simple Bayesian analyses using WinBUGS
5. To learn how to design studies using Bayesian principles
6. To learn how to use WinBUGS including problems arising from MCMC sampling
7. To learn how to conduct and report results of a Bayesian analysis of a clinical study

Topics: Introduction to Bayesian Thinking and Statistics, introduction to WinBUGS, comparing means, comparing proportions, linear regression, logistic regression, choosing a prior, Bayesian trial design & stopping rules, convergence, cluster-randomised trials, cross-over trials, meta-analysis, missing data, reporting the results, decision-making.

Principal text: Bayesian Approaches to Clinical Trials and Health-Care Evaluation. DJ Spiegelhalter, KR Abrams and JP Myles. Wiley 2004.

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)

Whilst Bayesian thinking is not a new concept, its application has become much more widespread in the last two decades, largely due to the availability of appropriate software. Besides being closer to our intuitive concepts of probability, Bayesian methods provide solutions to design and analysis problems that are difficult to address using frequentist methods. These include stopping rules, studies of rare conditions with small sample sizes, and complex models. Whilst the statistical methodology is available, there is a shortage of epidemiologists who are familiar with Bayesian ideas. Students in the HRM program are no exception: whilst they are trained in frequentist statistical techniques, they have little exposure to Bayesian methods. The purpose of this course is to familiarize students with Bayesian thinking, introduce them to the potentials and alert them to the challenges, so that, in collaboboration with a biostatistician (as appropriate) they can design, implement and interpret clinical studies using Bayesian methodology.

2. EXPECTED ENROLMENT:

20

3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):

Seminars and computer labs

4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION: (For 600-level course, indicate the Extra Work to be required of graduate students, i.e., exams, essays, etc.)

10% course participation
60% labs (4 lab reports, worth 15% each)
20% project and presentation
10% reflective paper

5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).

No

6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?

Not relevant

PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Eleanor Pullenayegum Email: pullena@mcmaster.ca Extension: 35929

If you have any questions regarding this form, please contact the Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/December 2006

HRM Course Outline

Course Number & Title:	HRM 750: Practical Bayesian Design and Analysis in Clinical Studies
Course Co-ordinator:	Eleanor Pullenayegum
Additional Faculty/Support:	Lehana Thabane

Course Description

The intention of the course is both to introduce students to Bayesian ideas and to equip them to design, analyse and interpret clinical studies from a Bayesian perspective. Instruction will consist of both seminars and computer labs using WinBUGS. WinBUGS is not "point-and-click" software, so students will need to write short sections of code. Examples will be provided, and an instructor will be present in the lab sessions to provide advice.

Course Objectives

1. To discuss the differences between Bayesian and frequentist methods, and understand the challenges and advantages of each
2. To introduce the key Bayesian ideas
3. To introduce the basic principles used in selection of prior distributions
4. To learn how to conduct simple Bayesian analyses using WinBUGS
5. To learn how to design studies using Bayesian principles
6. To learn how to use WinBUGS including problems arising from MCMC sampling
7. To learn how to conduct and report results of a Bayesian analysis of a clinical study

Educational Methods/Course Format

Seminars and computer labs

Course Text/Materials

Bayesian Approaches to Clinical Trials and Health-Care Evaluation. DJ Spiegelhalter, KR Abrams and JP Myles. Wiley 2004.

Prerequisites:	**HRM 702, HRM 723**

Session	**Topic**
Week 1	Introduction to Bayesian Thinking and Statistics
Week 2	Lab 1 – introduction to WinBUGS (t-tests)
Week 3	Lab 2 – chi-square tests
Week 4	Lab 3 – linear regression, logistic regression
Week 5	Choosing a prior
Week 6	Bayesian trial design & stopping rules
Week 7	Lab 4 – priors and design
Week 8	Convergence
Week 9	Cluster-randomised/cross-over trials, meta-analysis
Week 10	Lab 5 – random effects
Week 11	Missing data (lecture & lab)
Week 12	Reporting the results
Week 13	Decision-making / Student Projects

Evaluation of Student Performance

10% course participation
60% labs (4 lab reports, worth 15% each)
20% project and presentation
10% reflective paper

Bayesian Course (Version 4): May 16, 2007

Practical Bayesian Design and Analysis in Clinical Studies

Instructors: Eleanor Pullenayegum, Lehana Thabane

Textbook for the course: Bayesian Approaches to Clinical Trials and Health-Care Evaluation. DJ Spiegelhalter, KR Abrams and JP Myles. Wiley 2004.
Learning objectives:

1. To discuss the differences between Bayesian and frequentist methods, and understand the challenges and advantages of each
2. To introduce the key Bayesian ideas
3. To introduce the basic principles used in selection of prior distributions
4. To learn how to conduct simple Bayesian analyses using WinBUGS
5. To learn how to design studies using Bayesian principles
6. To learn how to use WinBUGS including problems arising from MCMC sampling
7. To learn how to conduct and report results of a Bayesian analysis of a clinical study

Pre-requisites: HRM 702, HRM 723, or permission of instructor

Why this course is needed:
Whilst Bayesian thinking is not a new concept [Bayes, 1763], its application has become much more widespread in the last two decades, largely due to the availability of appropriate software [Spiegelhalter et al.]. Under the Bayesian model, parameters are treated as random variables, prior beliefs about the parameters are explicitly quantified *a priori* and then updated in the light of the observed data. Besides being closer to our intuitive concepts of probability, Bayesian methods provide solutions to design and analysis problems that are difficult to address using frequentist methods. These include, but are not limited to, stopping rules [Fayers et al.], studies of rare conditions with small sample sizes [Lilford et al], and complex models. Whilst the statistical methodology is available, there is a shortage of epidemiologists who are familiar with Bayesian ideas. The purpose of this course is to familiarize students with Bayesian thinking, introduce them to the potentials and alert them to the challenges, so that, in collaboration with a biostatistician (as appropriate) they can design, implement and interpret clinical studies using Bayesian methodology.

What this course will involve:
The intention of the course is both to introduce students to Bayesian ideas and to equip them to do Bayesian analysis, and so instruction will consist of both seminars and computer labs. WinBUGS is not “point-and-click” software, so students will need to write short sections of code. Examples will be provided, and an instructor will be present in the lab sessions to provide advice. Students will be expected to write 4 lab reports, summarizing their in-class work. They will also conduct and report a Bayesian analysis of a simple study that was previously analysed using frequentist methods, and write a

short paper reflecting on the potential uses of Bayesian methodology in their area of research.

Assessment
10% course participation
60% labs (4 lab reports, worth 15% each)
20% project and presentation
10% reflective paper

Session	*Topic*	*Textbook Readings*
1	Introduction to Bayesian Thinking and Statistics	sections 1.1-1.4; 2.1-2.3, 2.5; 3.1-3.5
2	Lab 1 – introduction to WinBUGS (t-tests)	sections 3.7-3.10; 3.19
3	Lab 2 – chi-square tests	section 3.6
4	Lab 3 – linear regression, logistic regression	
5	Choosing a prior	sections 2.6, 5.1-5.6
6	Bayesian trial design & stopping rules	sections 6.1-6.7
7	Lab 4 – priors and design	
8	Convergence	section 3.19
9	Cluster-randomised/cross-over trials, meta-analysis	6.8, 8.1-8.3
10	Lab 5 – random effects	
11	Missing data (lecture & lab)	
12	Reporting the results	section 3.21
13	Decision-making	sections 3.14, 9.6
14	Student Projects	

Session 1: Introduction to Bayesian Thinking and Statistics
Learning objectives:

1. Understand the difference between Bayesian and frequentist ideologies
2. Understand what a distribution is
3. Learn how Bayes' theorem links the prior and posterior distributions
4. Learn how to use the posterior distribution for inference

Readings:

- Textbook, sections 1.1-1.4; 2.1-2.3, 2.5; 3.1-3.5
- Bland JM, Altman DG. Statistics notes: Bayesians and frequentists. BMJ 1998; 317:1151-1160.

Lab 1 – Estimating and comparing means of Normal variables
Learning objectives:

1. Become familiar with the WinBUGS environment
2. Learn how to use WinBUGS to estimate the posterior distribution of a mean parameter (given a prior)

3. Learn how to use WinBUGS to compare the mean responses between two groups

Readings:

- Textbook, sections 3.7-3.10; 3.19
- Watch "WinBUGS: the movie" http://www.mrc-bsu.cam.ac.uk/bugs/winbugs/winbugsthemovie.html

Lab 2 – Binary outcomes

Learning objectives:

1. Learn how to use Bayesian methods to estimate proportions
2. Learn how to compare proportions
3. Learn how to implement these models in WinBUGS

Readings:

- Textbook, section 3.6
- Fryback DG, Stout NK, Rosenberg MA. An Elementary Introduction to Bayesian Computing Using WinBUGS. International Journal of Technology Assessment in Health Care, 17:1 (2001) 98-113.
- Abrams K, Ashby D, Errington D. Simple Bayesian Analysis in Clinical Trials: A Tutorial. Controlled Clinical Trials 15: 349-359 (1994).

Lab 3 – Regression models

Learning objectives:

1. Learn how to formulate a linear regression as a Bayesian estimation problem.
2. Learn how to formulate a logistic regression as a Bayesian estimation problem.
3. Learn how to implement these models in WinBUGS

Prior distributions

Learning objectives:

1. Appreciate the impact of the prior on the results, and the importance of selecting a suitable prior
2. Learn methods for eliciting priors, and understand the strengths and weaknesses of each
3. Understand how the prior impacts interpretability
4. Learn some standard prior choices (conjugate priors, non-informative priors)

Readings:

- Textbook, sections 2.6, 5.1-5.6
- Tan SB, Cung YFA, Tai BC, Cheung YB, Machin D. Elicitation of prior distributions for a phase III randomized controlled trial of adjuvant therapy with surgery for hepatocellular carcinoma. Controlled Clinical Trials 24 (2003): 110-121.

Bayesian Trial Design

Learning objectives:

1. Learn the principles of a simple Bayesian sample size calculation
2. Understand how Bayesian thinking influences interim monitoring and stopping rules

Readings:

- Textbook, sections 6.1-6.7
- Fayers PM, Ashby D, Parmar MKB. Tutorial in Biostatistics: Bayesian Data Monitoring in Clinical Trials. Stat Med 16: 1413-1430 (1997).
- Joseph L, Belisle P. Bayesian sample size determination for normal means and differences between normal means. The Statistician 1997; 46: 209-226.
- Dignam JJ, Bryant J, Wieand HS, Fisher B, Wolmark N. Early Stopping of a clinical trial when there is evidence of no treatment benefit: protocol B-14 of the national surgical adjuvant breast and bowel project. Controlled Clinical Trials 19: 575-588 (1998).

Lab 4 – Priors, Trial Design

Learning objectives:

1. Learn how to use hierarchical priors, sensitivity analysis
2. Observe the effects of using sceptical and enthusiastic priors

Readings:

Spiegelhalter DJ. Bayesian approaches to randomized trials. JRSSA 157(3), 1994:357-416.

Convergence and sampling diagnostics

Learning objectives:

1. Understand in principle what WinBUGS is doing
2. Appreciate the importance of assessing convergence
3. Be aware of the dangers of MCMC sampling
4. Learn some simple convergence diagnostics

Readings:

- Textbook, section 3.19
- Cowles MK, Carlin BP. Markov Chain Monte Carlo Convergence Diagnostics: A Comparative Review. Journal of the American Statistical Association, Vol 91, no. 434 (1996): 883-904.
- "Checking convergence" from the Tutorial section of the WinBUGS manual

Meta-analysis/ Multi-centre trials/ cluster-randomised trials

Learning objectives:

1. Learn the role of random effects in expressing uncertainty and modelling correlation
2. Learn how to formulate a model for Bayesian meta-analysis
3. Learn how to formulate a model for multi-centre trials
4. Learn how to formulate a model for cluster-randomised trials

Readings:

- Textbook, sections 6.8, 8.1-8.3
- Sutton AJ, Abrams KR. Bayesian methods in meta-analysis and evidence synthesis. Stat Methods Med Res 2001; 10; 277.

- Gould AL. Bayesian analysis of multicentre trial outcomes. Stat Methods Med Res 2005; 14:249.
- Andreozzi VL et al. Random-Effects Models in Investigating the Effect of Vitamin A in Childhood Diarrhea. Ann Epidemiol. 2006; 16:241:247.

Lab 6 – Random Effects/Convergence

Learning objectives:

1. Learn how to implement random effect models
2. Learn how to assess convergence

Readings:

- Spiegelhalter DJ. Bayesian methods for cluster randomized trials with continuous responses. Stat Med 2001; 20:435-452

Missing Data (Lecture + Lab)

Learning objectives:

1. Understand how missing data is treated in Bayesian analysis – how imputation is done naturally.
2. Learn how to implement analyses with missing data.

Readings:

- Kmetic A, Joseph L, Berger C, Tenenhouse A. Multiple Imputation to account for missing data in a survey: estimating the prevalence of osteoperosis . Epidemiology 2002; 13:437-444.
- Schafer JL. Multiple Imputation: a Primer. Statistical Methods in Medical Research 1999; 8:3-15.

Reporting the Results

Learning objectives:

1. Learn how to describe Bayesian methods in a paper
2. Learn how to report Bayesian results
3. Learn how to interpret Bayesian analyses.

Readings:

- Textbook, section 3.21
- Sung L, Hayden J, Greenberg ML, Koren G, Feldman BM, Tomlinson GA. Seven items were identified for inclusion when reporting a Bayesian analysis of a clinical study. J. Clinical Epidemiology 2005; 58:261-268.

Decision-Making

Learning objectives:

1. Understand key concepts in Bayesian decision theory
2. Appreciate its value in health research

Introduction to Bayesian decision theory
Management trials
Cost-effectiveness

Readings:

- Textbook, sections 3.14, 9.6
- Sheingold SH. Can Bayesian Methods make data and analyses more relevant to decision makers. International Journal of Technology Assessment in Health Care, 17:1 (2001), 114-122.
- Briggs A. A Bayesian approach to stochastic cost-effectiveness analysis. Health Economics (1999) 8: 257-261.

References

Bayes T. Essary towards solving a problem in the doctrine of chances. Philisophical Transactions of the Royal Society of London (1763).
Fayers PM, Ashby D, Parmar MKB. Tutorial in Biostatistics: Bayesian Data Monitoring in Clinical Trials. Stat Med 16: 1413-1430 (1997).
Lilford RJ, Thornton JG, Braunholtz D. Clinical trials and rare diseases: a way out of a conundrum. BMJ 1995; 311:1621:1625.
Spiegelhalter DJ, Thomas A, Best N, Lunn D. WinBUGS user manual, version 1.4.1.

McMaster University

SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING COURSES

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM	Health Research Methodology			
COURSE TITLE	Survival Analysis in Health Research			
COURSE NUMBER	759	**COURSE CREDIT**		
		FULL COURSE ( )	**HALF COURSE (X)**	**QUARTER (MODULE) ( )**
INSTRUCTOR(S)	Noori Akhtar-Danesh			
PREREQUISITE(S)	HRM-723 or HRM-731 or by permission of instructor. N.B. HRM 721 is recommended			

NATURE OF RECOMMENDATION ***(PLEASE CHECK APPROPRIATE BOX)***

NEW COURSE	X	**DATE TO BE OFFERED:** Winter 2008	**WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:**

WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? NO **IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.**

CHANGE IN COURSE TITLE		**PROVIDE THE CURRENT COURSE TITLE:**				
CHANGE IN COURSE DESCRIPTION		**600-LEVEL COURSE** ***(Undergraduate course for graduate credit)*** ***Please see #4 on page 2 of this form***				
CHANGE TO FULL COURSE		**CHANGE TO HALF COURSE**		**CHANGE TO QUARTER COURSE**		
COURSE CANCELLATION		**PROVIDE THE REASON FOR COURSE CANCELLATION:**				
OTHER		**EXPLAIN:**				

BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description *(maximum 6 lines)* to be included in the Graduate Calendar.

This course will cover the main statistical issues in survival analysis. Specific topics of the course are Kaplan-Meier curves, log-rank test, Cox Proportional Hazard Model, Stratified and Extended Cox Model, Parametric Survival Models, Recurrent Events, Competing Risks, and Model Evaluation. Depending on time and the students' progress and interests, new advancements in survival analysis will be discussed.

CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.

Survival analysis involves the modelling of time to event data, in this context, death or failure is considered an "event" in the survival analysis literature. This course is mainly aiming current and future graduate students of the HRM program.

This course will cover the main statistical issues in survival analysis. Specific topics of the course are Kaplan-Meier curves, log-rank test, Cox Proportional Hazard Model, Stratified and Extended Cox Model, Parametric Survival Models, Recurrent Events, Competing Risks, and Model Evaluation. Depending on time and the students' progress and interests, new advancements in survival analysis will be discussed.

The main textbook for the course will be:

Kleinbaum and Klein (2005), Survival Analysis- A Self-Learning Text, 2nd Edition.

For further reading the following books are also suggested:

1. Hosmer and Lemeshow (1999), Applied Survival Analysis: Regression Modeling of Time to Event Data, Wiley.
2. Lee and Wang (2003), Statistical Methods for Survival Data Analysis, 3rd Edition, Wiley.
3. Collett (2003), Modelling Survival Data in Medical Research, 2nd Edition, Chapman & Hall.

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)

The graduate students and faculty in the Department of CE&B are frequently encountered with datasets that need to be analyzed using survival techniques, however, there is no specific course for teaching survival analysis. Such courses seem to be necessary with the expansion of the special disciplines such as biostatistics and epidemiology within the department.

2. EXPECTED ENROLMENT:

12 Students

3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):

The course is designed to be taught in a lecture based format with a problem-based discussion component. Each week there will be a data analysis assignment for discussion to help students better understand and apply the concepts.

4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION: (For 600-level course, indicate the Extra Work to be required of graduate students, i.e., exams, essays, etc.)

The course will be evaluated based on student's attendance and participation (15%), three hand-in assignments (15% each), a final project (20%), and the presentation of the final project (20%).
For each week there will be an assignment; three of them will be handed-in by students and graded by the tutor. For each assignment a dataset will be given and students will be asked to use appropriate statistical techniques to analyze the dataset and interpret the results; the solution will be discussed in the tutorial group.
The final assignment (the project) consists of two parts - a hand-in report, of at most 10 double-spaced pages, font size 12, (plus the final computer output), and a class presentation of 10-15 minutes.

5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).

NO

6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?

The course is primarily intended for the graduate students of biostatistics and epidemiology in the Department of CE&B. However, we anticipate that graduate students from the other disciplines such as Statistics and Nursing will be interested.

PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Noori Akhtar-Danesh Email: daneshn@mcmaster.ca Extension: 22297

If you have any questions regarding this form, please contact the Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/December 2006

HRM Course Outline

(Revised February 2006)

Course Title & Number:	HRM 759: Survival Analysis
Course Co-ordinator:	Noori Akhtar-Danesh daneshn@mcmaster.ca ext. 22297
Additional Faculty/Support:	

Course Description

This course will cover the main statistical issues in survival analysis. Specific topics of the course are Kaplan-Meier curves, log-rank test, Cox Proportional Hazard Model, Stratified and Extended Cox Model, Parametric Survival Models, Recurrent Events, Competing Risks, and Model Evaluation. Depending on time and the students' progress and interests, new advancements in survival analysis will be discussed.

Course Objectives

Survival analysis involves the modelling of time to event data, in this context, death or failure is considered an "event" in the survival analysis literature. This course is mainly aiming current and future graduate students of the HRM program.

This course will cover the main statistical issues in survival analysis. Specific topics of the course are Kaplan-Meier curves, log-rank test, Cox Proportional Hazard Model, Stratified and Extended Cox Model, Parametric Survival Models, Recurrent Events, Competing Risks, and Model Evaluation. Depending on time and the students' progress and interests, new advancements in survival analysis will be discussed.

Educational Methods/Course Format

The course is designed to be taught in a lecture based format with a problem-based discussion component. Each week there will be a data analysis assignment for discussion to help students better understand and apply the concepts.

Course Text/Materials

The main textbook for the course will be:
Kleinbaum and Klein (2005), Survival Analysis- A Self-Learning Text, 2nd Edition.

For further reading the following books are also suggested:

1. Hosmer and Lemeshow (1999), Applied Survival Analysis: Regression Modeling of Time to Event Data, Wiley.
2. Lee and Wang (2003), Statistical Methods for Survival Data Analysis, 3rd Edition, Wiley.
3. Collett (2003), Modelling Survival Data in Medical Research, 2nd Edition, Chapman & Hall.

Prerequisites:	HRM 721, HRM 723 or HRM 731

Session	**Topic**
Week 1	Introduction to Survival Analysis
Week 2	The Cox Proportional Hazards Model
Week 3	Evaluating The Cox Proportional Hazards Assumption

Week 4	Stratified Cox Procedure
Week 5	Extension of Cox Proportional Hazards Model (time dependent variables)
Week 6	Parametric Survival Models 1
Week 7	Parametric Survival Models 2
Week 8	Recurrent Event Survival Analysis
Week 9	Competing Risks Survival Analysis
Week 10	Model Checking in Survival Analysis
Week 11	Sample Size Calculation
Week 12	Some Additional Topics
Week 13	Students' Final Presentation
Week 14	Students' Final Presentation (if needed)

Evaluation of Student Performance
The course will be evaluated based on student's attendance and participation (15%), three hand-in assignments (15% each), a final project (20%), and the presentation of the final project (20%). For each week there will be an assignment; three of them will be handed-in by students and graded by the tutor. For each assignment a dataset will be given and students will be asked to use appropriate statistical techniques to analyze the dataset and interpret the results; the solution will be discussed in the tutorial group. The final assignment (the project) consists of two parts - a hand-in report, of at most 10 double-spaced pages, font size 12, (plus the final computer output), and a class presentation of 10-15 minutes.

Survival Analysis in Health Research

Winter 2008

COURSE PROPOSAL:

THE RATIONALE:

Survival analysis is a branch of statistics which deals with death in biological organisms and failure in mechanical systems. This topic is called *reliability theory* or *reliability analysis* in engineering, and *duration analysis* or *duration modeling* in economics. More generally, survival analysis involves the modelling of time to event data, in this context, death or failure is considered an "event" in the survival analysis literature. Although graduate students and faculty in the Department of CE&B are frequently encountered with such datasets, there is no specific course for teaching survival analysis. Such courses seem to be necessary with the expansion of special disciplines such as biostatistics and epidemiology in the department. This course is mainly intended for current and future graduate students of the HRM program.

This course will:

1. Cover all basic and advanced statistical concepts and tests in Survival Analysis
2. Include relevant examples of studies and datasets
3. Provide information on further reading

There will be no overlap between this course and other existing courses in the Department of CE&B or Department of Statistics. This is the first course devoted to survival analysis at McMaster University.

OBJECTIVES:

This course will cover the main statistical issues in survival analysis. Specific topics of the course are Kaplan-Meier curves, log-rank test, Cox Proportional Hazard Model, Stratified and Extended Cox Model, Parametric Survival Models, Recurrent Events, Competing Risks, and Model Evaluation. Depending on time and the students' progress and interests, new advancements in survival analysis may be discussed. Statistical package of STATA will be used as the course software for analysis.

COURSE FORMAT: (3 hrs/Week)

The course is designed to be taught in a lecture based format with a problem-based discussion component. Each week there will be a data analysis assignment for discussion to help students better understand and apply the concepts.

EVALUATION:

The course will be evaluated based on student's attendance and participation (15%), three hand-in assignments (15% each), a final project (20%), and the presentation of the final project (20%).

For each week there will be an assignment; three will be handed-in by students and graded by the tutor. For each assignment a dataset will be given and students will be asked to use appropriate statistical techniques to analyze the dataset and interpret the results, then, the solution will be discussed in the class.

The final assignment (the project) consists of two parts: a hand-in report, of at most 10 double-spaced pages (plus the final computer output), and a class presentation of 10-15 minutes.

TEXTBOOKS

The main textbook for the course will be:

Kleinbaum and Klein (2005), **Survival Analysis- A Self-Learning Text,** 2nd Edition, Springer-Verlag.

For further reading the following books are also suggested:

1. Hosmer and Lemeshow (1999), **Applied Survival Analysis: Regression Modeling of Time to Event Data**, Wiley.
2. Lee and Wang (2003), **Statistical Methods for Survival Data Analysis**, 3rd Edition, Wiley.
3. Collett (2003), **Modelling Survival Data in Medical Research**, 2nd Edition, Chapman & Hall.

COURSE OUTLINE:

Session 1. Introduction to Survival Analysis

a. Basic definitions
b. Kaplan-Meier Curves
c. Log-rank test

Session 2. The Cox Proportional Hazards Model

Session 3. Evaluating The Cox Proportional Hazards Assumption

Session 4. Stratified Cox Procedure

Session 5. Extension of Cox Proportional Hazards Model (time dependent variables)

Session 6. Parametric Survival Models 1

Session 7. Parametric Survival Models 2

Session 8. Recurrent Event Survival Analysis

Session 9. Competing Risks Survival Analysis

Session 10. Model Checking in Survival Analysis

Session 11. Sample Size Calculation

Session 12. Some Additional Topics

Session 13. Students' Final Presentation

Session 14. Students' Final Presentation (if needed)

Specific Course Objectives

Session 1. Introduction to survival analysis

Upon completing this session, the student should be able to:

1. Recognize or describe the type of problem addressed by a survival analysis.
2. Define what is meant by censored data.
3. Define or recognize right-censored data.
4. Define, recognize, or interpret a survivor function.
5. Define, recognize, or interpret a hazard function.
6. Interpret or compare examples of survivor curves or hazard functions.
7. Given a problem situation, state the goal of a survival analysis in terms of describing how explanatory variables relate to survival time.
8. Compute or interpret average survival and/or average hazard measures from a set of survival data.
9. Define or interpret the hazard ratio defined from comparing two groups of survival data.
10. Compute Kaplan-Meier (KM) probabilities of survival given survival time and failure status information on a sample of subjects.
11. Interpret a graph of KM curves that compare two or more groups.
12. Draw conclusions as to whether or not two or more survival curves are the same based on computer results that provide a log-rank test and/or an alternative test.
13. Decide whether the log-rank test or one of the alternatives to this test is more appropriate for a given set of survival data.

Session 2. The Cox Proportional Hazards Model

Upon completing this session, the student should be able to:

1. State or recognize the general form of the Cox PH model.
2. State the specific form of a Cox PH model appropriately for the analysis, given a survival analysis scenario involving one or more explanatory variables.
3. State or recognize the form and properties of the baseline hazard function in the Cox PH model.
4. State or recognize the meaning of the PH assumption.
5. State or recognize what is an adjusted survival curve.
6. Compare and/or interpret two or more adjusted survival curves.
7. Given a computer printout involving one or more fitted Cox PH models,
    a. Compute or identify a hazard ratio(s) of interest;
    b. Carry out and interpret a designated test of hypothesis;
    c. Carry out, identify or interpret a confidence interval for a designated hazard ratio.

Session 3. Evaluating The Cox Proportional Hazards assumption

Upon completing this session, the student should be able to:

1. State or recognize three general approaches for evaluating the PH assumption.
2. Summarize how log-log survival curves may be used to assess the PH assumption.
3. Summarize how observed versus expected plots may be used to assess the PH assumption.
4. Summarize how GOF tests may be used to assess the PH assumption.
5. Summarize how time-dependent variables may be used to assess the PH assumption.
6. Describe—given survival data or computer output from a survival analysis that uses a Cox PH model—how to assess the PH assumption for one or more variables in the model.

Session 4. Stratified Cox Procedure

Upon completing this session, the student should be able to:

1. State the hazard form of a stratified Cox model for a given survival analysis scenario and/or a given set of computer results for such a model.
2. Evaluate the effect of a predictor of interest based on computer results from a stratified Cox procedure.
3. For a given survival analysis scenario and/or a given set of computer results involving a stratified Cox model,
   - State the no-interaction assumption for the given model;
   - Describe and/or carry out a test of the no-interaction assumption;
   - Describe and/or carry out an analysis when the no-interaction assumption is not satisfied.

Session 5. Extension of Cox Proportional Hazards model (time dependent variables)

Upon completing this session, the student should be able to:

1. State or recognize the general form of the Cox model extended for time-dependent variables.
2. State the specific form of an extended Cox model appropriate for the analysis, given a survival analysis scenario involving one or more time-dependent variables.
3. State the formula for a designated hazard ratio of interest given a scenario describing a survival analysis using an extended Cox model.
4. Carry out an appropriate analysis of the data to evaluate the effect of one more of the explanatory variables in the model(s) being used, given computer results for a survival analysis involving time-dependent variables. Such an analysis will involve:
    - Computing and interpreting any hazard ratio(s) of interest;
    - Carrying out and interpreting appropriate test(s) of hypotheses for effects of interest;
    - Obtaining confidence intervals for hazard ratios of interest;
    - Evaluating interaction and confounding involving one or more covariates.

Session 6 and Session 7. Parametric Survival Models

Upon completing these sessions, the student should be able to:

1. State or recognize the form of the parametric survival model and contrast it with a Cox model.
2. State common distributions used for parametric survival models.
3. Contrast an accelerated failure time (AFT) model with a PH model.
4. Interpret output from an exponential survival model.
5. Interpret output from a Weibull survival model.
6. Interpret output from a log-logistic survival model.
7. State or recognize the formulation of a parametric likelihood.
8. State or recognize right-censored, left-censored, and interval-censored data.
9. State or recognize the form of a frailty model and the purpose of including a frailty component.
10. Interpret the output obtained from a frailty model.

Session 8. Recurrent Event Survival Analysis

Upon completing this session, the student should be able to:

1. State or recognize examples of recurrent event data.
2. State or recognize the form of the data layout used for the counting process approach for analyzing correlated data.
3. Given recurrent event data, outline the steps needed to analyze such data using the counting process approach.
4. State or recognize the form of the data layout used for the marginal model approach for analyzing correlated data.
5. Given recurrent event data, outline the steps needed to analyze such data using the marginal model approach.

Session 9. Competing Risks Survival Analysis

Upon completing this session, the student should be able to:

1. State or recognize examples of competing risks survival data.
2. Given competing risks data, outline the steps needed to analyze such data using separate Cox models.
3. State or describe the independence assumption typically required in the analysis of competing risks data.
4. Describe how to carry out and/or interpret a "sensitivity analysis" to assess the independence assumption about competing risks.
5. State why a survival function obtained from competing risk using the Cox model has a questionable interpretation.
6. State or describe the "cumulative incidence" approach for analyzing competing risks data.
7. Given competing risk data, describe how to calculate a CIC and/or a CPC curve.
8. Given competing risks data, outline the steps needed to analyze such data using the Lunn-McNeil method.
9. Given computer output from fitting either a LM or LM_{alt} model, carry out an analysis to assess the effects of explanatory variables on one or more of the competing risks.

Session 10. Model checking in survival analysis

Upon completing this session, the student should be able to:

1. Describe an influential subject in the model
2. Identify an influential subject using the computer output.
3. Describe the overall Goodness-of-fit (GOF) tests and measures
4. Assess the suitability of a model given the computer output of the GOF tests.

Session 11. Sample size calculation

Upon completing this session, the student should be able to:

1. Recognize the need for sample size calculation in each study.
2. Apply the relevant formulas to calculate sample sizes for their study designs.
3. Identify shortcomings in published studies with inadequate sample sizes.

Session 12. Some Additional topics

In this session depending on the students' interests some of the previous sessions will be revisited in more detail or some additional topics will be presented. These additional topics may include Nested Case-Control Studies and Additive Models in survival analysis.

Sessions 13 and 14. Students' Final Presentation

McMaster University

SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING COURSES

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM	Health Research Methodology			
COURSE TITLE	Introduction to Biostatistics			
COURSE NUMBER	HRM 702	**COURSE CREDIT**		
		FULL COURSE ( )	**HALF COURSE (X)**	**QUARTER (MODULE) ( )**
INSTRUCTOR(S)	Harry Shannon			
PREREQUISITE(S)	Not required for HRM students; otherwise, permission of the instructor.			

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

NEW COURSE		**DATE TO BE OFFERED:**	**WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:**

WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.

CHANGE IN COURSE TITLE	X	**PROVIDE THE CURRENT COURSE TITLE:** Introduction to Health Care Biostatistics (Lecture-based)			
CHANGE IN COURSE DESCRIPTION	X	**600-LEVEL COURSE** ***(Undergraduate course for graduate credit)*** ***Please see #4 on page 2 of this form***			
CHANGE TO FULL COURSE		**CHANGE TO HALF COURSE**		**CHANGE TO QUARTER COURSE**	
COURSE CANCELLATION		**PROVIDE THE REASON FOR COURSE CANCELLATION:**			
OTHER		**EXPLAIN:**			

BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description *(maximum 6 lines)* to be included in the Graduate Calendar.

Basic statistical concepts and techniques as they apply to analysis and presentation of data in biostatistical and epidemiology practice. The course covers: graphical presentation of data, elementary probability, descriptive statistics, probability distributions, and introduces hypothesis testing using parametric and non-parametric methods. Specific techniques covered include z-tests, t-tests, ANOVA, contingency tables, regression and correlation.

CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.

Basic statistical concepts and techniques as they apply to analysis and presentation of data in biostatistical and epidemiology practice. The course covers: graphical presentation of data, elementary probability, descriptive statistics, probability distributions, and introduces hypothesis testing using parametric and non-parametric methods.

The course will not be designed around a textbook; rather, any text used will complement the instruction. Thus any introductory text will likely suffice, and students will be advised that they can choose one to suit their learning style. We will recommend several options, including Norman and Streiner "Biostatistics: the Bare Essentials" and Moore and McCabe "Introduction to the Practice of Statistics"

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)

HRM students are required to take a basic biostatistics course. This course serves that need. We will also accommodate students from other programmes to the extent possible.

2. EXPECTED ENROLMENT:

50-60 students

3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):

Students will be expected to attempt problems on topics before they are covered in class. The problems will be discussed in tutorial groups, which will be followed by a plenary lecture summarizing the key points in the problem and course material.

4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION: (For 600-level course, indicate the Extra Work to be required of graduate students, i.e., exams, essays, etc.)

The final grade will be based on:

-The tutors' assessment of the student's performance in weekly sessions (20%)

-Two hand-in exercises based on problems (20% for each, 40% total)

-A problem-based exercise at the end of term. This will be presented to the group. We encourage students to analyze their own data sets, rather than use one provided. If a student decides to use his/her own data, this must be approved by the tutor before proceeding. If the student has no suitable data sets available, a final problem exercise will be provided by the course coordinator (20%).

-A brief, in-class, multiple choice and short answer exam (20%)

5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).

No

6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?

N/A

PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Harry Shannon Email: shannonh@mcmaster.ca Extension: 22147

If you have any questions regarding this form, please contact the Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/December 2006

HRM Course Outline

Course Number & Title:	HRM 702 Introduction to Biostatistics
Course Co-ordinator:	Harry Shannon
Additional Faculty/Support:	Various lecturers and tutors

Course Description

Basic statistical concepts and techniques as they apply to analysis and presentation of data encountered in biostatistical and epidemiology practice. The course covers: graphical presentation of data, elementary probability, descriptive statistics, probability distributions, and introduces hypothesis testing using parametric and non-parametric methods. Some specific methods will be included, such as t-tests, ANOVAs, contingency tables, and regression and correlation.

Course Objectives

The successful student will:
Understand the basic principles of statistical methods:
Know when and how to apply different approaches;
Be able to interpret the results of these analyses.

Educational Methods/Course Format

The course will use a problem-based approach, combined with synthesizing lectures. Each week's class will begin with a tutorial which will briefly review issues from the previous week's material, and then explore the new problem. The tutorial will be followed by a plenary lecture, which will review the key points that arise from the week's problem. The lecturing will be shared by several HRM faculty statisticians.

The problems will be written and structured, so that new ideas, concepts and methods are introduced to build on previous material.

Course Text/Materials

The course will not follow a text; rather the text will complement the instruction. Any introductory statistics text would thus suffice. Several were proposed in a planning meeting for the course, including:

* GR Norman & DL Streiner (2000). *Biostatistics: The Bare Essentials* (Second Edition). Login Brothers.
* JM Utts (2004) *Seeing Through Statistics* (3rd edition). Nelson Canada.
* DS Moore & GP McCabe (2005). *Introduction to the Practice of Statistics*. (5th edition)
* L Gonnick (2000). *The Cartoon Guide to Statistics.* Harper Collins Canada LTD.

Other materials will be developed, and likely include lecture notes, etc. A central feature of the course is the set of problems. This will be based on the set of problems that has been used in HRM701.

Prerequisites:	**None for HRM students. This is a required course.**
Session	**Topic**
	Provisional list of topics
Week 1	Introduction; graphical display of data.
Week 2	Descriptive data
Week 3	Population and sampling distributions
Week 4	Inference on means 1: single sample
Week 5	Inference on means 2: two samples

Week 6	Inference on proportions
Week 7	Contingency tables: 2x2
Week 8	Contingency tables: stratified data
Week 9	ANOVA
Week 10	Simple linear regression
Week 11	Non-parametric methods
Week 12	Presentations
Week 13	Presentations

Evaluation of Student Performance
The final grade will be based on: -The tutors' assessment of the student's performance in weekly sessions (20%) -Two hand-in exercises based on problems (20% for each, 40% total) -A problem-based exercise at the end of term. This will be presented to the group. We encourage students to analyze their own data sets, rather than use one provided. If a student decides to use his/her own data, this must be approved by the tutor before proceeding. If the student has no suitable data sets available, a final problem exercise will be provided by the course coordinator (20%). -A brief, in-class, multiple choice and short answer exam (20%)

Problem Set 1

DESCRIPTIVE STATISTICS: Describing Data Graphically

You wanna be in pictures!

For the following data sets, work out some way to display the data so that you can get some idea of the distributional shape, and any relationships that appear relevant. Think about what aspect(s) of the data you are wanting to illustrate.

1-1. Two hundred (200) women with breast cancer are classified at initial diagnosis by Tumor State (I, II, III, IV). The data looks like this:

STAGE	No. of Women
I	82
II	53
III	35
IV	18
Not determined	12

1-2. The Intelligence Quotient (IQ) of 20 medical students was determined using the WAIS (Weschler Adult Intelligence Scale). The scores were:

Subject	1	2	3	4	5	6	7	8	9	10
IQ	93	104	99	110	122	115	107	106	89	97

Subject	11	12	13	14	15	16	17	18	19	20
IQ	95	102	105	86	113	131	96	91	122	110

1-3. The weight and diastolic blood pressure (DBP) of 10 football players were:

Player	Weight (kg)	DBP (mm Hg)
1	101	83
2	110	98
3	89	76
4	122	88
5	133	97
6	116	85
7	92	75
8	104	78
9	115	83
10	108	91

1-4. This data set reports the body weight in kilograms of 20 obese men who were randomly assigned to one of two exercise programs – 10 men per group. The experimental arm, and intensive program of aerobic exercise performed while wrapped in plastic, is named SWEAT (Saran Wrap Exercise Aerobic Therapy). The control arm is a sham program named SLUMP (Sedentary Lifestyle Underactivity Maintenance Program).

SWEAT:	122, 117, 104, 127, 103, 134, 129, 98, 128, 110
SLUMP:	118, 132, 109, 133, 105, 137, 133, 102, 127, 115

Problem Set 2

DESCRIPTIVE STATISTICS: Describing Data Numerically

So What Does This Mean Mean Anyway?

2. Using the first 3 data sets from Problem Set 1, figure out ways of summarizing the data to show estimates of:

   a) **Central Tendency** (where is the centre or high point of the distribution?)

   b) **Dispersion** (how wide or spread out is the distribution around the centre?)

Problem Set 3

STATISTICAL INFERENCE: Working with Distributions

Is Little Johnny Really Smart?

3-1. Intelligence Quotient (IQ) tests, unlike most things in nature, are designed to have a normal distribution with a mean of 100.0 and a standard deviation (SD) of 15.0. Suppose now that you have just received through the mail an ad which looks like this:

Don't Miss This Fabulous Offer!

Increase the IQ of your children by 15 points in just 16 weeks!

■

Subscribe now to Dr. Duntz's Dummy Dredging program
and astound your kid's friends, teachers, and grandparents!
Assure a college education for your children
(and security for your old age).

■

A scientific study of 25 children randomly sampled
from all over Dundas, Ontario
showed an average IQ score of 108 after six weeks
of the fantastic DDDD Program.

You Owe It To Your Children!

a) Leaving aside the emotional appeal and the flaws of the study design, what is the likelihood that a random sample of 25 kids from Dundas could have had an average IQ of 108 or higher by chance alone, assuming that IQ is distributed in the population of Dundas just the same as everywhere else (mean = 100, SD = 15). In other words, what is the chance of observing an improvement at least this large, under the null hypothesis that the program had no effect?

b) How big a difference is necessary to conclude that the program really had a benefit (with the usual level of statistical significance of 0.05)?

c) The proceeding calculation assumed that the program would have a benefit. Suppose that there is a chance it could lower a kid's IQ. Now if we want to frame the problem differently, so we are interested in differences in either direction, how big a difference do we need to conclude the program has been a benefit?

d) Suppose now, however implausibly, that Dr. Duntz was right and the program really is good for 15 IQ points. What is the probability that the scientists in Dundas could have observed an IQ as **small** as 108 or less, if an alterative hypothesis – the claim that the program is good for a 15 point gain – is true?

e) Asking the question in a different way, assume the treatment really did work, and the "true" gain is 15 IQ points. What is the likelihood that you might reach the wrong conclusion, and decide the treatment doesn't work? That is, what is the likelihood that you will accept H_0 when in fact H_1 is true?

f) Finally, what is the power of the study to detect a difference of 15 points?

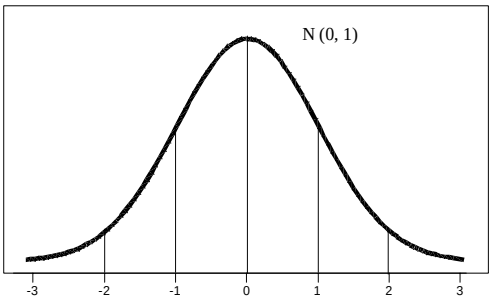
3-2. Now, let's start over again. Assume that we did exactly the same experiment, only using a sample size of 9, not 25.

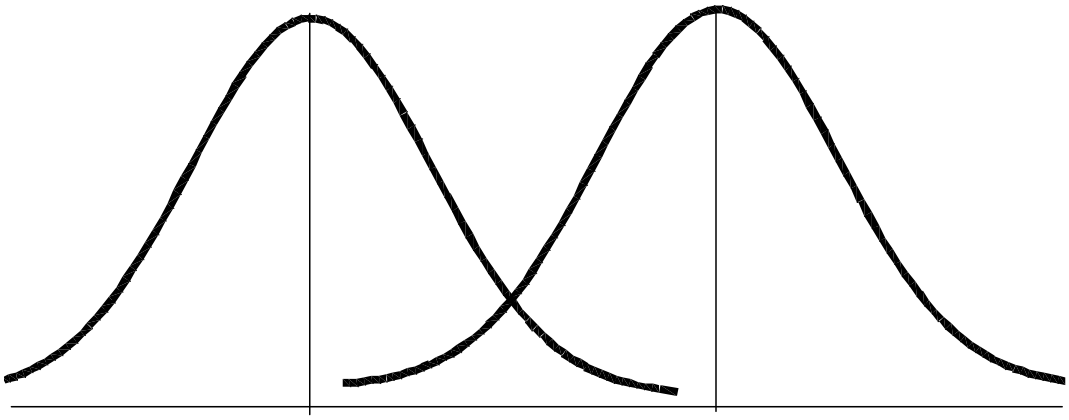
a) What is the probability of observing a treatment effect of at least 8 IQ points under the null hypothesis?

b) What is the minimum difference which will result in a decision to reject H_0 (what is the critical value)?

c) What is the probability that you would not detect a difference of 15 IQ points (a Type II error)?

d) What is the power to detect a difference of 15 IQ points?





Now for some not-so-painful practice in statistical thinking…

3-3. a) What is the approximate probability that a single diastolic blood pressure reading will exceed 95 mm Hg under the null hypothesis that diastolic blood pressure is normally distributed with a mean of 80 mm Hg and a standard deviation of 10 mm Hg?

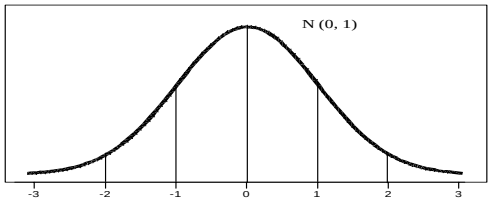
b) Suppose you take three readings, one each from three different people; What is the chance of observing the following events:

(1) None of the three readings exceeds 95 mm Hg

(2) All three readings exceed 95 mm Hg

(3) One or more of the readings exceeds 95 mm Hg

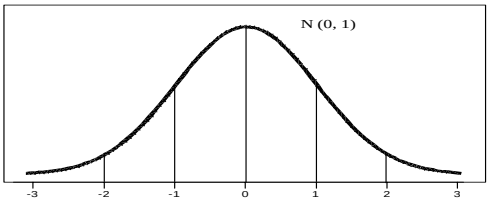
(4) The mean of the three readings exceeds 95 mm Hg



c) How does this change if the readings are taken from the same person?

3-4. Assume that the normal range of serum sodium (from 135 to 155 mmol/L) really represents a normal distribution with 95% of all individuals tested falling within these limits:

a) What is the mean and standard deviation of the distribution?



b) What is the likelihood of occurrence of each one of the following study outcomes, assuming that the subjects selected were a random sample from the normal population?

(1) A mean Na of 150 or more in a sample of 9 subjects
(2) A mean Na of between 147 and 150 in a sample of 100 subjects
(3) A mean Na of 145.3 or more in a sample of 2,500 subjects

Problem Set 4

STATISTICAL INFERENCE: Comparing 2 Groups

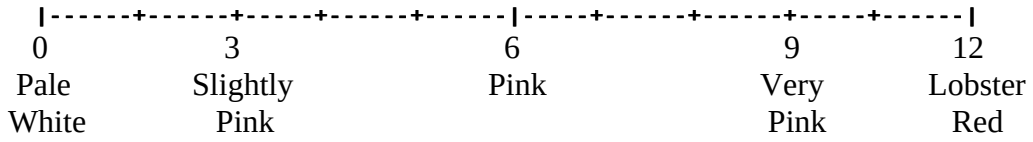
Do Sun-Screens Save your Skin?

In the last case, we compared the mean from a single sample with the "population" mean for data with a known mean and standard deviation. Such circumstances, where the true mean and standard deviation of the variable are known, are the exception and not the rule.

Far more common is the situation where you want to try out some experimental treatment on some unsuspecting folks, measure something, and compare the outcome with what it would be if there was no treatment. But since you don't know what it would be with no treatment, you randomize one half of the people to get the treatment, and one half to not get it (or to get a placebo). Then you measure an outcome in both groups and compare the two means.

Newspaper stories lately indicate that there may be some "little white lies" being told about the effectiveness of a new sun-screen treatment. To test effectiveness, it would not be too hard to do an experiment. Take a bunch of Caucasian sun worshippers, randomize half to receive the sun-screen and the other half to get a placebo containing all but the active ingredient, expose them to the sun's harmful rays (or the equally harmful but better controlled rays of the tanning salon), and measure the "degree of burning" using an ultra-red spectra-thermo-derma-meter (or something like that) based on a scale varying from "0" (pale white) to "10" (boiled lobster red):

Degree of Burning Scale



4-1. You do the experiment with 10 subjects in each group, and the data look like this:

Sun-Screen		Placebo	
Subject	Score	Subject	Score
1	3	11	7
2	2	12	5
3	5	13	6
4	7	14	9
5	1	15	5
6	3	16	8
7	4	17	4
8	6	18	7
9	5	19	5
10	4	20	4
Mean	4.0	Mean	6.0
SD	1.825	SD	1.700

How can you tell if there is a **statistically significant** difference between the two groups?

4-2. Another way to do the experiment would be to use subjects as their own control. You could put sun-screen on one arm and placebo on the other (and you would probably randomize which goes on the right arm and which goes on the left arm). You do this, and the results are as follows:

Subject	Sun-Screen	Placebo
1	3	7
2	2	5
3	5	6
4	7	9
5	1	5
6	3	8
7	4	4
8	6	7
9	5	5
10	4	4
Mean	4.0	6.0
SD	1.825	1.700

Is there still a significant treatment effect (Sun-Screen vs. Placebo)?

Problem Set 5

STATISTICAL INFERENCE: <u>Comparing More than Two Groups</u>

Do Sun-Screens Save your Skin (Part 2)?

5. In the previous problem set, we analysed the data as both an unmatched and matched design using t-tests. However, there is more to sun-screens than addressed by the simple question of "Does it work?" All screens prominently display a SPF code (Sun Protection Factor) which is defined as the ratio of time to burn with sun-screen on to time to burn with no sun-screen.

   Can we establish whether there really is a dose-response relationship? We might proceed by taking three samples of Bronzetone off the shelf, with SPF ratings of 2, 8, and 15 for the sake of argument (staying within one brand name for consistency). For six subjects in each group, the degree of burning scores might look like this:

SPF-2		SPF-8		SPF-15	
Subject	Score	Subject	Score	Subject	Score
1	10	7	7	13	4
2	11	8	5	14	5
3	12	9	12	15	6
4	4	10	2	16	3
5	5	11	5	17	2
6	6	12	5	18	4
Mean	8.0	Mean	6.0	Mean	4.0

   Once again, we ask the question: Does the SPF level affect the degree of burning?

Problem Set 6

STATISTICAL INFERENCE: Relations among Continuous Variables

Do Tall Folks Have More Fun?

6-1. The originator of this problem has always been intrigued about the possible relationship between height and subsequent career success. There may not be a relationship, but if there is, there are some intriguing possible explanations, very few of which have anything to do with actual ability. For example:

a) Tall people are perceived as having greater leadership potential.

b) Tall people got taller because they had better nutrition as children, and this was reflected in cognitive abilities, as well as size.

c) Related to b), higher social class people tend to be taller, perhaps because of nutrition, and it is well established that parents' social class predicts children's success, again for a variety of reasons.

d) Height is confounded with gender. Women are shorter, are less well paid, get less career advancement, etc. because of gender bias.

e) Physical size is reflected in cranial volume as well as height, and cranial volume is, in turn, possibly related to intelligence, hence to subsequent career success (incidentally, this last point is not hypothetical. Despite prevailing wisdom, intelligence is strongly related to job success).

To prove any of this, it is first necessary to show a relation between height and career success. To avoid d), we select only females. We select a random sample of 12,000 names from the Canadian Labour Force Survey maintained at Statistics Canada, link to their income tax data located at Revenue Canada, and retrieve their vital statistics information (i.e., height) from the National Population Health Survey data held by Health and Welfare Canada. Here are the data on 10 of the subjects:

Subject	Height (cm)	Income ($000)
1	150	40
2	180	50
3	170	48
4	190	85
5	130	35
6	210	125
7	180	80
8	170	55
9	190	60
10	130	25

Based on this data, is there a relationship between height and income?

6-2. We can at least check out some hypotheses. We could determine cranial size by CT scan but it's too expensive. Let's examine the relationship with intelligence. We do an IQ test, and the data look like this:

Subject	Height (cm)	IQ	Income ($000)
1	150	92	40
2	180	102	50
3	170	105	48
4	190	110	85
5	130	85	35
6	210	130	125
7	180	104	80
8	170	93	55
9	190	122	60
10	130	88	25

What is the better predictor – IQ or height? Once you know the relationship between IQ and income does height add anything? Does IQ add any predictive power over height?

6-3. Now for a final twist. It turns out that half the folks in the sample had rich daddies (high Socio-Economic Status (SES)) and half did not. The new data are shown below:

Subject	SES	Height (cm)	IQ	Income ($000)
1	Lo	150	92	40
2	Hi	180	102	50
3	Hi	170	105	48
4	Lo	190	110	85
5	Lo	130	85	35
6	Hi	210	130	125
7	Hi	180	104	80
8	Hi	170	93	55
9	Lo	190	122	60
10	Lo	130	88	25

How can you include this in the predictive equation?

Problem Set 7

STATISTICAL INFERENCE: Non-parametric Methods - 2 x 2 Tables

Does Sintox Cause Lung Cancer?

7-1. Workers at a manufacturing plant are concerned about their risk of developing lung cancer from exposure at the plant to a chemical called Sintox based on a recent animal study. The company agreed to participate in an industry-wide case-control study involving some 1000 lung cancer cases diagnosed over a 3-year period and 1000 unmatched controls randomly selected in an appropriate manner (that's another short course!). Long term exposure to Sintox was assessed through employment records and industrial hygiene sampling. Other pieces of information were also collected in a systematic fashion, but the primary data set consisted of the 2 x 2 table shown here:

		Sintox Exposure			
		Yes	No	Total	
Lung Cancer	Yes	400	600	1000	(cases)
	No	410	590	1000	(controls)

a) How would you summarize the workers' risk of developing lung cancer from this data?

b) Is there a significant relationship between exposure to Sintox and lung cancer?

Since it is well known that smoking is a major risk factor for lung cancer, the industry had argued that the analysis should account for smoking status. Therefore, they scurried around to collect smoking data on the study subjects from many different sources. When the data were separated by smoking status, the following tables emerged:

		Smokers		Non-Smokers	
		Sintox Exposure		**Sintox Exposure**	
		Yes	No	Yes	No
Lung Cancer	Yes	240	160	160	440
	No	330	270	80	320

c) How, if at all, does this change your answer?

d) Now another group of researchers did a similar study using matching – that is, for each lung cancer case, a control with the same smoking status was identified. The

data were presented showing the exposure history of the different pairs (of cases and matched controls).

		Cases	
		Exposed	Not Exposed
Controls	Exposed	90	100
	Not Exposed	150	160

This shows there were 90 matched pairs in which the case was exposed and the control was also exposed; 100 matched pairs in which the case was not exposed but the control was exposed; etc.

Is there a significant relationship between Sintox exposure and lung cancer? What is the odds ratio?

Problem Set 8

LIFE TABLES: Survival Analysis

Is the Drug Efficacious?

A randomized trial was conducted of patients with Stages 3 and 4 prostatic cancer. Twelve men were randomized to the study drug or an identical-looking placebo pill, and were followed over time for survival according to a standard protocol. Follow-up visits occurred at 6-month intervals, or more frequently if required:

ID	Stage	Rx	Follow-up (months)	Status
1	3	Drug	72	A
2	3	Placebo	2	D
3	3	Drug	40	D
4	3	Placebo	20	D
5	4	Placebo	31	A
6	4	Drug	42	A
7	4	Drug	35	L
8	4	Drug	69	D
9	4	Placebo	39	D
10	4	Placebo	33	A
11	4	Drug	12	L
12	4	Placebo	53	A

* Status (Survival status on last follow-up visit):

A = Alive
D = Dead from prostatic cancer
L = Lost to follow-up

a) How can you take into account the different lengths of follow-up? In particular, how do you handle the fact that some patients are still alive at the end of the observation period?
b) How would you present the data graphically to show the comparison between treatments?
c) What statistical methods might you use to compare the treatments?

Problem Set 9

STATISTICAL INFERENCE: Non-parametric Methods - Logistic Regression

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Who should get into residency?

For many years, residents have been admitted into the residency program in pediatric gerontology after an interview with the program director. He finally retires, and the new residency program director decides to try to figure out what he was using as a basis for selecting candidates. He goes back through the files for the past 10 years, and assembles data from all 15 applicants. He manages to find complete data for Licensing exam score (LMCC), undergraduate GPA, Canadian or foreign graduate, age and gender. It looks like this:

Candidate	LMCC	GPA	Canadian/ Foreign	Age	Gender	Accept?
1	550	3.2	C	32	F	Y
2	500	2.4	C	24	F	N
3	480	3.3	C	27	M	N
4	590	3.7	F	22	F	Y
5	350	3.3	C	38	M	N
6	400	3.1	F	32	F	Y
7	395	2.9	F	27	M	N
8	440	3.2	C	26	F	Y
9	390	2.8	C	31	M	Y
10	470	3.1	C	25	M	Y
11	380	3.5	F	27	F	N
12	450	3.6	F	25	M	Y
13	310	3.1	C	28	F	N
14	420	3.3	C	27	M	N
15	440	3.5	F	29	F	Y

What variables predict who gets into the program?

Problem Set 10

SPECIAL TOPICS: Agreement Among Observers

Tasting Scotch: Can you tell the difference?

A perennial issue is whether Scotch drinkers can really tell single malt from blended. Everyone thinks they can, but there have actually been studies published in the British Medical Journal indicating they can't.

One way to approach it would be to conduct an inter-rater agreement study. We take two experienced scotch drinkers, and 100 or so wee drams of Scotch (with the emphasis on wee so the raters don't get too drunk along the way). After the dust settled and the raters were dragged off to bed, the data looked like this:

		Boozer #2		
		Single Malt	Blended	Total
Boozer #1	Single Malt	50	15	
	Blended	10	25	
	Total			100

a) How would you express the agreement between the two raters?

b) Would your analysis change if Boozer #2 was actually the “Gold Standard” (i.e., truth)?

Problem Set 11

SPECIAL TOPICS: <u>Comparing groups - Multiple factors</u>

Are you still out in the sun?

11-1. Let's go back to Problem Sets 4 and 5 on sunscreens. There was something we didn't tell you. Actually, the first three subjects in each group were deliberately selected to be fair-skinned, and the last three were olive-skinned. Therefore, we have to introduce this second factor into the analysis. The data set now looks like this:

Skin Type	SPF-2		SPF-8		SPF-15	
	Subject	Score	Subject	Score	Subject	Score
Fair	1	10	7	7	13	4
	2	11	8	5	14	5
	3	12	9	12	15	6
	Mean	11.0	Mean	8.0	Mean	5.0
Olive	4	4	10	2	16	3
	5	5	11	5	17	2
	6	6	12	5	18	4
	Mean	5.0	Mean	4.0	Mean	3.0

What conclusions can you draw now? Is skin type (Fair vs. Olive) an important factor? Does the SPF effect (SPF-2 vs. SPF-8 vs. SPF-15) depend on skin type?

11-2. Suppose that instead of assigning 18 subjects to one of the three SPF groups, we decided to use the more efficient within-subject design where 6 subjects each donated three areas of skin on their bare backs for the experiment. Before you jump right into the analysis, how do you think the results of this study will compare with those in question 11-1?

Subject	SPF-2	SPF-8	SPF-15	Mean (subject)
1	10	7	4	7.0
2	11	5	5	7.0
3	12	12	6	10.0
4	4	2	3	3.0
5	5	5	2	4.0
6	6	5	4	5.0
Mean (SPF)	8.0	6.0	4.0	6.0

11-3. One final twist. Remember that three of the subjects were fair skinned, and three were olive skinned. Repeat the analysis with this **between - subject** factor back in.

Fair / Olive	Subject	SPF-2	SPF-8	SPF-15	Mean (Subject)
Fair	1	10	7	4	7.0
	2	11	5	5	7.0
	3	12	12	6	10.0
Olive	4	4	2	3	3.0
	5	5	5	2	4.0
	6	6	5	4	5.0
	Mean (SPF)	8.0	6.0	4.0	6.0

McMaster University

SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING COURSES

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM	Health Research Methodology			
COURSE TITLE	Introduction to Biostatistics			
COURSE NUMBER	HRM 701	**COURSE CREDIT**		
		FULL COURSE ( )	**HALF COURSE (X)**	**QUARTER (MODULE) ( )**
INSTRUCTOR(S)	Harry Shannon			
PREREQUISITE(S)	Not required for HRM students; otherwise, permission of the instructor.			

NATURE OF RECOMMENDATION ***(PLEASE CHECK APPROPRIATE BOX)***

NEW COURSE		**DATE TO BE OFFERED:**	**WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:**

WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.

CHANGE IN COURSE TITLE		**PROVIDE THE CURRENT COURSE TITLE:** Introduction to Health Care Biostatistics (Problem-based)				
CHANGE IN COURSE DESCRIPTION		**600-LEVEL COURSE** ***(Undergraduate course for graduate credit)*** ***Please see #4 on page 2 of this form***				
CHANGE TO FULL COURSE		**CHANGE TO HALF COURSE**		**CHANGE TO QUARTER COURSE**		
COURSE CANCELLATION	X	**PROVIDE THE REASON FOR COURSE CANCELLATION:** In the past there were two biostatistics courses offered in the HRM program, now, with the cancellation of HRM 701 there will only be one course offered: HRM 702.				
OTHER		**EXPLAIN:**				

BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description *(maximum 6 lines)* to be included in the Graduate Calendar.

CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)
2. EXPECTED ENROLMENT:
3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):
4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION: (For 600-level course, indicate the <u>Extra Work</u> to be required of graduate students, i.e., exams, essays, etc.)
5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).
6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?
PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE: Name: Harry Shannon Email: shannonh@mcmaster.ca Extension: 22333

If you have any questions regarding this form, please contact the Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/December 2006

McMaster University

SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING COURSES

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM	CHS			
COURSE TITLE	Determinants of the Health of Populations			
COURSE NUMBER	730*	**COURSE CREDIT**		
		FULL COURSE ( )	**HALF COURSE ( )**	**QUARTER (MODULE) ( )**
INSTRUCTOR(S)	Dr. Paul Krueger			
PREREQUISITE(S)				

NATURE OF RECOMMENDATION ***(PLEASE CHECK APPROPRIATE BOX)***

NEW COURSE		**DATE TO BE OFFERED:**	**WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:**

WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.

CHANGE IN COURSE TITLE		**PROVIDE THE CURRENT COURSE TITLE:**			
CHANGE IN COURSE DESCRIPTION		**600-LEVEL COURSE** ***(Undergraduate course for graduate credit)*** ***Please see #4 on page 2 of this form***			
CHANGE TO FULL COURSE		**CHANGE TO HALF COURSE**		**CHANGE TO QUARTER COURSE**	
COURSE CANCELLATION	X	**PROVIDE THE REASON FOR COURSE CANCELLATION:** Change in course description/outline. Course revised and offered as HRM 748*			
OTHER		**EXPLAIN:**			

BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description *(maximum 6 lines)* to be included in the Graduate Calendar.

In this course, students will examine the conceptual frameworks and theoretical models underlying the study of the determinants of the health of populations. The course allows the student to use advanced problem-solving, critical thought, and research to develop a comprehensive understanding of the determinants of the health of opoulations and their complex interactions and to consider the extent of congruence between the determinants of health and decision making at local and national levels. The course is built on the philosophy of self-directed, problem-based, small group learning. Students in the course have the opportunity to learn from each other, from tutors with varied and broad expertise, and from invited resource people who are eladers in their field.

CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)
2. EXPECTED ENROLMENT:
3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):
4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION: (For 600-level course, indicate the <u>Extra Work</u> to be required of graduate students, i.e., exams, essays, etc.)
5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).
6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?
PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE: Name: Email: Extension: Date:

If you have any questions regarding this form, please contact the Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/December 2006

HEALTH RESEARCH METHODOLOGY
Ph.D. PROGRAMME
FACULTY OF HEALTH SCIENCES
GRADUATE PROGRAMMES

COMPREHENSIVE EXAMINATION
PURPOSE AND PROCEDURE

McMaster University

Hamilton, Ontario

For GPCC approval, May 2007

COMPREHENSIVE BOOKLET
HEALTH RESEARCH METHODOLOGY

Ph.D. LEVEL

INDEX

DISCLAIMER

This booklet is intended to guide faculty and students through the procedures of the comprehensive examination. It is not a code of conduct or a precise legal document and, therefore, it must be understood by all that minor variations in the details, timing and manner in which the various steps are addressed or completed may occur and should be acceptable to all parties.

It is incumbent on the student to avail himself or herself of the described procedures. If any of the steps are not taken, the responsibility rests with the student and such omissions cannot be used as a basis for an Appeal against a decision of the Examining Committee. Any inquiries about these procedures are to be directed to the Board of Comprehensive Examinations (BCE) or the Administrative Assistant at extension 27718.

Any disagreement or misunderstanding over the interpretation of specific points should be referred to the Board of Comprehensive Examinations and, if resolution is not achieved, to the Associate Dean of Graduate Studies (Health Sciences) who will make a final decision.

PREAMBLE

McMaster has a long tradition of innovation in health education, one that the Health Research Methodology Program has embraced. We seek to provide our students with a comprehensive, methodologically rigorous and respectful interdisciplinary environment for learning, and to create intellectual leaders capable of addressing age-old and emerging problems in diverse areas of health research (e.g, clinical epidemiology, biostatistics, health service research, population and public health, health technology assessment and other health related fields).

GENERAL OBJECTIVE

The Health Research Methodology (HRM) Ph.D. Program seeks to provide an educational experience that produces researchers with appropriate skills to contribute to understanding the production, protection and restoration of health in individuals, patient groups or populations, by the applications of appropriate research methodology.

The comprehensive examination process within the HRM Ph.D. Program aims to assess the ability of students to integrate ideas that reflect the current state of knowledge in the five HRM fields (clinical epidemiology, biostatistics, health services research, population and public health and health technology assessment), and other areas of Health Research Methodology, as appropriate.

Candidates are expected to provide reasoned arguments to support their interpretation of the areas under study and to demonstrate their ability to use the information they have acquired. Students must pass the examination before being permitted to progress to the preparation of a research thesis.

ACADEMIC INTEGRITY AND ACADEMIC DISHONESTY

Any degree of academic dishonesty or plagiarism in the written part in the comprehensive examination is unacceptable (see Graduate Calendar, section 6.1). Any material taken word for word from the published work of others must be presented in quotation marks and referenced appropriately. It is not permissible to take the essential structure and ideas of a review article and merely to paraphrase them. The source of diagrams and figures taken from the published literature must be acknowledged. The content of the written reports should represent the student's own analysis of the research literature in the student's own words.

If academic dishonesty is suspected on the written portion of the examination the Examination Chair will be notified and the matter will be pursued through the Academic Integrity Policy of the University. The student will not be permitted to proceed to oral examination until the allegation of dishonesty is satisfactorily resolved.

GLOSSARY OF TERMS

THE BOARD OF COMPREHENSIVE EXAMINATIONS (BCE)

The Board of Comprehensive Examinations consists of at least three experienced HRM graduate faculty. committee members are appointed for staggered three-year terms by the Faculty of Health Sciences, Graduate Policy & Curriculum Committee. The Chair is appointed by the HRM Program Coordinator. The seminar coordinator(s), HRM Program Coordinator and the Associate Dean of Graduate Studies (Health Sciences) are ex-officio members.

COMPREHENSIVE SEMINAR COORDINATOR(S)

Member(s) of HRM graduate faculty will serve as seminar coordinator(s) responsible for coordinating the

PhD Seminar.

COMPREHENSIVE SEMINAR PRESENTER
An HRM graduate faculty member who serves as a resource person and content expert in each core seminar session. On occasion, a post-comprehensives Ph.D. student will serve as a presenter in non-core sessions (i.e., non-examinable sessions)

INDEPENDENT STUDY SUPERVISOR
A member of graduate faculty at McMaster University, not the student's thesis supervisor, but may be a member of the supervisory committee (NB. Only one of the independent study supervisor or the member-at-large may sit on the student's supervisory committee). This person supervises the independent study component of the comprehensives.

DISSERTATION SUPERVISOR
This person is a member of HRM graduate faculty. This person cannot serve as the student's independent study supervisor or the member-at-large.

MEMBER-AT-LARGE
A member of graduate faculty at McMaster University, not the student's thesis supervisor, but may be a member of the supervisory committee (NB. Only one of the independent study supervisor or the member-at-large may sit on the student's supervisory committee). This person aids in the evaluation of the Independent Study component of the comprehensives.

PROGRAM COORDINATOR
The Health Research Methodology Graduate Program is under the leadership of an experienced Graduate Faculty member, who is the Program Coordinator.

ADMINISTRATIVE ASSISTANT
The administrative assistant is the person responsible for the administrative functioning of the HRM Program in the Health Sciences Graduate Program Office (HSC-3N10).

AIM AND CONTENT OF THE COMPREHENSIVE EXAMINATION

The comprehensive examination process has two educational components: a Ph.D. seminar of approximately 20 sessions, providing students with the opportunity to engage in broadly interdisciplinary learning, and an independent study, involving part time work over 10 months, to allow students to demonstrate their competence in an area of specialization. The Ph.D. seminar addresses the student's need to demonstrate breadth of learning, and the independent study empowers the student to demonstrate their depth of specialization.

Full-time students will complete both components of the exam in the second year of their Ph.D. studies. Part-time students may elect to spread the comprehensive examination process over years 2 and 3, completing the Ph.D. seminar and independent studies in alternate years, as appropriate.

The comprehensive examination is graded like a course, with an overall mark that sums the grades assigned for all portions of the comprehensive process. Successful completion of both major components of the exam (the Ph.D. seminar and independent study) is required to pass (B- or above), with a final grade of pass (B- to A) or pass with distinction (A+) determined as a summary grade. The comprehensive examination process involves multiple faculty in grading each student for multiple discrete elements of the examination. These attributes improve the reliability of the evaluation process.

The comprehensive examination process as a whole will be coordinated by the Board of Comprehensive Examinations. The Ph.D. seminar will be coordinated by one or two faculty members, with individual seminar presentations developed by individual faculty presenters, in consultation with the seminar

coordinators and the Board of Comprehensive Examinations. Students are responsible for coordinating their independent study, in consultation with their dissertation supervisor (and supervisory committee, where appropriate). Students will help to identify a faculty member to supervise the independent study, and a member-at-large to aid in its evaluation.

PhD SEMINAR

The seminar consists of approximately twenty sessions. Of the 20 session dates, 12 will address core content (i.e., examinable content). Each of these core sessions will provide students with a historical, conceptual, theoretical or philosophical grounding in an area of research germane to HRM students. The first half of the core session presentation will be led by the seminar presenter; the second half of most core sessions will consist of student-led presentations and discussions on topics of interest that relate to that session's focus. Four of the 20 total session dates will be allocated to student presentations and oral defenses of independent study projects. The remaining four sessions will offer non-core material (i.e., not examinable) that is useful to students at this stage in their career (e.g., writing skills, establishing a research career, etc.). The approximate breakout of sessions will be as follows:

- Core Sessions (examinable content)
    - Ten sessions will be dedicated to a historical/philosophical/conceptual overview of each of the 5 HRM fields (generally, 2 sessions per field). The sessions should be problem oriented.
    - Two sessions will be dedicated to a similar overview of issues of scholarly or research importance to all HRM students. For example, one or more sessions might be devoted to research ethics issues, or issues in education such as student evaluation.

- Non Core Sessions (non-examinable content)
    - Four session dates will be dedicated to issues of more general interest or for skill development, specifically, pedagogical issues, career advancement, writing skills, or delivering oral presentations. The non-core sessions will typically bookend the core sessions, thus allowing students time to prepare their own presentations (either In-seminar or independent study oral defenses).

- Oral Defense Sessions
    - Four sessions will be allocated to student presentations and oral defenses of their Independent Study projects. Up to 3 students will present during each session, thus allowing one hour for presentation and response to questions (i.e., an oral defense). Several oral defense sessions will be held concurrently over the course of the month of May as necessary to ensure that all students have sufficient time to present their work.

Students are expected to attend and participate in the Ph.D. seminar for 10 months. They will be expected to submit a 2-3 page critique of previously disseminated readings for 6 of the core sessions, and may select the sessions of greatest interest or as their schedules permit. Students responsible for an in-seminar presentation on the session topic should not submit a written critique for those sessions.

Students are expected to prepare 2 in-seminar presentations in areas where they have an interest but limited expertise so that they may gain some breadth of exposure. Students will not prepare presentations within their fields of independent study or their dissertation fields. Students will use the initial list of papers identified by the faculty instructor for the relevant field session as the basis for a more advanced study in the area, addressing a question or topic of interest. To complete this advanced study, the student will be expected to identify additional, relevant readings, and prepare a 15-minute presentation (with electronic aids). Students may draw on the seminar presenter or their seminar colleagues to assist in the identification of additional sources, or search strategies, but they are expected to complete the in-seminar presentation independently.

INDEPENDENT STUDY

The independent study is expected to take 20% of the student's time (that is, one day per week), from

September through April. Full-time students are expected to complete the independent study alongside the Ph.D. seminar in the second year of their Ph.D. program. Part-time students may complete the total comprehensive examination process over two years, in years two and three, and may elect to complete either portion in either year. The independent study is intended to provide an opportunity for the student to explore an area of interest and specialization in depth. It is expected that the student will explore a topic that builds on and deepens their expertise, but the specific topic is expected to be different from the dissertation topic.

The independent study and dissertation should be distinct, so that the student has the opportunity to demonstrate breadth in their expertise. Generally, this will mean that the student explores a distinct topic or set of methods, though it is not necessary for the topic to be in a distinct field. Responsibility for ensuring the absence of extensive overlap falls to the dissertation supervisor, independent study supervisor and the supervisory committee (as appropriate), in consultation with the student.

The student, in consultation with his/her thesis supervisor (and supervisory committee, where appropriate), must select one topic (and one appropriate topic supervisor) for intensive independent study. The independent study supervisor will be a member of graduate faculty at McMaster University, independent of the thesis supervisor. The guiding principle should be that the student learns something new/valuable/and relevant in their area of specialization and will be able to demonstrate mastery of the material. Topics may be of multiple formats, including, but not limited to:

- Review state-of-the-art of an issue/area of study relevant to HRM
- Design a study to advance understanding
- Carry out a brief study including data analysis, etc.

Students must prepare a written report ***(20 pages double-spaced, excluding appendices***), summarizing their study, to be submitted at the end of March. The student will also prepare an oral presentation of their independent study (20 minutes in length), and be prepared to explain and defend their work in an oral defense (40 minutes).

TIMING OF THE EXAMINATION

Under normal circumstances, students enter the program in September. Full-time students are expected to take the comprehensive examination after the 12th month but before the end of the 24th month and part-time students before the end of the 36th month following the start of their doctoral studies. Full-time students are expected to complete the seminar in the second year of their Ph.D. studies. Part-time students may complete the total comprehensive examination process over two years, in years two and three, and may elect to complete either portion in either year. In instances in which students begin their PhD studies in January they are generally expected to complete the comprehensives exam in the same timing as those students who began the preceding September. In instances in which students begin their PhD studies in May they are generally granted a one-month extension to enable them to complete the comprehensives exam in the same timing as those students who began the following September.

Failure to successfully complete the comprehensive examination within two years of commencing the Ph.D. program for full-time students or three years for part-time students, without approval for delay by the Board of Comprehensive Examinations, will result in the student's withdrawal from the HRM Ph.D. Program.

PhD SEMINAR

The seminar consists of approximately twenty, 2-3 hour sessions that take place twice per month, on Thursday afternoons September through April and then weekly during the month of May to accommodate the independent study oral defenses. Full-time students are expected to complete the Seminar in the second year of their Ph.D. studies. Part-time students may complete the total comprehensive examination process over two years, in years two and three, and may elect to complete either portion in either year.

INDEPENDENT STUDY

The independent study topic should be chosen, and arrangements for supervision with an appropriate faculty member and for review by an appropriate member-at-large should be finalized, in time to submit a plan of study to the Board of Comprehensive Examinations for final approval by the first Thursday in June. In support of this, the seminar coordinator(s) will convene an organizational meeting the second Thursday afternoon in March for students who will begin their comprehensive examinations the following academic year, to apprise them of requirements.

The independent study will commence in September and proceed in parallel with (but independently from) the seminar throughout the academic year (though students may compress their independent study into a shorter period, if this is mutually agreed upon by the student and Independent Study supervisor). The independent study will be completed in time for students to prepare a final written report by the end of March and an oral defense in May. Key dates for students are as follows (see appendix for dates specific to coming year):

- March: Organizational meeting convened by seminar coordinators to inform pre-comp students about the process for their comprehensive examinations, beginning in September
- June: By the first of June students must submit plan of study for independent study to Board of Comprehensive Examinations for final approval. Plan of study must be signed by dissertation supervisor, independent study supervisor, member-at-large and student
- Early September: Student begins independent study and comprehensive seminar
- Early December: Student submits interim progress report to independent study supervisor and Board by first Thursday in December.
- End March: Student submits final written report on independent study to independent study supervisor, member-at-large and Board
- May: Student completes oral presentation and defense of independent study project

ROLES AND RESPONSIBILITES

THE BOARD OF COMPREHENSIVE EXAMINATIONS (BCE)

It will be the responsibility of the Board to:

i. Establish and revise the course material for the seminar, in consultation with the seminar coordinators. In most cases this will be a matter of identifying appropriate topics and identifying seminar presenters to develop/deliver the seminar on those topics.
ii. Review and give final approval to each student's Independent study plan
iii. Review and convey interim and final reports to students and the relevant authorities
iv. Serve as an advisory board for participating faculty, as issues arise
v. Serve as an advisory board for students, as issues arise

THE STUDENT

Ph.D. students pursuing their comprehensive examinations will take an active role in directing the examination, to ensure that their own educational goals are met. Specifically, the student will:

i. Select an independent study topic, in consultation with the dissertation supervisor (and supervisory committee, where appropriate), that allows the student to further develop and demonstrate depth of specialization in the field, while ensuring that the topic is sufficiently distinct from the dissertation research to evidence some breadth in the area of specialization
ii. Identify an appropriate independent study supervisor, in consultation with the dissertation supervisor (and supervisory committee, where appropriate)

iii. Develop a plan of study for the independent study, in consultation with the independent study supervisor, that specifies the project to be completed, a timeline and the nature and extent of a progress report to be submitted in December (sufficient to allow the supervisor to provide substantive interim feedback on the student's progress)
iv. Where necessary, revise this plan of study in consultation with the independent study supervisor, to account for any substantive modifications that are driven by external circumstances (e.g., the failure of an experiment, the lack of an expected data source, etc.)
v. Identify an appropriate individual to fulfill the member-at-large role for evaluation of the independent study, in consultation with the independent study supervisor (and dissertation supervisor, where appropriate)
vi. Attend and fully participate in Ph.D. Seminar activities, and complete all assignments, selecting topic areas that strengthen the student's interdisciplinary expertise and breadth of knowledge
vii. Submit a written commentary on 6 of the core sessions of greatest interest or as schedules permit. (students responsible for an in-seminar presentation on the session topic should not submit a written critique for those sessions)
viii. Prepare 2 in-seminar presentations in areas where they have an interest but limited expertise so that they may gain some breadth of exposure (i.e., not within fields of independent study or their dissertation fields)
ix. Provide an interim progress report to the Board of Comprehensive Examinations in December and to the independent study supervisor, to be evaluated by the independent study supervisor.
x. Produce a well-argued and written final report on the independent study, to be evaluated by the independent study supervisor and the member-at-large
xi. Provide a well-argued and presented oral summary of the independent study and orally explain and defend its content, to be evaluated by the independent study supervisor and the member-at-large.
xii. If problems arise with the independent study or with the seminar (where the latter cannot be resolved through consultation with the seminar coordinators), alert the Board to these issues, and work with the Board to seek a satisfactory resolution
xiii. Convey the plan of study for the independent study, any revisions of this study plan, the interim progress report, and other relevant materials as appropriate, to the independent study supervisor and the Board

PhD SEMINAR COORDINATOR(S)

One to two faculty members will serve as coordinators for the Ph.D. seminar. They will be responsible for attending (or providing alternating attendance at) each seminar, coordinating presenters for each session, ensuring continuity for students as the seminar progresses, and assisting in the grading of student activities. Specifically, the coordinator(s) will:

i. Work with the Board of Comprehensive Examinations to establish and revise the course material for the seminar
ii. Take attendance
iii. Mark in-seminar presentations (mark to be combined with that of the seminar presenter for that session)
iv. Collate marks for students on all critiques and in-seminar student presentations
v. If problems arise with individual students, alert the student to these problems where possible. Where these problems persist or cannot be resolved, alert the Board to these issues, and work with the Board to seek a satisfactory resolution
vi. Liaise with the Board of Comprehensive Examinations to provide interim and final assessments of student performance in the seminar component of the comprehensives.

PhD SEMINAR PRESENTER

Members of graduate faculty at McMaster University will serve as presenters for each core seminar session in their areas of expertise and interest. Post-comprehensive Ph.D. students may sometimes serve as seminar presenters for non-core seminar sessions, where marks are not assigned. Faculty seminar presenters will be responsible for preparing a session outline including identifying key materials

to be read in advance and critiqued. They will also mark student critiques addressing those materials, and any student presentations during their sessions. Specifically, seminar presenters will:

i. Identify appropriate articles to be pre-circulated to students in advance of the seminar session devoted to their discussion
ii. Mark all written critiques submitted for the seminar session
iii. Mark all in-seminar student presentations for the seminar session (mark to be combined with that of the seminar coordinator for that session)
iv. Liaise with the seminar coordinators to ensure that these marks have been documented

INDEPENDENT STUDY SUPERVISOR

The independent study supervisor is a member of graduate faculty at McMaster University with expertise and interest in the subject of the independent study. A key characteristic of independent study supervisors is that they are ***not*** the student's thesis supervisor (though they may be on the supervisory committee).[1] It is expected that students will pursue an advanced topic of mutual interest in an independent but consultative fashion. Independent study supervisors will be required to agree to a plan of study, as proposed and revised by the student; to submit an interim assessment of the student's progress (in December), and to evaluate the student's performance (written and oral). Specifically, independent study supervisors will:

i. Supervise a student's independent study in an area of expertise and mutual interest
ii. Assist the student to identify a member-at-Large who can evaluate the final written paper and oral presentation on the Independent Study
iii. Confirm with the member-at-large their willingness to serve in this capacity
iv. Be available for consultation at mutually convenient times at least once per month between September and April.
v. Work with student as student develops a plan of study specifying the project to be completed, a timeline and the nature and extent of a progress report to be submitted in December (sufficient to allow the supervisor to provide substantive interim feedback on the student's progress)
vi. Where necessary, encourage or permit the student to revise this plan of study in a mutually agreeable manner, to account for any substantive modifications that may be necessary or appropriate (due, for example, to circumstances such as the failure of an experiment, the lack of an expected data source, etc.)
vii. Provide an evaluation of the interim progress report to the Board of Comprehensive Exams in December, whose substance will be transmitted to the student
viii. Evaluate the student's final written paper on the independent study
ix. Evaluate the student's oral presentation and defense of their independent study
x. If problems arise, alert the Board to these issues, and work with the Board to seek a satisfactory resolution
xi. Convey all marks, and other relevant materials, to the Board in a timely manner

DISSERTATION SUPERVISOR

The proposed comprehensive examination process relies on the dissertation supervisor to play a key role in the independent study. The dissertation supervisor will assist the student to identify a suitable ondependent study (one that is of substantive interest and value to the student, but which does not replicate dissertation research), a suitable independent study supervisor, and (where appropriate) a suitable member-at-large to serve as a second evaluator. Specifically, the dissertation supervisor will:

i. Assist the student to identify an appropriate independent study topic
ii. Assist the student to identify an appropriate independent study supervisor
iii. Where requested, assist the student to identify an appropriate member-at-large to evaluate the independent study

MEMBER-AT-LARGE

[1] Note that only one of the independent study supervisor or member-at-large may sit on the student's supervisory committee.

The member-at-large is a member of graduate faculty at McMaster University with interest and expertise in the independent study topic, who assists in its evaluation. The member-at-large cannot be the student's dissertation Supervisor (though they may be on the supervisory committee).[2] Specifically, the member-at-large will:

i. Evaluate the student's final written paper on the independent study
ii. Evaluate the student's oral presentation and defense of their independent study
i. Convey all marks, and other relevant materials, to the Board in a timely manner

THE EXAMINATION PROCESS

PhD SEMINAR

Students are expected to attend and participate in the Ph.D. seminar for 10 months. They will be expected to submit a 2-3 page critique of previously disseminated readings for 6 of the core sessions, and may select the sessions of greatest interest or as their schedules permit. Students responsible for an in-seminar presentation on the session topic should not submit a critique for those sessions.

Students are expected to prepare 2 in-seminar presentations in areas where they have an interest but limited expertise so that they may gain some breadth of exposure. Students will not prepare presentations within their fields of independent study or their dissertation fields. Students will use the initial list of papers identified by the faculty instructor for the relevant field session as the basis for a more advanced study in the area, addressing a question or topic of interest. To complete this advanced study, the student will be expected to identify additional, relevant readings, and prepare a 15-minute presentation (with electronic aids). Students may draw on the seminar presenter or their seminar colleagues to assist in the identification of additional sources, or search strategies, but they are expected to complete the in-seminar presentation independently.

INDEPENDENT STUDY

The student is responsible for identifying an appropriate independent study topic and supervisor, in consultation with her/his dissertation supervisor (and supervisory committee, where appropriate). The student is also responsible for identifying an appropriate member-at-large, with the support of the independent study supervisor. The student should prepare a written plan of study that provides an overview of the independent study project, outlining any meeting schedule and the expectations for the independent study (including outlining the form and extent of a progress report that should be prepared to allow the supervisor to submit an Interim report on the student's progress to the Board of Comprehensive Exams in December). The plan of study should be agreed to by the independent study supervisor, and together with a copy of the student's curriculum vitae and a brief description of their present and any previous thesis topics, should be submitted to the Board of Comprehensive Examinations in early July. The plan of study should be reviewed and amended by the student and supervisor as necessary during the academic year, especially if major changes are made in the expectations (the Board should be notified of any such revisions).

Student Interim Progress Report

Students will submit an interim progress report on their independent study to the Board of Comprehensive Examinations and their independent study supervisor in early December. The nature and extent of the report will have been pre-specified in the student's plan of study, agreed to by July (and modified as required). The independent study supervisor will use this report to provide an interim grade (worth 10% of the final independent study mark). In addition to the progress report, which is circulated to the independent study supervisor, the student is invited to submit any further comments relating to their progress in the seminar or the independent study to the Board, in confidence.

[2] Note that only one of the independent study supervisor or member-at-large may sit on the student's supervisory committee.

Interim Assessment from Independent Study Supervisor
The independent study supervisor will submit an interim assessment of the student to the Board of Comprehensive Examination Chairs in mid-December. This assessment will consist of an evaluation of the student's interim progress report, which will be transmitted to the student directly, and any other comments on the student's progress of which the Board should be made aware, in confidence.

Interim Assessment from the Comprehensive Seminar Coordinators
The seminar coordinators will submit a brief report to the Board of Comprehensive Examinations in mid-December regarding the progress of all students participating in the comprehensive examination xeminar. The report will provide marks-to-date from written critiques and in-Seminar presentations, and an assessment of attendance. Where appropriate, the seminar coordinators will also append any comments about students' progress of which the Board should be made aware (e.g., attendance problems).

Interim Report
Students will be provided with an interim report by the Board of Comprehensive Examinations in early January. The interim report will provide feedback from three sets of reviewers (the student, the independent study supervisor, and the seminar coordinators). It is hoped that this feedback will be helpful to the student in monitoring their own progress, and that it may indicate to the Board and the student whether there are problems arising with the process such that students who are not performing satisfactorily will redouble their efforts to ensure success. Where appropriate, the Board will request a meeting with the student and/or independent study supervisor to discuss issues arising and to guide the parties to work toward a successful outcome.

Final Report
The Board of Comprehensive Examinations will provide official notification to students of their final grade shortly after the completion of the student's oral defense. This final grade will summarize the marks the students have received throughout the process, as reported by the seminar coordinators, the independent study supervisor, and the other evaluators.

EVALUATION OF THE EXAMINATION

The final mark on the comprehensive examination sums the individual components of the examination. The Ph.D. seminar is worth 50% of the total grade and the independent study is worth 50%. The student must, however, receive a mark of at least a B- in each component to be considered to have passed the exam.

PhD SEMINAR
The Ph.D. seminar is worth 50% of the final mark for the comprehensive exam. The mark for the Ph.D. seminar will be arrived at from a summation of the following components:

- Attendance: Students will receive 0.5% of their seminar grade for each session attended to a maximum of 10%, but at least 80% of the sessions must be attended.
    - Assessed by seminar coordinators
- Commentaries: Students will receive a total of 60% of their final mark for preparing 6, 2-3 page commentaries: 10% each = 60%.
    - Marked by the seminar presenter
- Presentations: Students will receive a total of 30% of their final mark for providing 2 in-seminar presentations at 15% each = 30%.
    - Students will be assessed on the quality of their presentation (electronic aids are expected) and their ability to facilitate discussion in a subsequent question and answer period.
    - Students will be assessed by the seminar presenter for that session, and 1 seminar coordinator
    - The final mark for each presentation will average the marks of the two evaluators

INDEPENDENT STUDY
The independent study is worth 50% of the final mark for the comprehensive exam. The mark for the

independent study will be arrived at from a summation of the following components:

- Interim progress report: Students will receive 10% of their independent study mark from the assessment provided by their independent study supervisor of their interim progress report. Without a progress report a mark cannot be assigned.
- Final paper: Students will receive 50% of their independent study mark from the final paper. The final paper should review the student's independent study in sufficient depth to allow an expert in the field to evaluate the student's competence. The paper should be 20 pages double-spaced, excluding appendices such as graphs, figures, tables, references and glossaries of abbreviations.
    - Students will be assessed by their independent study supervisor and the designated member-at-large
    - The final mark for the independent study paper will average the marks of the two evaluators
- Oral Defense: Students will receive 40% of their independent study mark from the oral defense. Students are expected to prepare a 20 minute presentation, covering the material reviewed in the paper (the use of electronic aids is expected), and to be able to orally explain and defend the material for a further 40 minutes.
    - Students will be assessed by their independent study supervisor and the designated member-at-large
    - The final mark for the oral defense will average the marks of the two evaluators

Key dates for evaluation (see appendix for dates specific to this year):

- Evaluation of written portion of independent study
    - Early December: Students submit interim progress report on independent study
    - Early January: Students receive interim report on their progress from the Board, including the assessment of their interim progress report
    - Late March (Time 0): Students submit final written report on their independent study
    - Early April (Time 0 + 1 week): Students receive evaluation of their final written report; students who fail are given 2 weeks to re-write the final report on their Independent Study
    - Mid April (Time 0 + 3 weeks): Students required to re-write their final reports submit revised version
    - End April (Time 0 + 4 weeks): Students receive evaluation of their re-written final report.

- Evaluation of oral portion of independent study
    - May: Students complete oral defense of their independent study
    - June: Students who failed their oral defense re-do their oral defense

- Evaluation of seminar
    - End May (at end of oral defense sessions): Students receive final grade on their seminar
    - June: Students who failed their seminar undertake oral examination to demonstrate their knowledge

PASS AND PASS WITH DISTINCTION

The final mark on the comprehensive examination sums the individual components (seminar and independent study) of the examination. The Ph.D. seminar is worth 50% of the total grade and the independent study is worth 50%. The student must, however, pass each component (i.e., B- or above) to be considered to have passed the comprehensive examination.

To pass the comprehensive seminar students must achieve a minimum of a B- in their final summary grade (i.e., the grade that sums the individual marks on the written critiques, in-seminar presentations and attendance). The final grade, whether fail (C+ or below), pass (B- to A) or pass with distinction (A+) will be determined by the summary grade. Students who do not achieve a passing summary grade on the seminar portion of the comprehensives will be given one second opportunity to address the deficiencies (see below).

To pass the independent study, students must pass both the written and oral portions of this component. Students must first pass the written portion of the independent study – that is, students must receive at least a B- on the combined grade assigned to the interim progress report (10%) and written paper (50%). Students who do not pass the written portion of the independent study will be given one opportunity to re-write the paper (see below). Students who pass the written portion of the independent study will then proceed to the oral defense. Students who are unsuccessful with their first attempt at the oral defense will be given one second opportunity (see below). Students who pass both the written and oral portions of their independent study (on first try or second chance) will be deemed to have passed that component of their comprehensive examination. The final grade on the independent study, whether pass (B- to A) or pass with distinction (A+) will be determined by the summary grade of the oral and written portions.

SECOND CHANCE AND FAILURE

Feedback mechanisms have been built into the examination process such that the student should have ample opportunity to address any potential weaknesses before the end of the comprehensive process. However, should a student fail either component of the comprehensive exam they will be provided with a second chance to demonstrate their knowledge of the material, as per the schedule outlined below. If this is required pass with distinction will no longer be a potential outcome for the student to achieve.

Ph.D. Seminar

A cumulative mark of less than 70% (B-) on the Ph.D. seminar will be considered a failure of that component of the comprehensive process. To address the deficiencies, the student will be required to sit an oral examination in late June. The oral exam will focus upon a sub-set of the topics for which the student submitted critiques and prepared presentations. The Board of comprehensive examinations will select the topics, in consultation with the seminar coordinators, and will recruit 2 additional faculty members who were involved with the comprehensive seminar to serve as oral examiners. Specifically, the student will be provided with a second opportunity to demonstrate their knowledge in two fields outside their own area of field expertise. These areas are understood to be defined by the students' selection of areas for written critiques and presentations. Where this is unclear (i.e., where students failed to submit sufficient critiques), the Board of Comprehensive Examinations will identify the areas to be examined orally, and the student will be notified. The oral examination committee will consist of:

- 1 Seminar coordinator, who acts as Chair
- 2 Faculty examiners who participated as seminar presenters in the fields under examination.

The oral examination will take 1 hour. The date for oral examinations will be specified in the seminar syllabus so that students and faculty can plan, in advance, for this possibility. Post-examination, each examiner will be asked to provide a mark using the percentage scale. The average of these two marks will determine the student's final grade on the seminar component of the comprehensive examination. If the student fails the oral examination, they will be deemed to have failed the comprehensive examination and will be required to withdraw from the program.

Independent Study

An average mark of less than 70% on the written component of the independent study (comprising the interim progress report and the final written report) will be considered a failure of that portion of the independent study. To make up for this failure the student will be required to re-submit a revised version of their final written report within two weeks of the original submission date. If the student fails on re-evaluation of the written portion, they will be deemed to have failed the comprehensive examination and will be required to withdraw from the program.

The student must pass the written portion of the independent study in order to proceed to the oral defense. Should a student fail the oral defense (based upon the average mark assigned by his/her examiners), the student will be expected to re-defend the project orally in late June. If the student fails on re-evaluation of the oral portion, they will be deemed to have failed the comprehensive examination and will be required to withdraw from the program.

IMPORTANT POINTS TO BEAR IN MIND

1. Students must submit the independent plan of study to the HRM Administrative Assistant (HSC-3N10) by the first Thursday in June.

2. Students must provide the HRM Administrative Assistant (HSC-3N10) with a copy of their curriculum vitae and a brief description of their present and any previous thesis topics when they submit their independent plan of study. This information is kept on file to prevent duplication of previous work in the comprehensive examination papers.

3. Once the sequence of dates for the examination process (i.e., independent study plan, PhD seminar presentation) has been set; it may only be delayed for reasons of ill health or other extreme circumstances. If a student fails to complete the written or oral examination components in time without such a reason, the student may, at the discretion of the Board, be considered to have failed the first attempt at the examination. The Board of Comprehensive Examinations will have the discretion in consultation with the seminar coordinators and the independent study supervisor of determining the validity of a student's need for extension. After a second failure to complete all components of the examination, the student will be required to withdraw from the HRM Ph.D. Graduate Programme.

5. The original copies of all documents relating to a student's comprehensive examination must be forwarded to the Faculty of Health Sciences Graduate Programmes Office (3N10) as they are generated, for storage in the student's file. This is essential because the Associate Dean of Graduate Studies (Health Sciences) and the Health Sciences Graduate Programmes Office will be involved if a student fails or appeals the result of his/her comprehensive examination.

TIMELINE 2007 - 2008

**All PhD seminars scheduled for 1:30 – 4 on Thursday afternoons

<table>
<tr><th></th><th>PhD Seminar</th><th>Independent Study</th></tr>
<tr><td>March 8, 2007</td><td colspan="2">Organizational Meeting</td></tr>
<tr><td>April - May</td><td></td><td>Student & dissertation supervisor (and supervisory committee, where appropriate) seek independent study supervisor

Student and independent study supervisor develop plan of study and seek member-at-large (Plan due to Board June 8th)</td></tr>
<tr><td>June</td><td></td><td>Board approves plan of study</td></tr>
<tr><td>September 13</td><td rowspan="2">Faculty-led presentations
(non-core material)</td><td rowspan="5">Student conducts independent study</td></tr>
<tr><td>September 27</td></tr>
<tr><td>October 11</td><td rowspan="12">Faculty-led presentations of core material
(first half of each session)

Student-led presentations
(second half of each session)

Students submit 2-3 page critiques for 6 sessions after reviewing material circulated by faculty facilitator</td></tr>
<tr><td>October 25</td></tr>
<tr><td>November 8</td></tr>
<tr><td>November 22</td></tr>
<tr><td>December 6</td><td>Student submits progress report</td></tr>
<tr><td>December 20</td><td>Supervisor submits interim assessment</td></tr>
<tr><td>January 3</td><td>Board distributes interim reports</td></tr>
<tr><td>January 17</td><td rowspan="4">Student conducts independent study</td></tr>
<tr><td>January 31</td></tr>
<tr><td>February 14</td></tr>
<tr><td>February 28</td></tr>
<tr><td>March 13</td><td>Student submits final report</td></tr>
<tr><td>Mach 27</td><td rowspan="2">Faculty-led presentations
(non-core material)</td><td>Evaluators submit assessments</td></tr>
<tr><td>April 10</td><td></td></tr>
<tr><td>April 24</td><td colspan="2" rowspan="4">Student presents independent study project (oral defense)</td></tr>
<tr><td>May 8</td></tr>
<tr><td>May 22</td></tr>
<tr><td>June 5</td></tr>
<tr><td>June 12</td><td colspan="2">Evaluators submit assessments</td></tr>
<tr><td>June 19</td><td colspan="2">Second chance week</td></tr>
</table>

HRM COMPREHENSIVE EXAMINATION
INDEPENDENT STUDY PLAN OF STUDY

PLEASE NOTE:
1. All sections of this form ***must*** be completed. This form must be ***signed*** by the independent study supervisor, the dissertation supervisor, the member-at-large and the student.
2. The *HRM Comprehensive Examination – Independent Study Plan of Study Form* must be completed by all Health Research Methodology student pursuing their comprehensive examinations.
3. This form must be submitted to the Board of Comprehensive Chairs by June 8th *along with a copy of your curriculum vitae and a brief description of your present and any previous thesis topic(s)*

Date:	
Student name & number:	
Dissertation supervisor:	
Members of supervisory committee:	
Independent study supervisor:	
Member-at-large:	

Independent study topic: *(Give a brief description, i.e. outline the topics or major sub-topics, and indicate anticipated outcomes)*

Relevance of proposed independent study topic: *(Please discuss the ways in which the proposed independent study will enhance your area of specialization without duplicating your dissertation research)*

Please turn over ☞

Interim progress report: *(Provide a description of the form and extent of the student's interim progress report, to be submitted in early December [exact date to be specified]. Please note, this description should clearly indicate what is required of the student; the interim progress report will be evaluated by the independent study supervisor, and will be assessed a grade worth 10% of the final grade for the independent study component of the comprehensive exam (i.e., 5% of the total grade for the comprehensives))*
Other: *(Please outline any other issues relevant to this independent study, such as a particular meeting schedule, a timeline for completion of specified elements of the study, etc.)*

I _____, [Name of Student] recognize that by signing this form I accept all responsibility in ensuring the completion of the independent study project. I understand that the independent study supervisor will play a consultative role in this project and that my work will be done independently. I also recognize that this agreement can be revised at any time, but that all parties must sign the new agreement.

By signing, each of the parties agrees that the above terms are appropriate for a comprehensive examination independent study project.

Signatures of:

PhD student: _____

Independent study supervisor: _____

Dissertation supervisor: _____

Member-at-large: _____

Memo

To: Dr. Carl Richards

From: Dr Margaret Black, Graduate Coordinator, Nursing

CC: Cassandra Weimann

Date: June 8, 2007

Re: Guide to Graduate Studies, Nursing Graduate Program

I would like to request approval for the changes to the Guide regarding the timing for the admission procedure to the PhD program for a student who completes the MSc degree requirements. Please see the proposed changes as attached.

5. ADMISSION PROCEDURE TO THE PhD PROGRAM FOR A STUDENT WHO COMPLETES THE MSc DEGREE REQUIREMENTS

The following procedure will be used:

1. The student, having begun work on his/her MSc thesis, who has an overall average of A- or higher, may be eligible for admission to the PhD Program. The student and the Supervisor shall call a supervisory committee meeting, preferably in the presence of the Nursing Program Coordinator. If the Supervisory Committee agree that the student should proceed to the PhD stream, then the supervisory committee form shall be completed to provide the following information:

   (i) A statement from the supervisory committee that they recommend the student ~~should be admitted to~~ be admitted to the PhD Program. This should also include a statement that the committee has approved a draft of the thesis with the intention that they believe the student will successfully defend and file the thesis by the September date stipulated in the Graduate Calendar.
   (ii) An approximate date when the student expects to have completed all the requirements of the MSc.
   (iii) The signature of the Nursing Program Coordinator; this would indicate that the Program Coordinator is ~~prepared to recommend the admission to the Admissions Committee of this student to the PhD stream with the propose supervisor~~ aware of the recommendation for admission going forward to the Admissions Committee with the proposed supervisor.

2. The MSc Supervisor must also ~~write a letter of endorsement of the student's application~~ complete an academic reference form for admission to the PhD program and submit this to the Admissions Officer, in the Office of the Associate Dean (Health Science, Room 3N10) by March 1st prior to the Admissions Committee meeting.

3. A letter of agreement from the proposed Supervisor (if different from the current Supervisor).

4. Before March 1st of the year the student would like to enter the PhD program, the student will submit the signed form from the supervisory committee to the Admissions Officer together with a letter indicating their career goals, area of thesis topic and reasons for the application to the PhD program, an up-to-date *curriculum vitae* and transcript and a $90.00 application fee (payable to McMaster University). When complete, the student's application to join the PhD Program will be considered at the March Admissions Committee meeting.

5. a) If the Admissions Committee approves the student for admission to the PhD Program, and once the student's MSc thesis has been defended successfully, then a "Request for Change in a Graduate Students' Status" form will be submitted by the Chair of the Admissions Committee to the Associate Dean of Graduate Studies (Health Sciences) for final approval. (Form available at www.mcmaster.ca/graduate/status.doc.

OR

4 b) It is conceivable that a student could be admitted to the PhD Program before having completed all requirements for the MSc degree. Such approval ("to be concurrently registered in both the MSc and PhD Programs") would be permitted for up to **two months** only. (Note: The same form as listed above must be completed, indicating the request to be

registered concurrently – the Coordinator of the Nursing Graduate Program will monitor student progress to ensure timing is appropriate to make this change).

6. If approval is given by the Associate Dean of Graduate Studies (Health Sciences), the Administrator, Graduate Studies shall write to the nh applicant to acknowledge that the applicant will be admitted to the PhD Program. A copy of the Administrator, Graduate Studies' letter will be sent to the School of Graduate Studies.