



# Biostatistics Exemption Exam

## **Preparing for the wealth of opportunities at Berkeley**

SPH students bring a range of experiences to graduate and professional study. Many of you haven't dealt with the challenges of the classroom for a number of years, and may find it helpful to spend some time in the coming months preparing to make the most of your time at UC Berkeley. This short note discusses three particular areas.

## **Quantitative reasoning**

Many courses in the School of Public Health, including those in epidemiology, biostatistics, research methods, and financial management, involve working with equations. The necessary skills -- basic math, symbolic manipulation, scientific reasoning, and algebra -- are the same skills tested in the Quantitative and Analytic sections of the GRE. So that you are able to participate fully and confidently in your classes at Berkeley, we recommend additional self-study for those who scored below the 75th percentile on either the Quantitative or Analytic sections of the GRE. We also suggest that those of you who were not required to take the GRE as part of the admission process assess your quantitative and analytic skills before you begin classes in the fall and practice the skills you have not used recently.

Students need to be comfortable with scientific notation, fractions, proportions, percents, exponents, the properties of square roots, simplifying algebraic expressions, solving equations in one or two unknowns, and plotting points and lines. Familiarity with logarithms is also necessary. While some of these topics are reviewed in discussion sections for the introductory courses, being familiar with them will make it easier to assimilate new material.

GRE review books are helpful, as are introductory statistics textbooks like *Biostatistics: How it Works*, by our own Professor Steve Selvin, which is the text for PH142, or *An Introduction to the Practice of Statistics* by David Moore and George McCabe, which is the text for PH141. Actively working problems, particularly "word problems," is essential.

## **Computers**

Because a number of epidemiological and statistical software packages are not implemented on Macintosh computers, computing in SPH classes is conducted in a Windows environment. An acquaintance with the basics of Windows is helpful. These basics include: a familiarity with icons on the Windows desk top, use of menus and dialogue boxes in programs, use of files, directories, and Windows Explorer with diskettes, flash drives, and hard drive files, use of the Windows clipboard to cut and paste and to shift text between applications, word processing (Word), and spreadsheets (Excel).

Experience with the internet and electronic mail (e-mail) is also helpful. Registered UC Berkeley students have access to basic e-mail services through the campus.

## **Biostatistics and Public Health**

Statistics plays an important role in public health research and practice. All MPH students are encouraged to take advantage of the resources of UC Berkeley to increase their statistical skills.

Many of the school's programs require that MPH students achieve a competence equivalent to two semesters of coursework in





biostatistics. Some programs require only a single semester of biostatistics. A strong background in biostatistics is essential for those considering a doctoral degree.

Students who do not have a working knowledge of basic statistical methods are required to take Public Health 142, typically in the fall semester of their first year of study. (One year MPH students may also take Public Health 141 in the summer.) We encourage students who have a good working knowledge of the basics to move directly into Public Health 145 or the 200 level intermediate biostatistics courses.

### Choosing the appropriate Biostatistics class

In consultation with their advisers, entering MPH students determine whether they need to enroll in Public Health 142 in their first semester, or whether they are ready to enroll in more advanced biostatistics courses. The Academic Coordinator in Biostatistics, Maureen Lahiff, can assist students in assessing their prior course work and working knowledge of biostatistics, but the student's adviser has the primary responsibility.

The Biostatistics Exemption Exam, described in the next section, is not a placement exam. There is no biostatistics placement exam. Entering MPH students may enroll in Public Health 145 or 200 level biostatistics courses after consultation with their advisers. For further information, please consult the course instructor or Dr. Lahiff.

### Biostatistics Exemption Exam

As a general principle, the School strongly encourages students who have a working knowledge of basic biostatistics to take advantage of the opportunities at Berkeley to further develop their statistical skills.

The exemption exam documents basic competence in biostatistics. The biostatistics exemption exam is not required as placement exams for higher level courses. It should be taken only by students who enter the MPH program with a good working knowledge of statistics and who do not plan to take any biostatistics courses as part of their MPH program

The exemption exam for PH142 is similar to a comprehensive final for a semester course in introductory statistics. A list of topics and suggested references is attached.

With consent of their adviser, students in the one-year MPH program who are required to have the equivalent of two semesters of biostatistics may take an exemption exam for the second semester of biostatistics by special arrangement. Please contact Maureen Lahiff ([lahiff@berkeley.edu](mailto:lahiff@berkeley.edu), 510-642-4028), Academic Coordinator in Biostatistics, for information about this exam.

Students who need to take a biostatistics exemption exam outside of the times it is offered during welcome week should contact Dr. Lahiff.

### Topics Covered

- ⇒ elementary probability for events
- ⇒ conditional probability and Bayes' formula
- ⇒ probability distributions for random variables
- ⇒ mean and expectation
- ⇒ the central limit theorem
- ⇒ binomial distribution
- ⇒ normal distribution
- ⇒ normal approximation to the binomial distribution
- ⇒ distribution of sample averages and proportions
- ⇒ one sample tests and confidence intervals for means and proportions
- ⇒ tests and confidence intervals for paired differences
- ⇒ two sample tests and confidence intervals for means and proportions
- ⇒ power of tests
- ⇒ finding required sample sizes for confidence intervals of desired accuracy
- ⇒ finding required sample sizes for required power
- ⇒  $\chi^2$  tests for r by c tables
- ⇒ regression with one X variable



# Reading List

These are only a few of the possible resource books; if you have statistics texts, please consult the topics lists for the exams.

The exam is open book. Working time is 3 hours. A calculator capable of taking square roots will be needed.

## **For the Public Health 142 basic material:**

Selvin, Steve. *Biostatistics: How it works*. Pearson.

Moore, David and McCabe, George. *Introduction to the Practice of Statistics*. Freeman. any edition. (the 6th edition has a third author, Bruce Craig)

Daniel, Wayne. *Biostatistics*. Wiley. any edition.

Pagano, Marcello, and Gauvreau, Kimberlee. *Principles of Biostatistics*. Duxbury. any edition.

Agresti, Alan, and Finlay, Barbara. *Introduction to Statistics for the Social Sciences*. Prentice Hall. 2nd or 3rd edition.

Rosner, Bernard. *Fundamentals of Biostatistics*. Duxbury. any edition.

Zar, Jerrold. *Biostatistical Analysis*. Prentice-Hall. any edition.

## **For advanced (second course) biostatistics material:**

Agresti, Alan. *An Introduction to Categorical Data Analysis*. Wiley.

Agresti, Alan and Finlay, Barbara. *Statistics for the Social Sciences*. Dellen. any edition.

Neter, John et al. *Applied Linear Statistical Analysis*. Irwin. any edition.

Fleiss, Joseph. *Statistical Methods for Rates and Proportions*, 2nd ed. Wiley.

Hosmer, David and Lemeshow, Stanley. *Applied Logistic Regression*. Wiley.

Jewell, Nicholas. *Statistics for Epidemiology*. Chapman Hall.

Selvin, Steve *Statistical Analysis of Epidemiologic Data*. Oxford Press

**For more information, contact Dr. Maureen Lahiff at [lahiff@berkeley.edu](mailto:lahiff@berkeley.edu).**