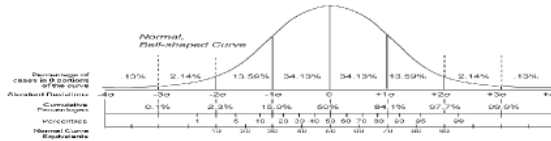$$p = \frac{(a+b)!\,(c+d)!\,(a+c)!\,(b+d)!}{n!\,a!\,b!\,c!\,d!}$$

$$X^2 = \Sigma\,\frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

BMED 602 Biomedical Statistics (Fall 2019, Credits: 3)

Course Description

The biomedical field produces quantitative data that students need to describe, summarize and use in order to make inferences about the general population or specific groups (e.g., treatment groups). This course is designed to help students understand the why's and how's of biostatistical analysis. The course starts with foundational topics such as data types, probability and sampling, and advances to statistical techniques that include contingency tables, analysis of variance and regression.

Lectures:
BMED 602-001 TR 1:30-2:45 pm Prince William: Johnson Hall, Rm 134
Hybrid classes:
BMED 602-002 TR 11:45am-1:00 pm Prince William, Johnson Hall, Rm 246

Hybrid session format: Students who signed up for flipped classroom will first review in their own time captured lecture delivered during the prior session. For example, Tuesday's lecture (to the regular classroom) is viewed on Tuesday or Wednesday then discussed with SFs on Thursday; Thursday's lecture is viewed from Thursday to Monday and discussed the following Tuesday.

Instructor:
Haw Chuan (HC) Lim, Asst. Professor, Department of Biology
Office: Colgan Hall, Rm 409 Email: hlim22@gmu.edu
Office hours: Wednesday 3-4pm or by appointment

Support Faculty:
Frank Cassavell, 308 Bull Run Hall Email: frankcassavell@gmail.com
Freesia Quezada, 308 Bull Run Hall Email: fquezada@gmu.edu
Michael Rejzer, 308 Bull Run Hall Email: mrejzer@gmu.edu
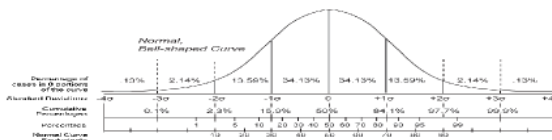Crystal Yi 308 Bull Run Hall Email: cyi12@gmu.edu

Blackboard
We will use the learning management system Blackboard in this class. Lecture notes, assignments, etc be posted to this site. Log in at http://mymason.gmu.edu.

Text book and calculator
Statistics for the Life Sciences. Samuels, Witmer, and Schaffner, 5th Ed

$$p = \frac{(a+b)!\,(c+d)!\,(a+c)!\,(b+d)!}{n!\,a!\,b!\,c!\,d!}$$

$$X^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

You may use versions 2nd to 4th, but do note that references to figures, examples, exercise questions, etc refer to the 5th edition

Important: Regardless of which edition you use or where you get it, you will need it almost right away for homework assignments and other things (I encourage you to get later editions). It is your responsibility to get the text on time. Electronic versions are discouraged as you will not be allowed to use them on the exams. You will need a calculator that has statistical functions. Chances are that if you own a "fancier" (e.g. scientific) calculator it will include these functions. If not, there are some available for less than $20.00 that will do (try, for example, the TI-30X IIS). You can use whatever brand you wish, but it is your responsibility to figure out how it works.

Examinations
Two exams, a midterm and a final. The mid-term will be worth 26% of your grade, and the final will be worth 38% of your grade.

Mid-term exam: Likely fall on Thursday of week 8. The whole class time will be used for exam. Further announcements will be in class and blackboard.

Final exam: Date to be announced. Final will be 2 hours.

Exam structure - you'll get more information about this as the exams get closer. Exams will consist of two parts:
Part I - you'll need to know terms, definitions, & some simple formulas. This will be closed book.
Part II - you will need to work some problems. This will be open book/notes.

You will need to hand in part I before you get to see part II.

**Cheat Sheet: It is advisable to create a summary (a few pages) of what you learn in class and bring it to the open section of the exam. This serves two purposes. One is that it helps you to crystalize what you have learnt during the past few months. Second, it acts as a cheat sheet that you can use to quickly refer to formulae, etc. **

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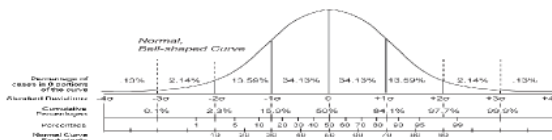
$$X^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

Notes:

To get full credits, show all the steps in each problem. Make sure you know how to use your calculator (computers and web devices not allowed). The final exam is somewhat cumulative, but will concentrate on the material after the midterm.

Review Sessions

Monday. For help with homework, general Q & A, and discussion of additional topics. More details to be provide by Supplemental Faculty.

Study groups

Students are encouraged to join study/support groups made up of ~8 students. These groups may be cross-disciplinary. That is, group members will also work on other courses that they are enrolled in. The SFs will provide more details regarding group formation.

Interpretation assignment

You will be required to read an article from a medical, pharmacological, or epidemiological journal, and then summarize this paying particular attention to the statistics used. Details will be provided in class. This will be worth 6%. Tentative due date is 4 December.

**Homework and late work policy**

You will be given 6 homework assignments, worth 5% each. You will have at least a week to complete the homework assignments. **Physical copies** of homework assignments will be turned in at the beginning of class on the due date. If we cover the materials quicker than anticipated, an assignment may be handed out earlier and you will have more time (> 1 week) to work on it.

You should not expect to be allowed to turn in assignments later in the day for full credit. Late work will not be accepted except in the case of a documented personal emergency or excused absence. **Unexcused late work will be penalized at a rate of 10% per day, up to 20% (ie, maximum 2 days late).** You will not be allowed to make up in-class assignments or exams unless you have a documented, excused absence. It is your responsibility to provide written documentation from a third party of your emergency or university-excused absence. I do not consider work-related absences, work in other classes, oversleeping, or meetings with other professors a personal emergency.

Grading

Your final grade will be based on your percent out of 100. See below for grading scale. All inquiries about homework/exam partial credits or potential grading mistakes need to be addressed soon after the homework/exam is returned, not toward the end of semester. **I do not**

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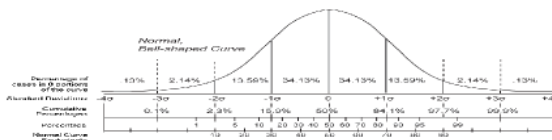
$$\chi^2 = \Sigma \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

round up points at the end of semester so that a student who is just below a threshold can move up to the next letter grade.

A+	97-100		B	84-86
A	94-96		B-	80-83
A-	90-93		C	60-79
B+	87-89		F	59 or less

Academic integrity

If you are caught cheating, you will be taken to the honor committee. GMU has an Honor Code with clear guidelines regarding academic integrity (https://oai.gmu.edu/mason-honor-code/). Three fundamental and rather simple principles to follow at all times are that: (1) all work/answers submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification.

Disability Accommodations

If you have a learning or physical difference that may affect your academic work, you will need to furnish appropriate documentation to the Office of Disability Services. If you qualify for accommodation, the ODS staff will give you a form detailing appropriate accommodations for your instructor. In addition to providing your professors with the appropriate form, please take the initiative to discuss accommodation with them at the beginning of the semester and as needed during the term. Because of the range of learning differences, faculty members need to learn from you the most effective ways to assist you. If you have contacted the Office of Disability Services and are waiting to hear from a counselor, please let your instructor know.

Diversity

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also

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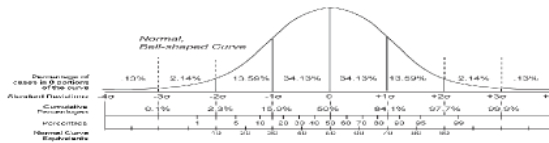
$$X^2 = \sum \frac{(observed - expected)^2}{expected}$$

entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.

Canceled and missed class
If for some reason class is canceled, then the following class will cover the material for the missed class. This is particularly important should an exam day be canceled for whatever reason (the exam will take place in our next scheduled class).

If you are having problems: please come and see us. We are here to help you learn this material and master biostatistics. We will do what we can to make sure that you make it successfully. Please don't wait too long if you are having difficulties.

Please try to be in class. You've probably heard it a million times already, but it's particularly true in this class. You will probably not do well if you are absent too often.

You may be asked to do some work on a computer. If so, you'll be provided with step by step instructions.
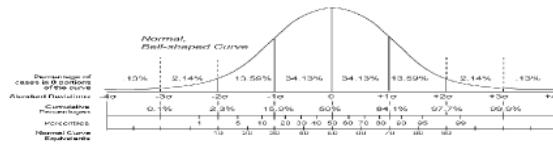
Thanksgiving
We will not meet the Tuesday before Thanksgiving.

Approximate outline of course (see Blackboard for updated topics and syllabus)
Introduction, descriptive statistics, random sampling

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Graphical methods

Probability

Probability distributions

Sampling distributions

Confidence intervals

Two-sample tests (t-tests, MW tests, sign tests)

ANOVA & Kruskal-Wallace

Chi-square based tests (goodness of fit, contingency, odds ratios, relative risk)

Fisher's exact test

More complicated statistics (open ended, we'll see how things go)