MPH Options for the Biostatistics Requirement

• Biostatistics options (choose one)
  – Statistical Reasoning in Public Health (611-612)
  – Statistical Methods in Public Health (621-623 required, 624 is optional)
  – Methods in Biostatistics (651-654)
Why are there 3 options?

- Heterogeneous student population
  - Diverse backgrounds
  - Differing quantitative backgrounds
  - Varying needs
- What are the different desired skills?
  - Critical statistical reasoning and thinking
  - Understanding of statistical methods and techniques
  - Skills in performing data analysis
  - Understanding of statistical theory
Types of Students

- **“Consumer”** - wants to develop skills for critical reading of the literature and reviewing of research proposals
- **“User”** - wants to develop additional computational skills and hands-on experience in analyzing data sets (data analysis skills)
- **“Advanced”** - has more advanced mathematical skills and wants to understand statistical techniques in more depth (theoretical underpinnings)
Why would you want to develop data analysis skills?

• If you want to develop skills to have hands-on experience in using a data set to do research or program evaluation. For example:
  – Assess relationships between risk factors and disease status
  – Evaluate a health program or treatment regimen
  – Analyze outcome or performance between two groups or programs over time
  – etc.
Description of the Options

- **For the consumer**: 3 credits x 2 terms = 6 credits
  Statistical Reasoning in Public Health (611-612)
  - 2 terms; 2 lectures per week; no labs; minimal computing

- **For the user**: 4 credits x 3 terms = 12 credits
  Statistical Methods in Public Health (621-623)
  - 3 - 4 terms; 2 lectures per week; 1 lab; other sessions
  - Statistical computing using Stata statistical analysis package

- **For the advanced**: 4 credits x 4 terms = 16 credits
  Methods in Biostatistics (651-654)
  - 4 terms; 2 lectures per week; 1 lab; statistical computing using R, S+ or Stata statistical analysis package
What topics are covered in all 3 options?

• The objectives of **all 3 options** methods:
  – Causal reasoning
  – Summarizing data: exploratory data analysis, tables and graphs
  – Probability concepts and distributions
  – Hypothesis testing and confidence intervals
  – p-values and statistical significance
  – Sample size and power
  – Linear and logistic multivariable regression analysis
  – Survival analysis and Cox regression analysis
How do the options differ?

- **Biostatistics 611-612** involves minimal calculation/computing.
- **Biostatistics 621-623** and **Biostatistics 651-654** teach the tools and techniques of data analysis. Both sequences use computers and statistical analysis packages.
- **Biostatistics 651-654** explains statistical techniques in more depth and requires students to have more advanced mathematical skills.
How do students typically distribute across the sequences?

- **Statistical Reasoning in Public Health (611-612)**
  - 70+ students (50-100 MPH students)

- **Statistical Methods in Public Health (621-623)**
  - 350+ students (100-150 MPH students)

- **Methods in Biostatistics (651-654)**
  - 50+ students (0 - 5 MPH students)
How does a student choose the introductory sequence?

- The Departments have requirements for non-MPH degree candidates.
- The **MPH student** will need to assess his/her own:
  - Mathematical skills and aptitude based on
    - Familiarity with mathematics, algebra
    - Performance in previous quantitative courses
  - Professional needs or ambitions
But HOW will I choose the best option for me?

• Would you like an overview of biostatistical concepts and methods in two terms with minimal focus on computing and calculations and limited hands-on data analysis? If YES → **Statistical Reasoning (611-612)**

• Are you seeking the ability to conduct, or actively participate in, the design and data analysis for a public health practice or research program? If YES → **Statistical Methods in Public Health (621-623)**
But HOW will I choose the best option for me? (continued)

• If you seek design and data analysis skills, do you have a working knowledge of linear algebra and multivariate calculus from your previous training? If YES → Methods in Biostatistics (651-654)
Example: Characteristics Associated with Risk of Event

• Multivariable Cox Proportional Hazards Model

<table>
<thead>
<tr>
<th></th>
<th>Hazard Ratio for Event (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low SES (vs. High SES)</td>
<td>2.7 (1.6 – 6.3)</td>
<td>0.04</td>
</tr>
<tr>
<td>Male (vs. Female)</td>
<td>4.5 (0.4 – 13.2)</td>
<td>0.21</td>
</tr>
</tbody>
</table>

• 611-612 – Interpret results
• 621-623 – Interpret results and calculate from a data set using Stata
• 651-654 – Interpret results, calculate from a data set, plus theoretical development
FAQ1: Who takes Biostat 651-654?

• Students whose interests or main professional goals are to analyze data (Biostatistics graduate students, other PhD student earning joint MHS degree)

• Students with strong mathematical abilities who recently have had a year of calculus and a course in linear algebra
FAQ2: I had calculus 15 years ago. Could I still take Biostat 651-654?

- Possibly. Some review and self-study may be necessary.
- You should be able to:
  - Perform algebraic manipulations.
  - Graph an exponential function.
  - Find values that minimize a function by setting the first derivatives equal to zero.
  - Perform an integration.
  - Find the product of $AB$ where $A$ is a $2 \times 3$ matrix and $B$ is a $3 \times 2$ matrix.
FAQ3: I am seriously considering applying to a doctoral program. . . . .

• What option should I take if I plan to apply to a JHBSPH doctoral program next year?

• Check the course requirements for doctoral students in the Department of interest. Many programs require Biostat 621-624.
FAQ4: How comfortable must I feel with math or computers?

• A recent randomized study by Boyd indicated:
  – Variables associated with **good performance** in Biostat 621 were:
    • Comfort with mathematical concepts
    • Comfort with computers
    • Not employed > 10 hours per week
  – Variable associated with **decreased performance** in Biostat 621:
    • Belief: “I think that I will need a tutor”
  – English as a native language is **not** a predictor of performance
FAQ5: Could I switch sequences during the school year?

- No, this is not possible. Although the sequences cover roughly similar topics, the topics are not taught in necessarily the same order or time frame.
- If you decide to drop Biostat 621-623 at the end of the first term, you must take Biostat 611-612 during the June Summer Institute in order to complete your requirements within the academic year.
FAQ6: I’m really not sure of my career plans…..

• Should I take Biostat 621-623 just in case I find a job that requires data analysis skills?

• Learning data analysis skills is not like learning how to ride a bicycle. If you don’t use the skills, you lose them.

• It would be preferable to take a data analysis course nearer the time that you accept the job.
FAQ7: Suppose I want more at the end of Biostat 611-612?

• Suppose I would like to gain additional data analysis skills?
• There are three 1-week intensive data analysis workshops offered during the Winter and Summer Graduate Institutes in Epidemiology and Biostatistics.
FAQ8: Why is Stata used in Biostat 621-623 rather than SAS?

• Biggest reason: Stata can be purchased inexpensively by students for use on their own computers (Stata Gradplan).
• One can perform the same procedures in Stata as in SAS.
• The graphics abilities of Stata are better than those of SAS.
• Stata has good manuals and useful Help features.
FAQ9: Why isn’t Biostat 624 required as part of the option?

• Biostat 621-623 covers methods through multivariable regression procedures.
• Biostat 624 provides:
  – Concentrated review of statistical methods
  – Some advanced topics (e.g., data analysis for correlated observations)
  – Data analysis project (practicum) of your choosing to pull it all together!
FAQ10: So why would I take Biostat 624?

- Provide a way to apply your data analysis skills.
- May help complement your capstone project.
FAQ11: Are there other elective Biostatistics courses I could take?

- Third term:
  - 140.641 Survival Analysis
  - 140.655 Analysis of Longitudinal Data
  - 140.662 Spatial Analysis and GIS I
- Fourth term:
  - 140.632 Introduction to SAS Statistical Package
  - 140.656 Multilevel Models
  - 140.663 Spatial Analysis and GIS II
FAQ12: Are there seminars and other activities of interest?

• Weekly seminars
  – Biostatistics: Wednesdays 4:00 pm (W2030)
• Biostatistics Grand Rounds
  – Monthly: Wednesdays 4:00 pm (W2030)
FAQ13: Which Epi sequence should I take with my Biostat sequence?

• If you take Biostat 611-612, the Applied track in Epi would be appropriate.

• If you take Biostat 621-623 or Biostat 651-654, either the Research track or the Applied track in Epi would be appropriate.
Related FAQ14s:

- Can I switch from one Biostat sequence to another? NO
- Can I switch from the Epi Research track to the Epi Applied track? YES
- Can I switch from the Epi Applied track to the Epi Research track? NO

- Remember: your chosen Biostat course sequence is an MPH requirement; the Epi track courses are electives (unless you are in the Epi/Biostat concentration)
Who are the instructors of these required Biostat options?

- **Statistical Reasoning (611-612)**
  - John McGready

- **Statistical Methods in Public Health (621-4)**
  - Marie Diener-West and Scott Zeger (621-3)
  - Jim Tonascia (624)

- **Methods in Biostatistics (651-4)**
  - Brian Caffo (651-2) Karen Bandeen-Roche (653-4)

We are always available for your questions!
http://www.biostat.jhsph.edu/