



# Biomedical Graduate Admissions

Who should we admit?

**Anna Ballew O'Connell**

Director, Biological & Biomedical Sciences Program  
Office of Graduate Education  
UNC Chapel Hill

# Biological & Biomedical Sciences Program (BBSP)

## Applications

single application;  
4 admissions  
committees

## Interviews

Campus visit; 5  
one-on-one faculty  
interviews

## First Year Training

unified first year  
cohort; 6 small groups

2nd year and beyond

Students transfer out  
of BBSP and into one  
of 14 different  
member PhD  
programs

1200 1400

300

80 90

# UNC Office of Graduate Education



# TIBBS

UNC Training Initiative in Biomedical & Biological Sciences



The Initiative for  
Maximizing Student  
Diversity



Preparing  
Tomorrow's  
Scientists

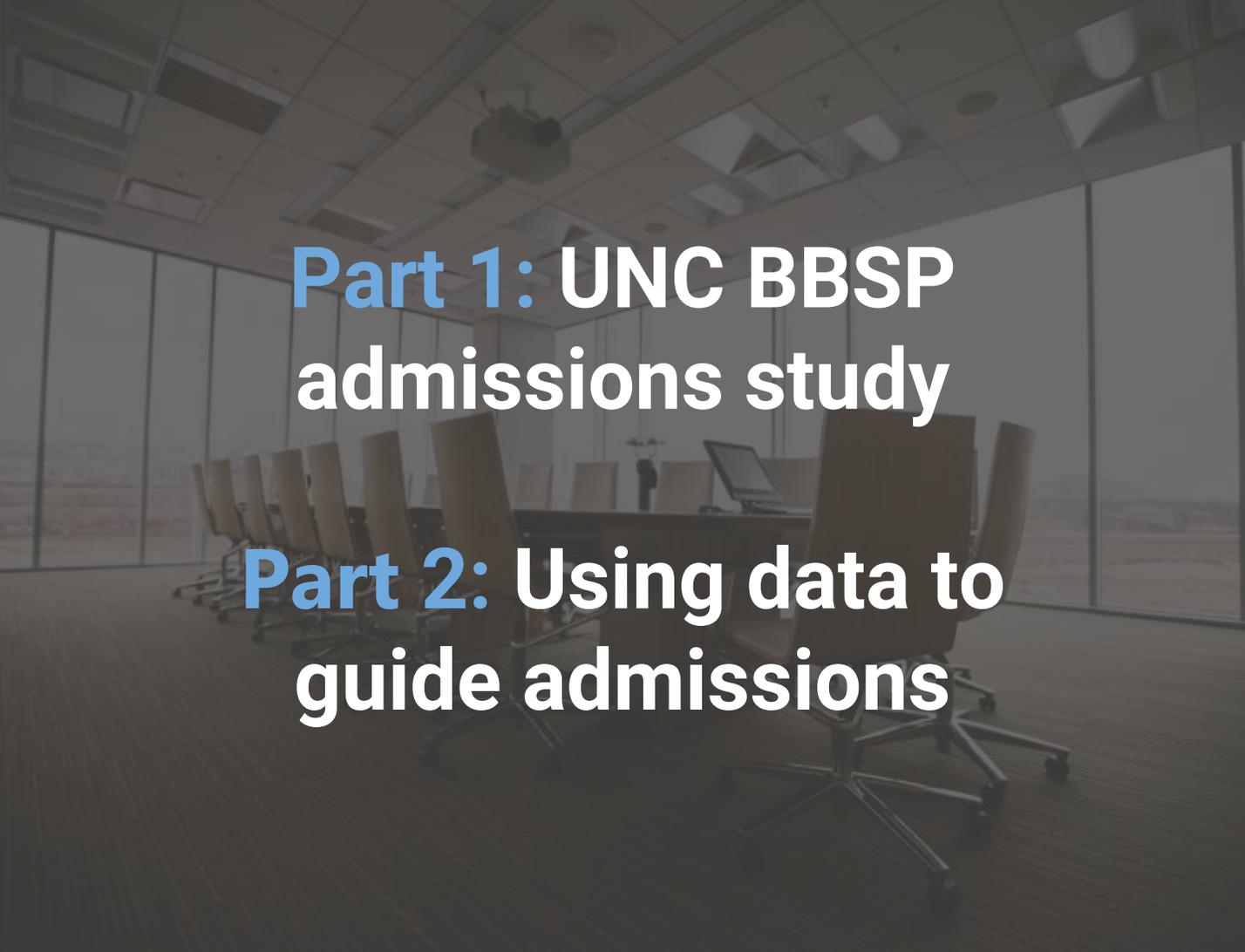


# UNC SOLAR

Summer of Learning and Research  
at UNC-Chapel Hill

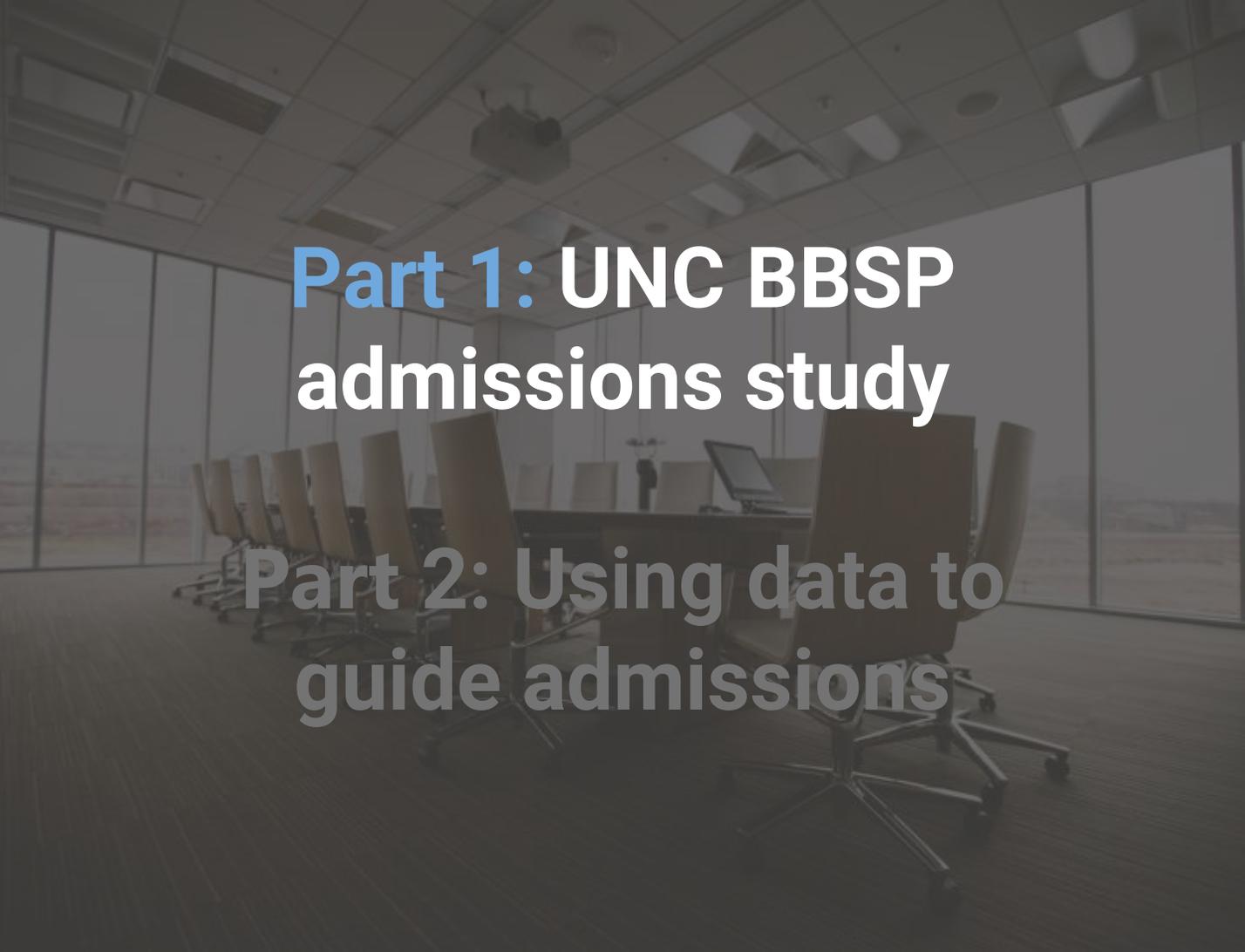
NC

# DNA DAY



**Part 1: UNC BBSP  
admissions study**

**Part 2: Using data to  
guide admissions**

A modern conference room with a long table, chairs, and large windows. The room is dimly lit, with the primary light source being the windows on the right side. The ceiling is a grid of recessed lights. The floor is a light-colored wood or laminate. The text is overlaid on the image.

# **Part 1: UNC BBSP admissions study**

## **Part 2: Using data to guide admissions**

 OPEN ACCESS  PEER-REVIEWED

RESEARCH ARTICLE

# Predictors of Student Productivity in Biomedical Graduate School Applications

Joshua D. Hall  Anna B. O'Connell, Jeanette G. Cook 

Published: January 11, 2017 • <http://dx.doi.org/10.1371/journal.pone.0169121>

# Motivations for this study

1. Experiences of our PREP scholars

# UNC PREP



Josh Hall,  
PhD



# Motivations for this study

1. Experiences of our PREP scholars
2. 2014 UCSF study

# How should we be selecting our graduate students?

**Orion D. Weiner**

Cardiovascular Research Institute, Department of Biochemistry and Biophysics, University of California, San Francisco, CA 94158

UCSF found that years of research experience and subject GRE scores differed between high and low performing graduate students (not general GREs, GPA, undergrad institution ranking)

Outcome measures were subjective (faculty opinions) and coarse (only two bins), and the sample sizes were relatively small (31 “top performing” and 21 “bottom performing” students).

**“I would urge faculty elsewhere to conduct similar analyses to improve the admissions process and to minimize the use of useless metrics in selecting our students.”**

A hand holding a pen over a document with a checklist. The document has several rows of text, each starting with a square checkbox. The text is partially obscured by the hand and the pen. The background is dark and out of focus.

# Our Goal

To objectively study application metrics as they relate to student outcomes

# Our question

Do application metrics differ  
between highly productive  
and less productive  
biomedical PhD students at  
UNC Chapel Hill?

# STUDY DESIGN

## Study cohort:

UNC BBSP PhD students who matriculated in **2008, 2009, and 2010 (n=280)**

## Application data:

- GRE V, Q, W,(percentile)
- Undergraduate GPA
- Months of prior research experience
- Recommendation letter rankings
- UNC faculty interview scores

## Outcomes:

- Number of first-author publications
  - Highly productive (3+)
  - Productive (1-2)
  - Lowly productive (0 1st;  $\geq 1$  mid- author)
  - Lowest productive (0)
- Degree outcome / Time-to-degree

# Student Publications

custom  
Python Script



PubMed query



xml output



Author Search:

Student last name  
+  
Advisor last name

For each pair

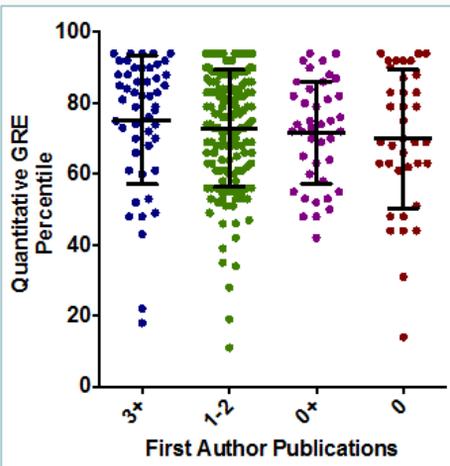
- # 1st author publications
- total # publications

## CONSIDERATIONS

- All first-author papers were considered equal
- Review articles count the same as primary research
- No attempt to assess "quality" or impact
- All non-first author positions were considered equal

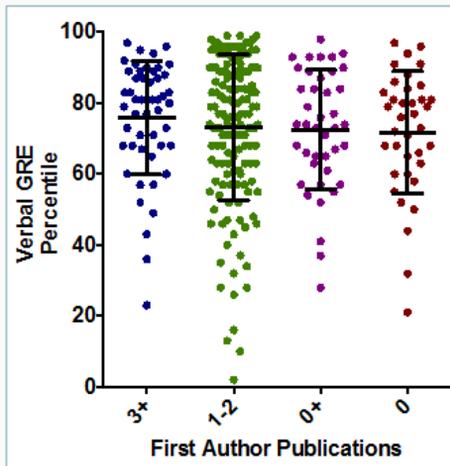
# General GRE scores do NOT predict student productivity

Quantitative



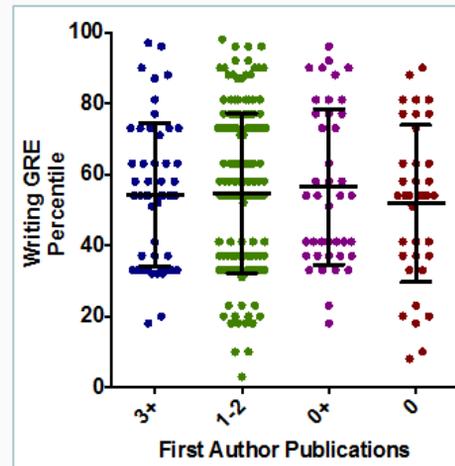
Kruskal-Wallis  
 $p = 0.325$

Verbal



Kruskal-Wallis  
 $p = 0.617$

Writing



Kruskal-Wallis  
 $p = 0.846$

# Vanderbilt GRE Study

*634 IGP students, 2003 2011*

## **NOT PREDICTIVE**

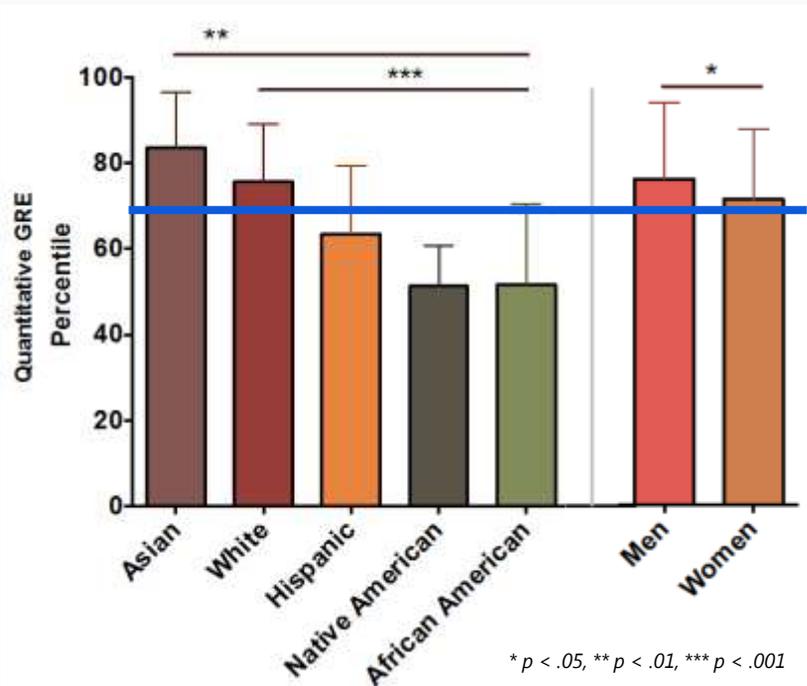
- PhD completion
- Time to degree
- Passing qualifying exam
- # of conference presentations
- # of publications
- Obtain fellowship/grant

## **MODERATELY PREDICTIVE**

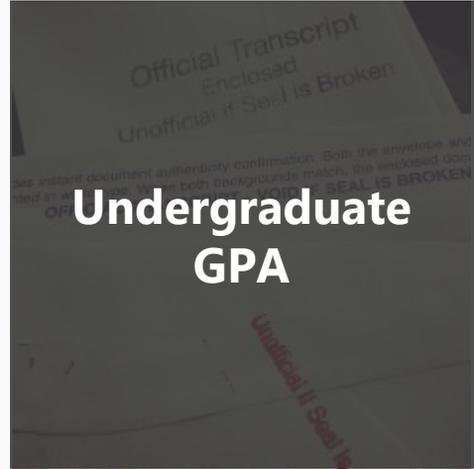
- Grades in first year courses

GRE scores DO  
vary by  
demographic  
groups at UNC

UNC BBSP Students  
2008-10, n=280



## Other metrics that do NOT predict productivity

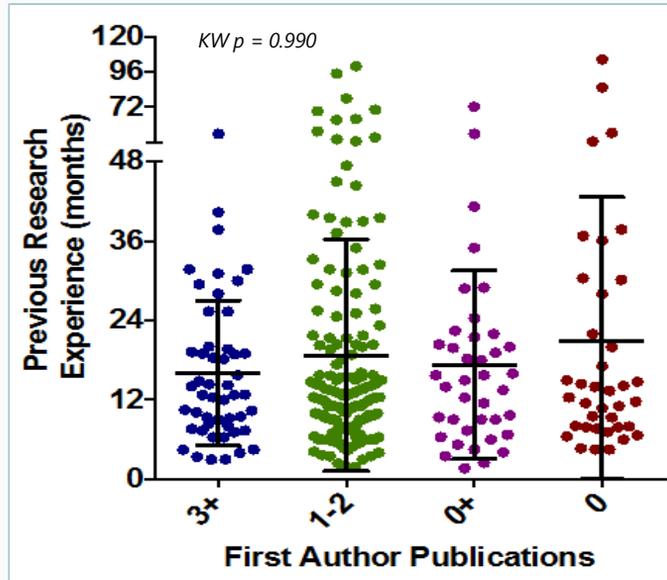
An official transcript document with a seal. The text on the document includes "Official Transcript", "Enclosed", "Unofficial if Seal is Broken", and "SEAL IS BROKEN".

**Undergraduate  
GPA**

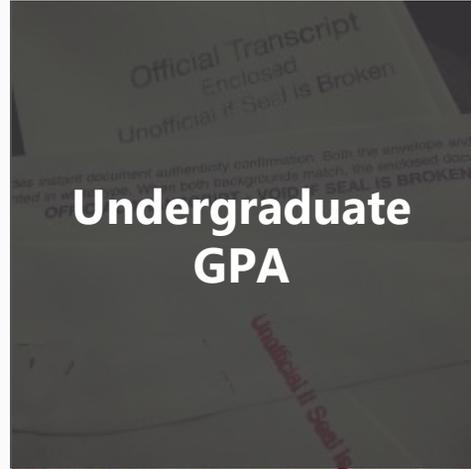
A laboratory setting with various pieces of glassware, including beakers and flasks, on a table. A person's hands are visible, suggesting an active research environment.

**# months previous  
research  
experience**

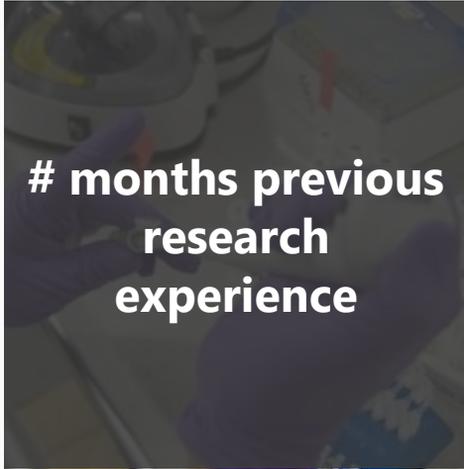
# Prior research experience does NOT predict student productivity



## Other metrics that do NOT predict productivity

An official transcript document with a seal. The text on the document includes "Official Transcript", "Enclosed", "Unofficial if Seal is Broken", and "SEAL IS BROKEN".

**Undergraduate  
GPA**

A pair of hands wearing purple nitrile gloves, working in a laboratory setting with various glassware and equipment.

**# months previous  
research  
experience**

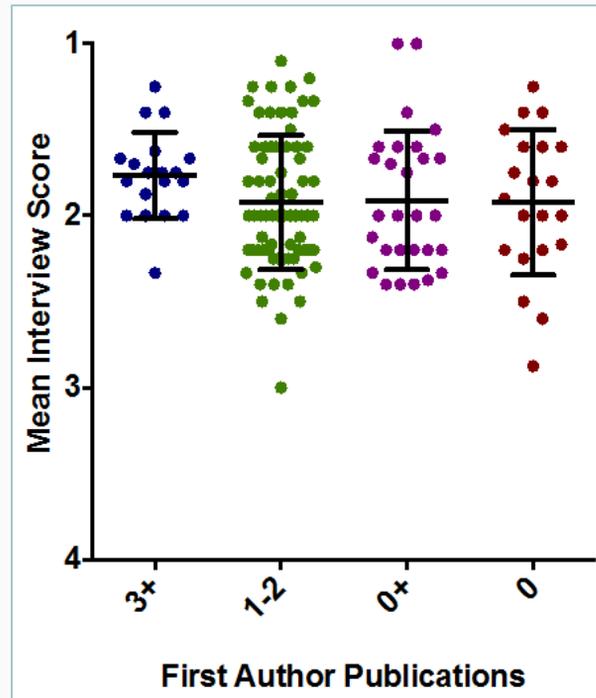
A person with blonde hair sitting at a table during an interview, with another person's hands visible in the foreground.

**Faculty  
interview scores**

# Interview ratings do NOT predict student productivity

## Overall interview rating

- 1 = Admit and Recruit
- 2 = Admit
- 3 = If there's space
- 4 = Reject



**Does anything in the graduate application differ between student productivity groups?**

# Letters of Recommendation

## UNC CH Recommender Rating Scale

Please rate this applicant relative to other students you have worked with:

Exceptional  
Outstanding  
Very Good  
Above Average  
Below Average

Submit



### Recommender Ratings

"Exceptional" = 1

"Outstanding" = 2

"Very Good" = 3

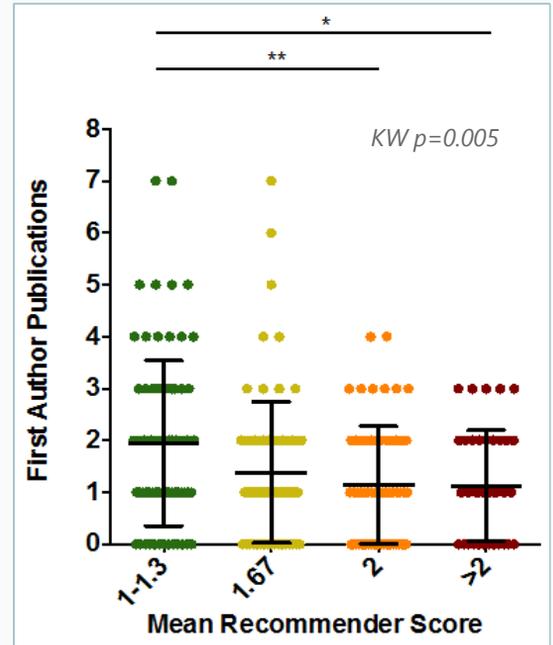
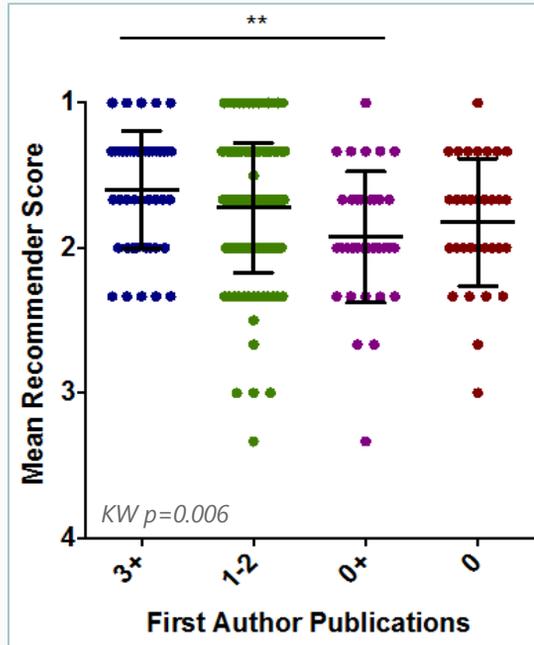
"Above Average" = 4

"Below Average" = 5

# Recommender ratings DO predict student productivity

## Recommender Ratings

- "Exceptional" = 1
- "Outstanding" = 2
- "Very Good" = 3
- "Above Average" = 4
- "Below Average" = 5



\*  $p < .05$ , \*\*  $p < .01$ , Dunn's Multiple Comparisons Test

# Limitations and future directions

## Limitations:

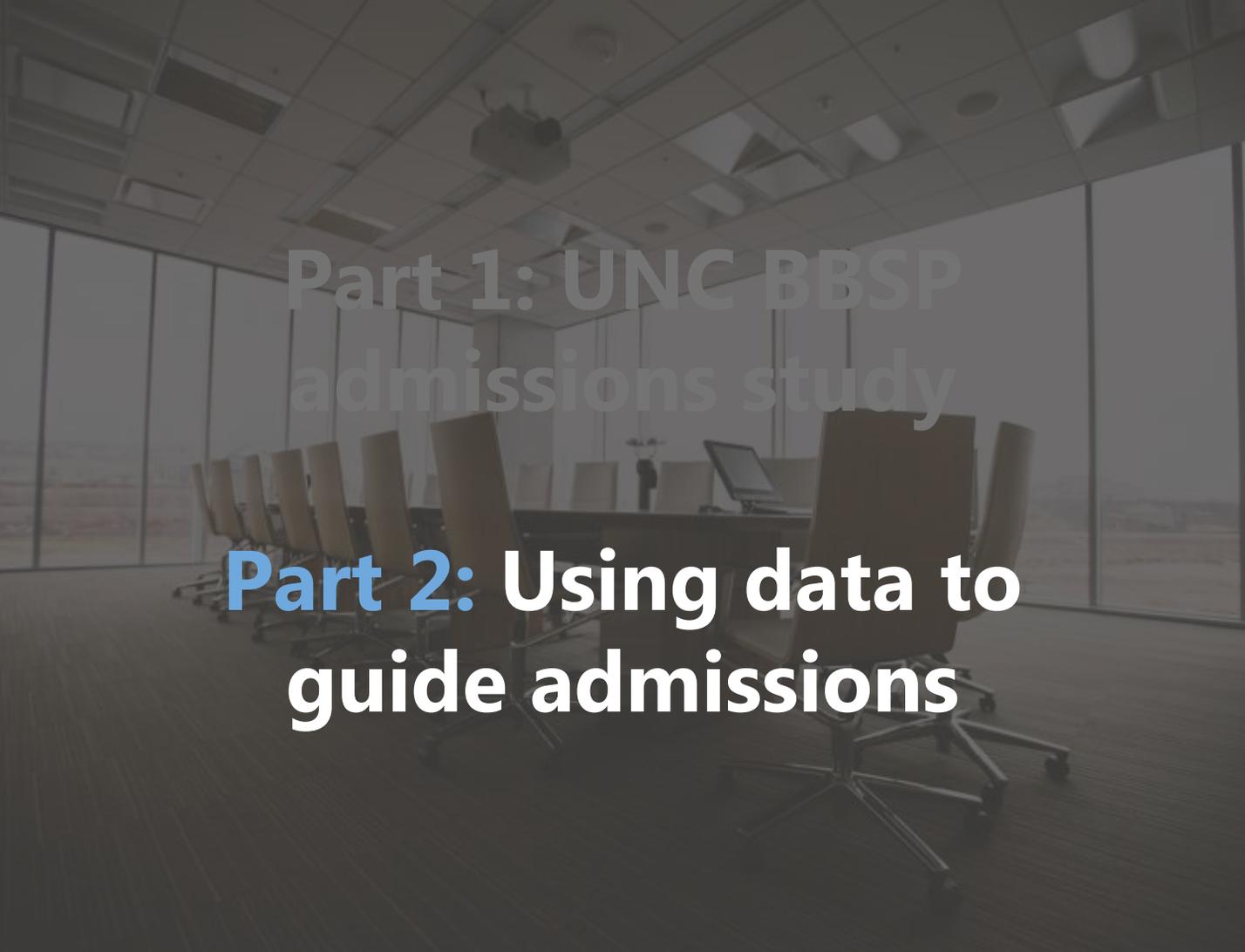
- Only enrolled students
- Bias in letters and interviews
- No students without research experience
- All publications considered equal, no credit for co-first authorship
- Didn't account for other factors that may impact productivity

## Future Directions:

- Effects of training environment / advisor on productivity
- Qualitative assessment of highly productive vs lowly productive graduate students (non-cognitive / psychosocial factors)

# Recommendations

1. De-emphasize the GRE in admissions decisions (or eliminate it)
2. Continue to prioritize research experience - higher focus on applicant potential described in letters, and less on institutional quality or amount of research
3. Define admissions criteria in advance
4. Consider ways to assess non-cognitive qualifications (motivation, perseverance, self-awareness, adaptability, optimism, etc.)
5. Work towards holistic review

A modern conference room with a long table, chairs, and large windows. The room is dimly lit, with the primary light source being the windows on the right side. The ceiling is a grid of recessed lights. The floor is a dark, polished material. The overall atmosphere is professional and quiet.

Part 1: UNC BBSP  
admissions study

**Part 2: Using data to  
guide admissions**

# New practices in 2015

## **1. Admissions committee education**

- a. Implicit bias
- b. Results of admissions study and other GRE studies

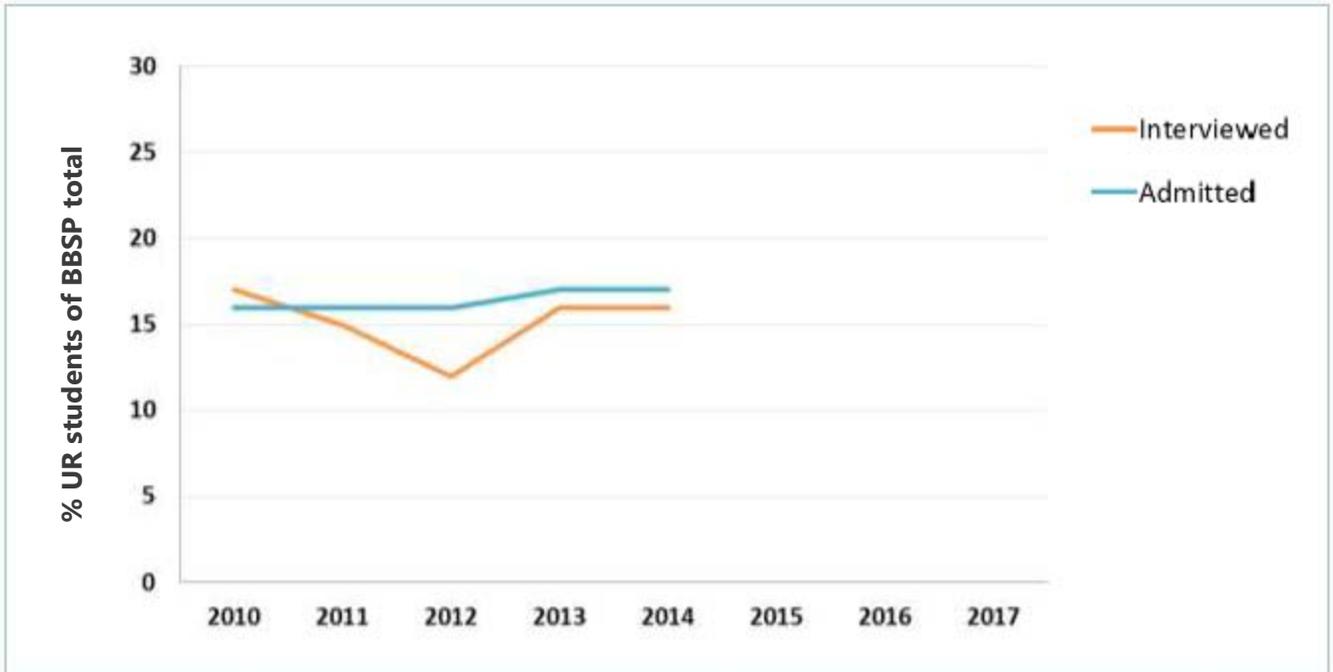
## **2. New application review criteria**

- a. research experience (includes quality, time, letters, description in statement)
- b. academic preparation (test scores, GPA, writing evidence in statement)
- c. motivation/potential (letters, statement, papers)
- d. overall enthusiasm

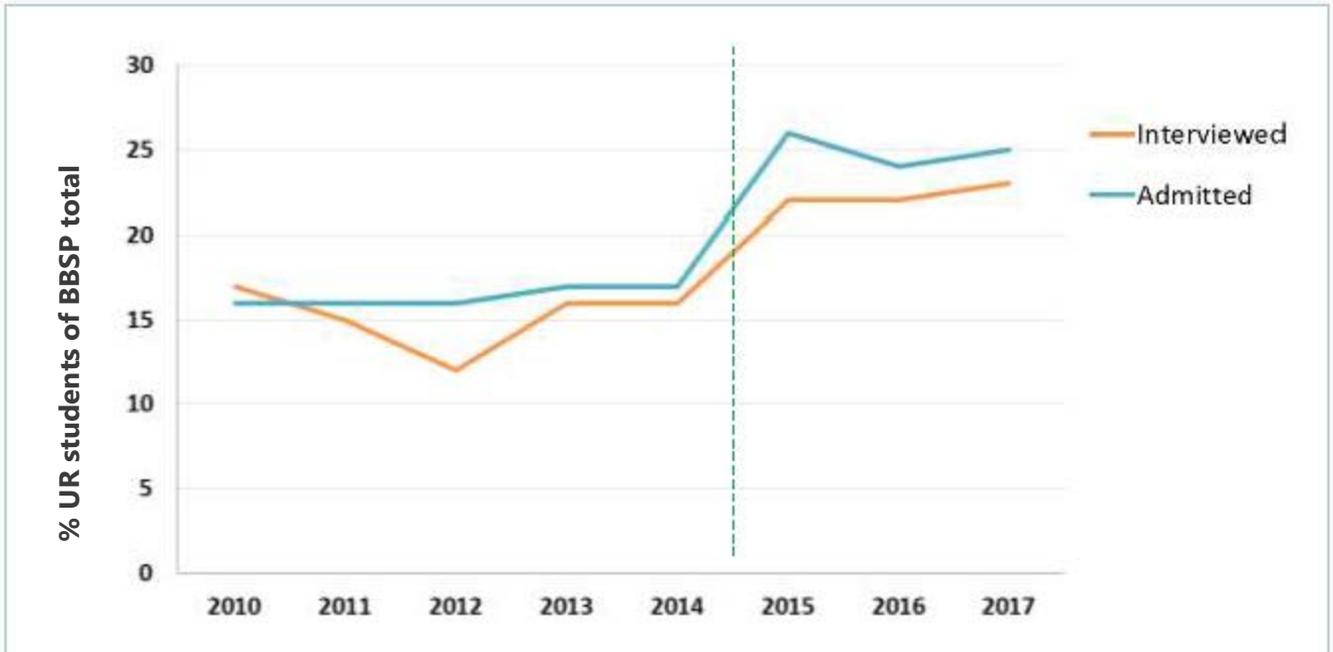
## **3. Online application workflow**

- a. Default information displayed does not include test scores or GPA

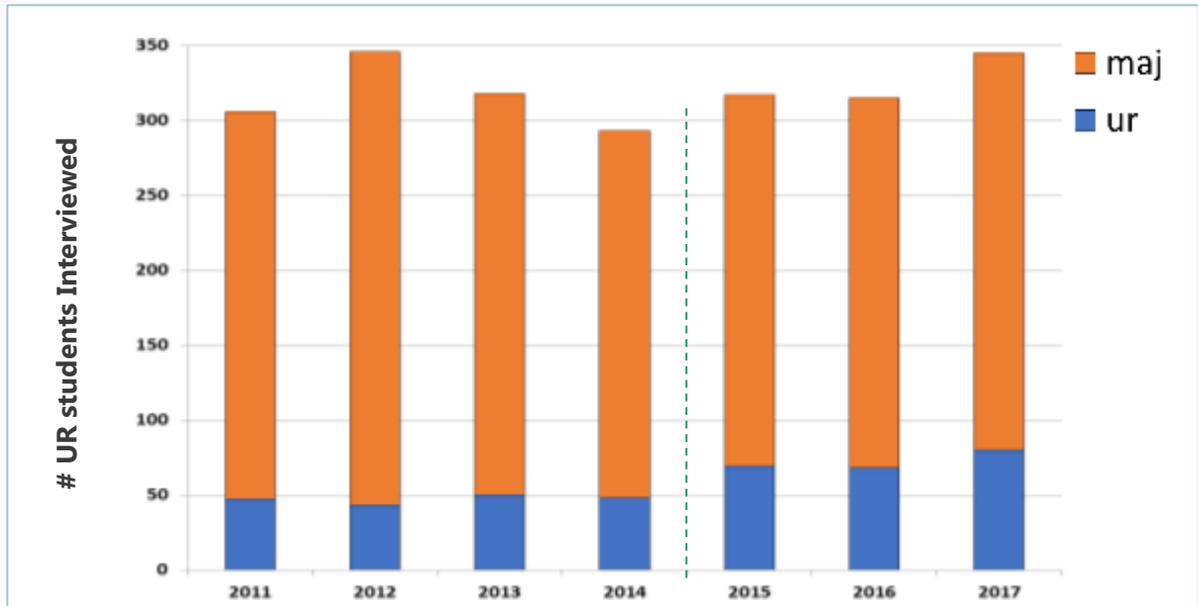
# UR admissions prior to changes



# UR admissions after 2015 changes were implemented



# Number of UR students interviewed has increased



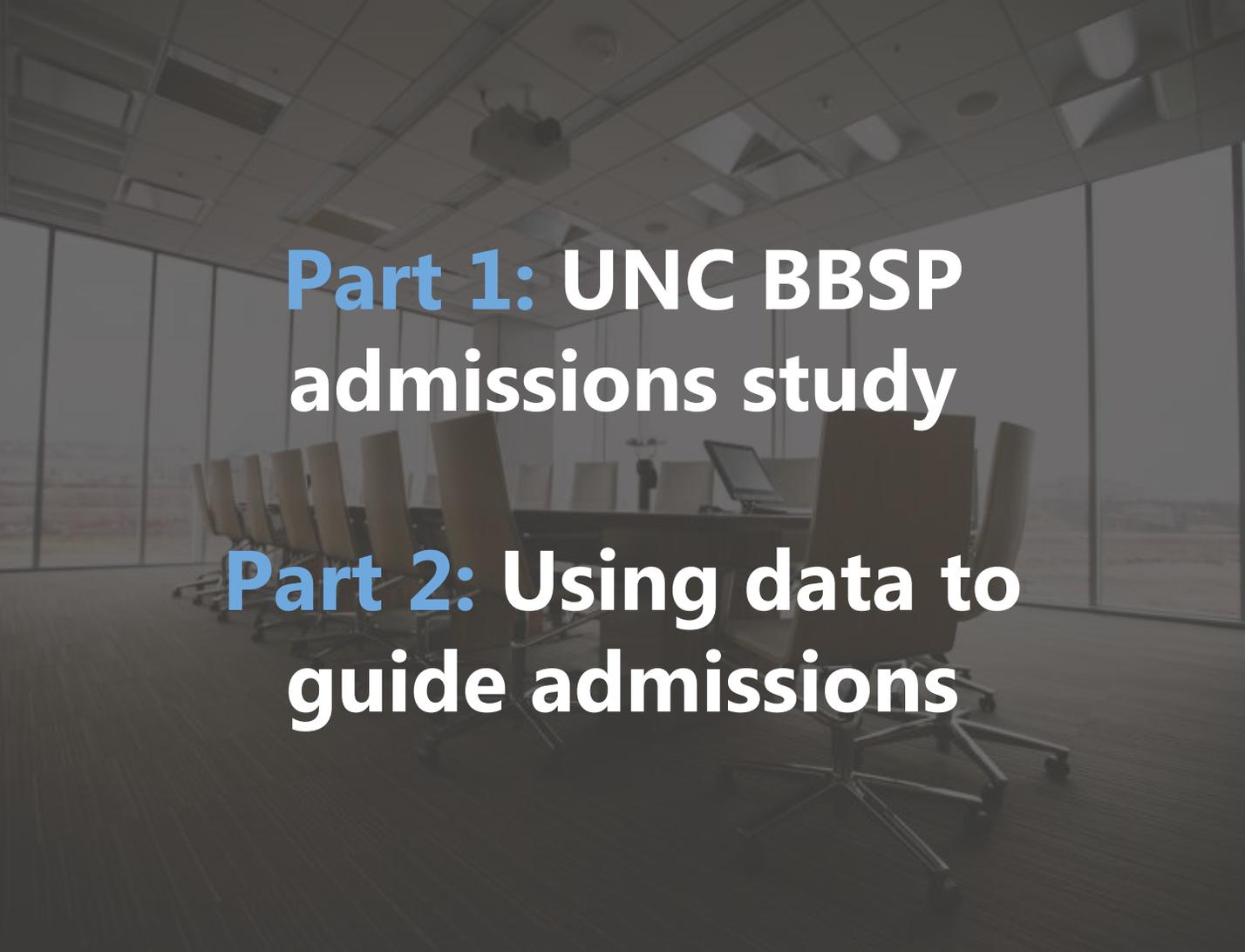
# Challenges

## **Application review:**

- How to evaluate academic preparation
- Consistent use of review criteria
- Workload
- Educating interviewers (300+ at UNC)

## **Culture change:**

- Role of committee chair
- The power of anecdotal evidence
- Looking for well suited vs perfect candidates

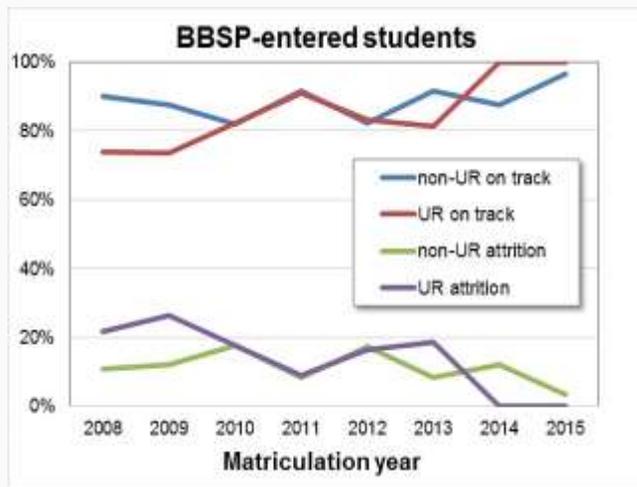


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*“Diversity doesn’t  
stick without  
inclusion”*

## UNC attrition, retention, and graduation data



### Current UNC BBSP retention/graduation rate

- **85%** for UR students
- **88%** for all students

(Feb 2017)



# Acknowledgements

**Josh Hall, PhD** Director of UNC PREP (co author)  
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## Office of Graduate Education (others)

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- Admissions/Student Services: Sue Modlin, Jeff Steinbach
- Business and Administrative Support: Sausyty Hermreck, Dani Burkhart, Danesha Curry