HPM 785
Advanced Decision Modeling
(Credit Hours: 3)
Department of Health Policy and Management
Gillings School of Global Public Health

REVISED 1/19/2017

Spring 2017 Syllabus
Class Location (2302 McGavran-Greenberg)
Meeting Time (Thursday 5:00- 8:00 p.m.)

Faculty: Kristen Hassmiller Lich, Ph.D.
Email: klich@unc.edu
Phone: 919-843-9932
Office Hours: Thursdays from 3-4 or by appointment
Course Pre-requisites HPM 772 or permission of instructor. High-level proficiency/expertise with Microsoft Excel® required.

Course Overview

In HPM 772 (and its pre-requisite HPM 770) you learned to develop economic models for cost-effectiveness and cost-utility analyses using data from the literature and other sources, and began the process of testing the sensitivity of model outcomes to parameters and assumptions made in an elementary fashion.

This course adds to these skills by first broadening your set of tools, which we will relate back to prior work in Excel with add-ons. We will explore more sophisticated sensitivity analysis techniques. Specifically, we will learn how to select and correctly parameterize distributions to explore uncertainty in different parameters, explore the net-benefit framework for interpretation, and use incremental cost-effectiveness ratio (ICER) planes, cost-effectiveness acceptability curves (CEACs), and confidence intervals for presentation and interpretation. We will meet additional sensitivity analysis methods from engineering, such as Sequential Bifurcation and Morris Methods. We will also learn advanced methods to calibrate our decision support models and build confidence in them. We will close with a discussion of advanced model analysis and interpretation, including design of (simulation) experiments, advanced approaches to uncertainty analysis, and interpretation of large quantities of simulation output (e.g., principle component analysis, classification, clustering).

Along the way, I will encourage you to broaden your thinking about the kinds of questions and problems for which decision support models are useful. For those of you who took HPM 770, we will revisit some decision support modeling derived from operations engineering – for example, forecasting and queueing models. As well, we will discuss key terms like “systems”, “systems science”, and “complexity,” exploring how what you’ve already learned is a wonderful building block to addressing even more complex public health problems. Throughout, and in common with both HPM 770 and 772, we will practice formulating problem statements and conceptualizing decision problems. And, we will gain
exposure to several modeling approaches (and supportive software) to address these problems, including TreeAge, AnyLogic, and (as time permits) Vensim.

For each of these types of models and for the analytical techniques presented, we will discuss best practices. Instruction in this course will be multi-modal, employing lectures, guided instruction on “see one, do one” (SODO) exercises, and in-class exercises to reinforce course materials.

**Learning Objectives and HPM Competencies**

Upon successful completion of the course, students should be able to perform each item listed.

<table>
<thead>
<tr>
<th>Course Learning Objective</th>
<th>Competencies†</th>
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<tbody>
<tr>
<td>1. Conduct probabilistic sensitivity analysis, including the identification and</td>
<td>AT, ST, IS,</td>
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<tr>
<td>appropriate parameterization of parameter distributions, correct use and interpretation</td>
<td>2, 6, 7, 9</td>
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<tr>
<td>of the net-benefit framework using ICER planes, CEACs, and confidence intervals.</td>
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<tr>
<td>2. Develop proficiency in the use of Crystal Ball software and to have fundamental</td>
<td>AT, ST,</td>
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<tr>
<td>expertise in the use of TreeAge® Pro-Suite software for the conduct of probabilistic</td>
<td>2, 6,7,9</td>
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<td>sensitivity analysis and development of sophisticated decision models, respectively.</td>
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<tr>
<td>3. Identify and understand when other types of advanced decision models (i.e., discrete</td>
<td>AT, ST, IS,</td>
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<td>event simulation, agent-based modeling, and system dynamics) are more appropriate than</td>
<td>2, 6, 7, 9</td>
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<td>standard decision analysis techniques, and to be able to design, conduct analysis, and</td>
<td></td>
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<tr>
<td>interpret results from these approaches.</td>
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<tr>
<td>4. Critique economic evaluation and decision modeling studies in the peer-reviewed</td>
<td>CS, 10</td>
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<tr>
<td>literature.</td>
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Master’s Program Competencies: AT, Analytical Thinking; CS, Communication Skills; IS, Information Seeking; ST, Systems Thinking

PhD Core Competencies: 2. Develop expertise in a substantive area (a minor); 4. Identify and appropriately apply theoretical knowledge and conceptual models in support of health services/health policy research; 6. Select appropriate research designs and methodologies (quantitative and qualitative) for health services/health policy research; 7. Understand and appropriately apply analytical strategies used in health services/health policy research; 9. Interpret and explain the results of research; 10. Critically evaluate articles from scholarly journals and research presentations. Source: [http://sph.unc.edu/files/2014/09/hpm_docguide_2014_2015.pdf](http://sph.unc.edu/files/2014/09/hpm_docguide_2014_2015.pdf) (page 2).

**Resources**

**Website:**

HPM 785 has its own website using Sakai software (See http://sakai.unc.edu.) All registered students are automatically enrolled in the site. This website will be used extensively during the course, and students should check the site frequently for announcements, changes to the schedule, and access to readings. Lecture slides and other materials will be posted on Sakai. All written assignments will be turned in via the Sakai Assignment Tool. Students will be able to check grades on the website.

**Textbooks:**

Two books are required, which you likely bought in HPM 772. Please purchase from the most economical provider—either new or used is acceptable.


**Articles:**
In addition, I have selected a number of articles and conference proceedings to augment the textbook readings. These readings are available on the Sakai site. Alternatively you may obtain them directly through the library or web links provided.

**Software:**
Four software programs will be used in this course—Crystal Ball (Oracle Corporation), TreeAge® Pro-Suite (TreeAge Software, Corp), Vensim, and AnyLogic. Crystal Ball is available through UNC virtual lab. All other software can be obtained in evaluation/trial mode for the purposes of class. If you wish to work more extensively in any software, see me to find out how to acquire a student copy (there may be cost). For example, a limited (but very appropriately sized) version of TreeAge® Pro Suite is available [http://www.treeage.com/shop/](http://www.treeage.com/shop/) for purchase for $45. NB: In the drop down boxes on the website, select “Academic Use” and “Purchase Student Course License ($45.00)”. Please purchase your software with sufficient time to install and to familiarize yourself with basic commands.

**Web Sources:**
A limited number of documents and other items are available from the course Sakai site. These websites are listed as links in the “Course Materials” tool. Students are encouraged to bring to the instructor’s attention other web resources as well as to report broken or incorrect links.

**Requirements and Expectations**

**Active Participation in class discussion and see-one-do-one (SODO) activities:**
In order to be successful learning experiences, your active participation is required in the SODO discussions and the in-class exercises/activities. You will need to make certain that you have prepared thoroughly for the activities, have all necessary materials, and come prepared with thoughtful questions (questions of clarification on difficult points are considered thoughtful). Attendance is important; therefore please make certain that you notify the instructor if you will miss a session.

**Peer model critique:**
One skill we will practice in this class is really stepping into a colleague’s model, making sense of it, and giving thoughtful feedback. Not only will this help you learn to debug your own models, it will also help you appreciate why it’s worth spending a little extra time thinking about the “art” of modeling. This will be due Jan 31.

**Problem/Solution Report:**
More than anything in this class, I want to teach you how to think like a modeler, and learn how to learn new tools and approaches. To this end, each student will complete a structured exercise, in which they identify a methodological problem, describe it, identify a solution, and describe it – generally and with a step-by-step description of how it is implemented. Examples forthcoming. This will be due April 27.
Modeling Project:
In lieu of a final exam, you will be asked to present a final modeling project in a poster session. Each student will be asked to develop a model over the course of the semester, which may continue their work from HPM 770 or 772, or develop a new model using any techniques learned in class. Students are required to submit reports monthly, throughout the semester, though they will not be formally graded (credit will be given based on whether or not the submission was responsive to all requirements). The first report will describe the focal problem statement, motivate and inform it using a conceptual framework, and outline modeling approach at a high-level and introduce your objectives (Feb 05). The second report will update prior content, and add a formal modeling plan (Mar 19). The third report will update prior content, and add an operationalized simulation model and sensitivity analysis description and results (April 10). The fourth report will update prior content, and add a final poster presentation, explaining how the student handled calibration, testing, uncertainty analysis, and interpretation of results (April 27). The formal poster session date is to be decided. (And we can discuss whether you all would prefer a poster session or a short podium presentation.)

Modeling peer evaluation:
Each student will be assigned to another student, and asked to provide detailed feedback on their monthly reports and assist in debugging their model. All feedback is due within one week after the assignment is submitted (dates in section above).

Late Assignment Policy:
All assignments are due at time/dates specified in this syllabus and corresponding schedule on Sakai, and are to be submitted using the Sakai Assignment Tool. Late assignments will not be accepted, except in the case of unforeseen and distressing events (serious illness, a death in the family). Please notify the instructor immediately should one of these events arise.

Additionally, I attempt to avoid making assignments due on known religious holidays (see www.interfaithcalendar.org). Should I have set a deadline during a relevant observance, please let me know so that I can make appropriate accommodation.

Class Participation:
You are responsible for preparing all assigned readings and/or materials in advance of the course session. Lecture slides will be available from the course website. You are strongly encouraged to take your own detailed notes rather than to rely on the lecture slides. The slides present only highlights of information and, thus, are not comprehensive. You should have access to the readings on the day they will be discussed. You also are encouraged to bring to the attention of the instructor and course colleagues relevant items of interest.

Cell Phones, Laptops, and Tablets:
As our classroom does not have sufficient outlets, you should make certain that your laptop is fully charged at the beginning of each class session. Please do not read/send e-mail or use the internet during class for anything aside from class purposes. Using the internet can be very distracting to your colleagues and the instructor. Cell phones are to be used only in case of emergency and should be placed in “vibrate” mode. Your cooperation in this matter is truly appreciated.

Syllabus revisions:
The instructor reserves the right to make changes to the syllabus, including due dates and test dates. Changes will be announced as early as possible.
Evaluation Method

Grade Components:
A total of 100 points are possible in this course. Weight will be assigned to the required assignments or grade components as indicated below.

<table>
<thead>
<tr>
<th>Component</th>
<th>% of Grade</th>
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<tbody>
<tr>
<td>Problem/solution report</td>
<td>20</td>
</tr>
<tr>
<td>Peer-model critique</td>
<td>20</td>
</tr>
<tr>
<td>Modeling project (sufficiently responsive ~monthly reports count for 2.5 each; final poster/project write-up/model counts for 30)</td>
<td>40</td>
</tr>
<tr>
<td>Peer review of modeling project (5 per thoughtful feedback at each ~monthly submission)</td>
<td>20</td>
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<tr>
<td>TOTAL</td>
<td>100</td>
</tr>
</tbody>
</table>

Grading Scale:
Your scores from each of the assignments will be combined to calculate your total score. Final grades will be assigned according to the following scheme:

- 90 or above = H
- 76 to 89 = P
- 65 to 75 = L
- Below 65 = F

Evaluation Criteria:
Evaluation is specific to each assignment. Grading criteria (available on the course website) describe the required elements of each assignment and the weight placed on each of the elements. You are encouraged to print these criteria and use them as checklists to ensure that you have completed each element of the assignment. Among these criteria are:

- Clarity and thoughtfulness of written materials. Correct use of grammar and scientific terms is required.
- Well-crafted and thoughtful discussion and participation that enhances learning and class discussions/activities.
- Effective, appropriate application of course materials and other resources in the written assignments.
- Other evaluation criteria (elements specific to the assignment are listed in the rubric).

Each assignment will be graded using the following scale (the points awarded for the grades will depend on the assignment and its total points—specific information will be provided with each assignment).

0 = Poor effort
\( \sqrt{ } = \) Fair/average effort, but several key elements were missing
\( \sqrt{ } = \) Overall good effort/acceptable graduate-level work, only minor errors/omissions
\( \sqrt{+} = \) Excellent effort/high-quality graduate-level work

Written communication is very important in our field. The following article provides important information on writing cogent, professional scientific prose. If English is not your first language, you are encouraged to seek out the services of the UNC Writing Center or a professional editor; please notify the course instructor if you will be using an editor.

UNC Honor Code
The principles of academic honesty, integrity, and responsible citizenship govern the performance of all academic work and student conduct at the University as they have during the long life of this institution. Your acceptance of enrollment in the University presupposes a commitment to the principles embodied in the Code of Student Conduct and a respect for this most significant Carolina tradition. Your reward is in the practice of these principles.

Your participation in this course comes with the expectation that your work will be completed in full observance of the Honor Code. Academic dishonesty in any form is unacceptable, because any breach in academic integrity, however small, strikes destructively at the University's life and work.

If you have any questions about your responsibility or the responsibility of faculty members under the Honor Code, please consult with someone in either the Office of the Student Attorney General (966-4084) or the Office of the Dean of Students (966-4042).

Read “The Instrument of Student Judicial Governance” (http://instrument.unc.edu).

Course Evaluation
HPM participates in the UNC-CH’s online course evaluation system, enabled at the end of each semester. Your responses will be anonymous, with feedback provided in the aggregate. Open-ended comments will be shared with instructors, but not identified with individual students. Your participation in course evaluation is an expectation, since providing constructive feedback is a professional obligation. Feedback is critical, moreover, to improving the quality of our courses, as well as for instructor assessment.

In addition, at various points in the semester, the course instructor will solicit your feedback; your thoughtful and constructive participation is appreciated.

Recognizing and Encouraging Diversity
The importance of diversity is recognized in the mission statement of HPM. In the classroom, diversity strengthens the products, enriches the learning, and broadens the perspectives of all in the class. Diversity requires an atmosphere of inclusion and tolerance, which oftentimes challenges our own closely-held ideas, as well as our personal comfort zones. The results, however, create a sense of community and promote excellence in the learning environment. This class will follow principles of inclusion, respect, tolerance, and acceptance that support the values of diversity.

Diversity includes consideration of: (1) life experiences, including type, variety, uniqueness, duration, personal values, political viewpoints, and intensity; and (2) factors related to “diversity of presence,” including, among others, age, economic circumstances, ethnic identification, family educational attainment, disability, gender, geographic origin, maturity, race, religion, sexual orientation, social position, and veteran status.