Risk Calculation for Genetic Counseling
Human Genetics 2039
University of Pittsburgh Graduate School of Public Health
Spring 2017
1 credit

Fridays 1:30 – 2:25 (see schedule), room 3140
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Course Description (online)
Provides training in calculating risk of disease, or carrier status, in a variety of genetic counseling situations by learning to identify the sources of risk in the counselee's personal and family history and to analyze and synthesis a single overall risk of disease from these competing risks.

Course Description (detailed)
This course provides hands-on training in calculating risk of disease or carrier status in a variety of typical genetic counseling situations, as well as discussion of the limitations of those calculation methods. Seven topics are included: four pedigree-based calculation topics that will be covered in depth, and three other risk prediction paradigms that will be discussed briefly.

- Pedigree-based risk calculation for dominant diseases
- Pedigree-based risk calculation for recessive diseases
- Pedigree-based risk calculation for X-linked diseases
- Pedigree-based risk calculation using linked markers

- Risk prediction based on population screening
- Epidemiological models for risk calculation (e.g. for breast cancer)
- Risk prediction/discussion based on whole-exome or whole-genome sequence

Detailed learning objectives are listed at the end of the syllabus.

PeopleSoft Course Description
Provides training in calculating risk of disease, or carrier status, in a variety of genetic counseling situations by learning to identify the sources of risk in the counselee's personal and family history and to analyze and synthesis a single overall risk of disease from these competing risks.

Course Format
For each calculation topic, there will be one or two lectures (including extensive class participation in problem solving) to demonstrate the calculation methods, a homework set to practice solving problems, and an exam consisting of problems very similar to those on the
homework. The course is “competency-based,” which means that students may re-take exams on each topic as many times as desired to achieve competency. Only the final grade on each exam will count toward the course grade. Homeworks must be turned in, but will not be graded for correctness, only completion. Solutions will be posted on courseweb and discussed in class.

Textbook and Course Materials
You may want to have a copy of Risk Calculation in Genetic Counseling by Ian Young, 3rd edition (purple cover, available electronically or on paper). It is not required, but some students find it useful to have a reference other than what we do in class. All required course materials will be posted on courseweb.

Grading
There is no pre-determined numeric grading scale and students’ cumulative performance across all assessments will lead to an assigned letter grade based on the following rubric. A: the student demonstrates mastery of all detailed learning objectives listed below; B: the student demonstrates mastery of most detailed learning objectives listed below; C: the student fails to demonstrate mastery of a significant number of the detailed learning objectives; D: the student fails to demonstrate mastery of most detailed learning objectives; F: the student fails to demonstrate mastery of any detailed learning objectives.

Academic Integrity
Homework can and should be done collaboratively, but most students learn better if they try the problems themselves first, then consult with others, then create their own final write-up.

Exams will be in class and should be entirely your own work. A one-page “cheat sheet” will be allowed for each exam.

All students are expected to adhere to the school’s standards of academic honesty. Any work submitted by a student for evaluation must represent his/her own intellectual contribution and efforts. The Graduate School of Public Health’s policy on academic integrity, approved by EPCC on 10/14/08, which is based on the University policy, is available online in the Pitt Public Health Academic Handbook (www.publichealth.pitt.edu/home/academics/academic-requirements). The policy includes obligations for faculty and students, procedures for adjudicating violations, and other critical information. Please take the time to read this policy.

Students committing acts of academic dishonesty, including plagiarism, unauthorized collaboration on assignments, cheating on exams, misrepresentation of data, and facilitating dishonesty by others, will receive sanctions appropriate to the violation(s) committed. Sanctions include, but are not limited to, reduction of a grade for an assignment or a course, failure of a course, and dismissal from the school.

All student violations of academic integrity must be documented by the appropriate faculty member; this documentation will be kept in a confidential student file maintained by the Office of Student Affairs. If a sanction for a violation is agreed upon by the student and instructor, the
record of this agreement will be expunged from the student file upon the student's graduation. If the case is referred to the Pitt Public Health Academic Integrity Hearing Board, a record will remain in the student’s permanent file.

Accommodation for Students with Disabilities
If you have any disability for which you may require accommodation, you are encouraged to notify both me and the Office of Disability Resources and Services, 140 William Pitt Union (Voice or TTD 412-648-7890) as early as possible in the term.

Detailed Learning Objectives

Dominant inheritance
Be able to infer Mendelian inheritance patterns and obligate carrier status and calculate risks in a pedigree, considering the following factors.

• various affected and unaffected pedigree members
• reduced and age-dependent penetrance
• genetic test results and metabolic test results
• negligible or high mutation rate

Recessive inheritance
Be able to infer carrier status and calculate Mendelian risks in a pedigree, considering the following factors in addition to those listed for dominant inheritance.

• consanguinity
• relatively common disorders with multiple mutations

X-linked inheritance
Know and/or be able to calculate risks for common pedigree situations such as mother of an isolated case, mother of two cases, sister of an isolated case, etc., and be able to calculate Mendelian risks in a pedigree, considering the following factors in addition to those listed for dominant and recessive inheritance.

• various configurations of affected and unaffected relatives in the generation of the consultand, the generation above, and the generation below

Calculations using linked markers
Be able to calculate risks based on linked markers for the following situations.

• dominant disease with phase known
• dominant disease with phase unknown
• recessive disease
• x-linked recessive disease

Non-calculation topics
Risk prediction based on screening tests and tools
  - Be able to explain what is meant by a “screening” test
- Be able to explain why most positive results may be false positives
- Calculate posterior risk of disease

Epidemiological models for risk prediction (Gail, Klaus, etc.)
- Be able to discuss what they are, how they work, strengths, weaknesses

Risk prediction from sequencing data
- Be able to discuss what it is, how it works, strengths, weaknesses

Schedule

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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>homework</th>
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<tbody>
<tr>
<td>January 6</td>
<td>Intro lecture</td>
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<tr>
<td>January 13</td>
<td>Dominant lecture, dominant practice problems</td>
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<tr>
<td>January 20</td>
<td>Recessive lecture, recessive practice problems</td>
<td>dominant homework due</td>
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<td>January 27</td>
<td>Dominant exam</td>
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<tr>
<td>February 3</td>
<td>X-linked lecture, x-linked practice problems</td>
<td>recessive homework due</td>
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<tr>
<td>February 10</td>
<td>Recessive exam</td>
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<td>February 17</td>
<td>Linked marker lecture, linked marker problems</td>
<td>X-linked homework due</td>
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<td>February 24</td>
<td>X-linked exam</td>
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<td>March 3</td>
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<td>Spring break</td>
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<td>March 31</td>
<td>WES and WGS, screening and epi models</td>
<td>linked marker homework due</td>
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<td>Linked marker exam</td>
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<td>April 14</td>
<td>Optional day for repeat tests</td>
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<td>April 21</td>
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