Presentation of PUMAS

• **Ben Prytherch**  
  Undergraduate statistics advisor  
  Teaching faculty  
  Designer of much of the introductory statistics courses

• **Mary Meyer**  
  Developed STAT100

• **Don Estep**  
  Chair of Statistics
Growing Statistics and Data Science

• The importance of making decisions and policies informed by data is now recognized across all dimensions of human activity

• Gaining meaningful insight from data involves analysis of the properties of data and the relationships and structures it reflects, and proper interpretation of the results

• Students have seen the future and demand for introductory courses, advanced undergraduate courses, applied graduate statistics is steadily increasing

• Statistics has enrollment pressure across the entire curriculum
Statistics Response

- Increasing accessibility to the statistics curriculum for all students at Colorado State University
- Increasing understanding of statistical methodology and applicability and statistical thinking
- Instilling mastery of statistical methodologies in applications
- Commitment to providing conditions for strong student success in every statistics course in an efficient and sustainable fashion
PUMAS

Pathways to Understanding and MAstery of Statistics

• Extending accessibility to statistics courses by providing pathways to enter into the curriculum for students of all backgrounds and preparation

• Providing training, motivation and information to continue studies in statistics as long as desired

• Improving conditions for success for a very heterogenous student population
Thinking about populations

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
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<tbody>
<tr>
<td>Group 1</td>
<td>Minimal mathematical preparation, have confidence issues, in majors that do not require quantitative statistics</td>
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<tr>
<td>Group 2</td>
<td>Weaknesses in pre-Calculus background, mathematics skills need refreshing, in majors that require quantitative statistics</td>
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<tr>
<td>Group 3</td>
<td>Good pre-Calculus background, competent in mathematical computations, in majors that require a quantitative statistics course</td>
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<tr>
<td>Group 4</td>
<td>Statistics majors and students in other majors that require Calculus and have the deepest level of mathematical preparation and motivation</td>
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Entry points

<table>
<thead>
<tr>
<th>Course</th>
<th>Student population</th>
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<tbody>
<tr>
<td>STAT100</td>
<td>Group 1</td>
</tr>
<tr>
<td>STAT201, STAT204</td>
<td>Group 2</td>
</tr>
<tr>
<td>STAT301(a-z)</td>
<td>Group 3</td>
</tr>
<tr>
<td>STAT315</td>
<td>Group 4</td>
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Mapping old to new

<table>
<thead>
<tr>
<th>Old Course</th>
<th>New Course</th>
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<tbody>
<tr>
<td>STAT201</td>
<td>STAT201</td>
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<tr>
<td>STAT204</td>
<td>STAT204</td>
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<tr>
<td>STAT301</td>
<td>STAT301a</td>
</tr>
<tr>
<td>STAT307</td>
<td>STAT301b</td>
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<td>STAT301c</td>
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<td>STAT301d</td>
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<td>STAT315</td>
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Major changes STAT301/7

• Conforms with the American Statistical Association’s Guidelines for Assessment and Instruction in Statistics
• Innovative 2+1 credit format with a 2 credit core and a 1 credit “flavor”
• After completing any 3 credit sequence, students can take additional 1 credit modules
• Will develop various modules over time, based on input from campus
• Will develop a bridge to equivalency with STAT315
Major changes STAT201/204

- Syncing the core material of STAT 201 and 204 but providing different examples to students in the two courses
- STAT 201/204 core is the same as the 2 credit core of STAT301
- Front loaded with review and practice of mathematics skills
- Will develop a 1 credit “bridge” course that combined with STAT201/204 brings students to equivalent competency of STAT301a
Motivation and Goals:

- Students will be intelligent consumers of numerical information
- Students will be able to assess the merit of the interpretations of a statistical study or data analysis

- Identify the units of study and the purpose of the study.
- Identify the response variable and the main predictor of interest.
- State the purpose of the study as formal hypotheses.
- Determine if the results are statistically significant and interpret the p-value as a probability.
- Determine whether the study is an experiment or an observational study, and explain why this is important.
- Critique the study to determine if certain biases are likely to be present.
- Identify situations in which confounding factors are likely, and determine whether they have been accounted for.
Possibilities

• Data Analytics Minor for CLA/HHS/?
• Minor in Statistics that does not require Calculus
• (to be developed) Minor in Data Science that does not require Calculus
• STAT302 as an intermediate between STAT301 and STAT341
• Access to some Data Science courses, e.g., without Calculus (but with Linear Algebra)
• New Data Science-relevant versions of Mathematics Courses, e.g. Linear Algebra
Investment by Statistics and Provost

• Statistics must use limited resources to support improvement through the entire curriculum from introductory statistics through the PhD program
• Statistics has committed human and financial resources
  • We have streamlined our PhD program and moved the teaching capacity to the undergraduate, applied graduate, and applied masters programs
  • We have devoted considerable revenues from enterprise programs to undergraduate instruction
• The Provost has invested heavily in the graduate applied statistics curriculum