

Large-Scale Evaluation of the Effects of Supplemental Instruction at San Francisco State University

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Outline of Talk

Question: What is the impact of supplemental instruction (SI), particularly in terms of underrepresented minorities (URM) at San Francisco State University (SFSU)?

- Explanation of Supplemental Instruction
- Usage of database from institutional records: ~12,000 students
- Methodology of addressing question
- Sample results
- Evaluation vs. research

Supplemental Instruction Courses

Typical

- Support difficult courses, not high-risk students
- Peer facilitators
- Supplemental material/problems
- Embedded study and learning skills
- Cooperative learning
- Voluntary attendance

At SFSU

- Facilitators are undergrads, graduate students, lecturers
- Students register for course

Supplemental Instruction at SFSU

- Began in 1999
- Funded through NIH MORE RISE program
- 22 different courses in 4 departments
- 500-600 students/semester in recent years
- Some classes now have up to 40% enrolled in SI
- SI courses in catalog – 1 credit

Impact of Supplemental Instruction at SFSU

- Higher course performance (passing and progressing)
- Takers tend to come to SFSU with weaker academic indicators
- Higher rates of taking subsequent courses in the discipline.
- Performance levels for URM students taking SI reach and often surpass non-SI takers
- URM students participate in SI more than students from other racial/ethnic groups
- Women take more but men, when they show up, benefit more

Articles on Findings

Peterfreund, Rath, Xenos, and Bayliss:

“The Impact of Supplemental Instruction on Students in STEM Courses: Results from San Francisco State University”
Journal of College Student Retention (in press)

Rath, Peterfreund, Xenos, and Bayliss:

“Supplemental Instruction in Introductory Biology I: Enhancing the Performance and Retention of Underrepresented Minority Students” Journal of Cell Biology Education
(submitted)

Articles are available online at www.peterfreund.com/articles/

Potential Impact of Supplemental Instruction

Performance in class

- Grades in supported courses
- Rates of passing with C- or better
- Rates of withdrawing from the class

Longitudinal outcomes

- Rates of repeating the supported course
- Rates of taking subsequent courses
- Likelihood of graduating from SFSU

Other Factors Affecting Impact

Student-related

- Academic preparedness
- Awareness of SI
- Availability of time
- Motivation to succeed

Course experience

- Quality of supported course instructor
- Grading policies
- Quality of supplemental instruction

Description of Data

- SFSU institutional records
- 1994 through 2005 (SI starts 1999)
- All students from major introductory-level classes ($N \sim 12,000$)
- Fields:
 - Course grades and times
 - SAT, High school GPA, graduation
 - Gender, race/ethnicity, major

Using Institutional Data

Benefits

- Objective data
- Presence of important fields
- Anonymous collection
- No missing students

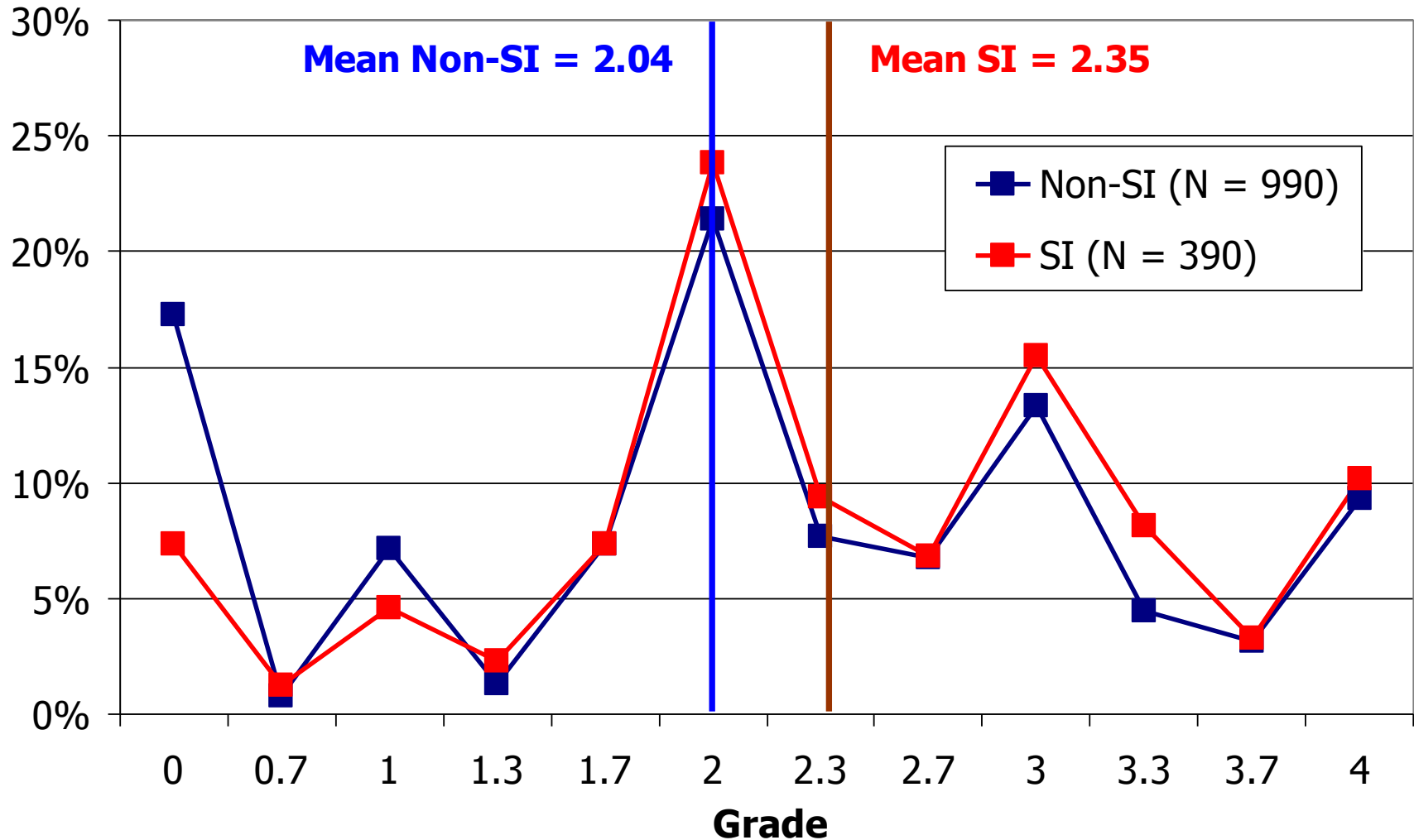
Drawbacks

- Messy data format
- Students who take SI without registering
- Inability to merge with other data
- Requires up-front decisions for data request

Methodology Options

- Semester-by-semester analysis
- SI vs. Non-SI within entire courses*
- Pre-SI vs. Post-SI
- All courses combined

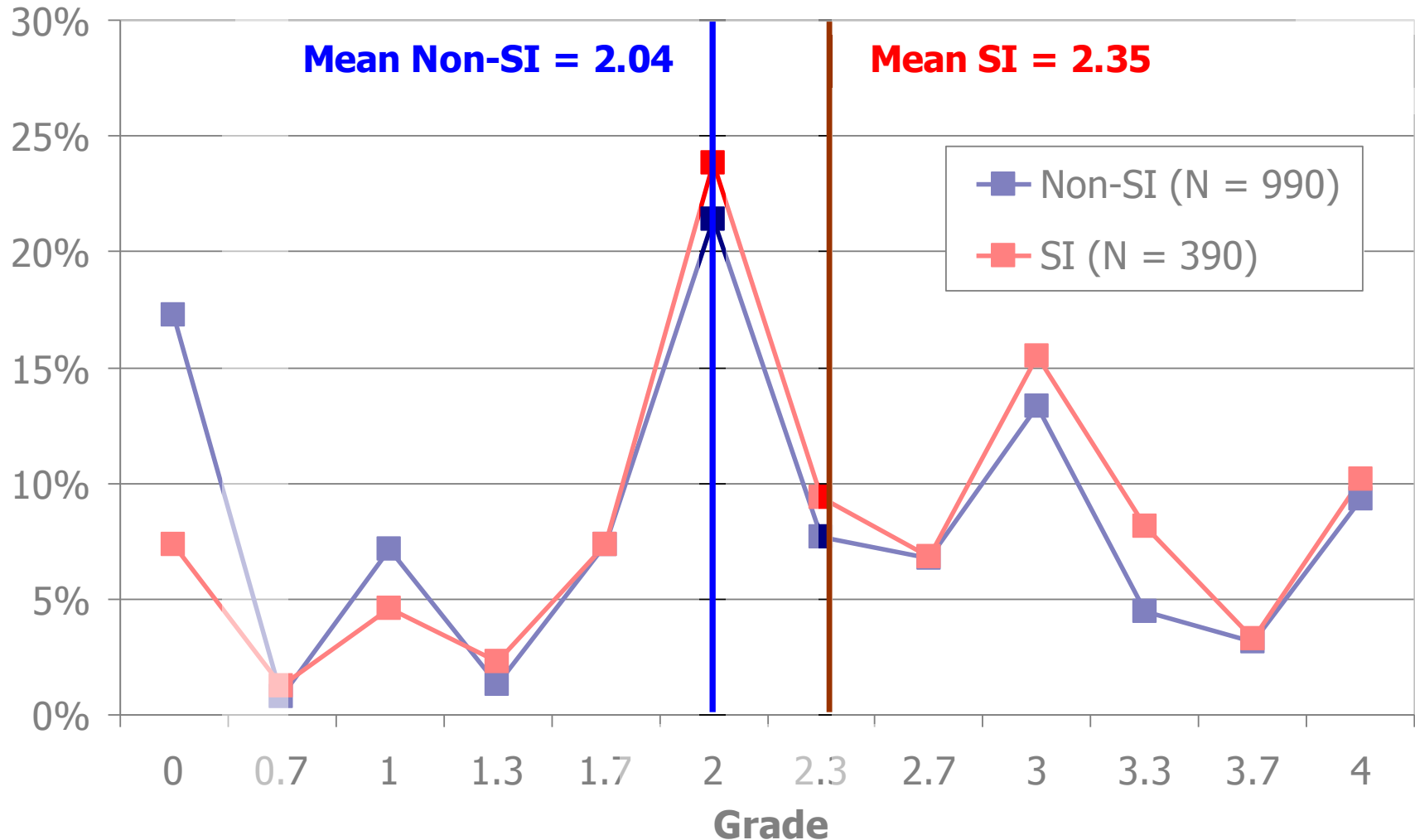
Intro to Biology I – Course Grades



SI C- or better – 85%

Non C- or better – 73%

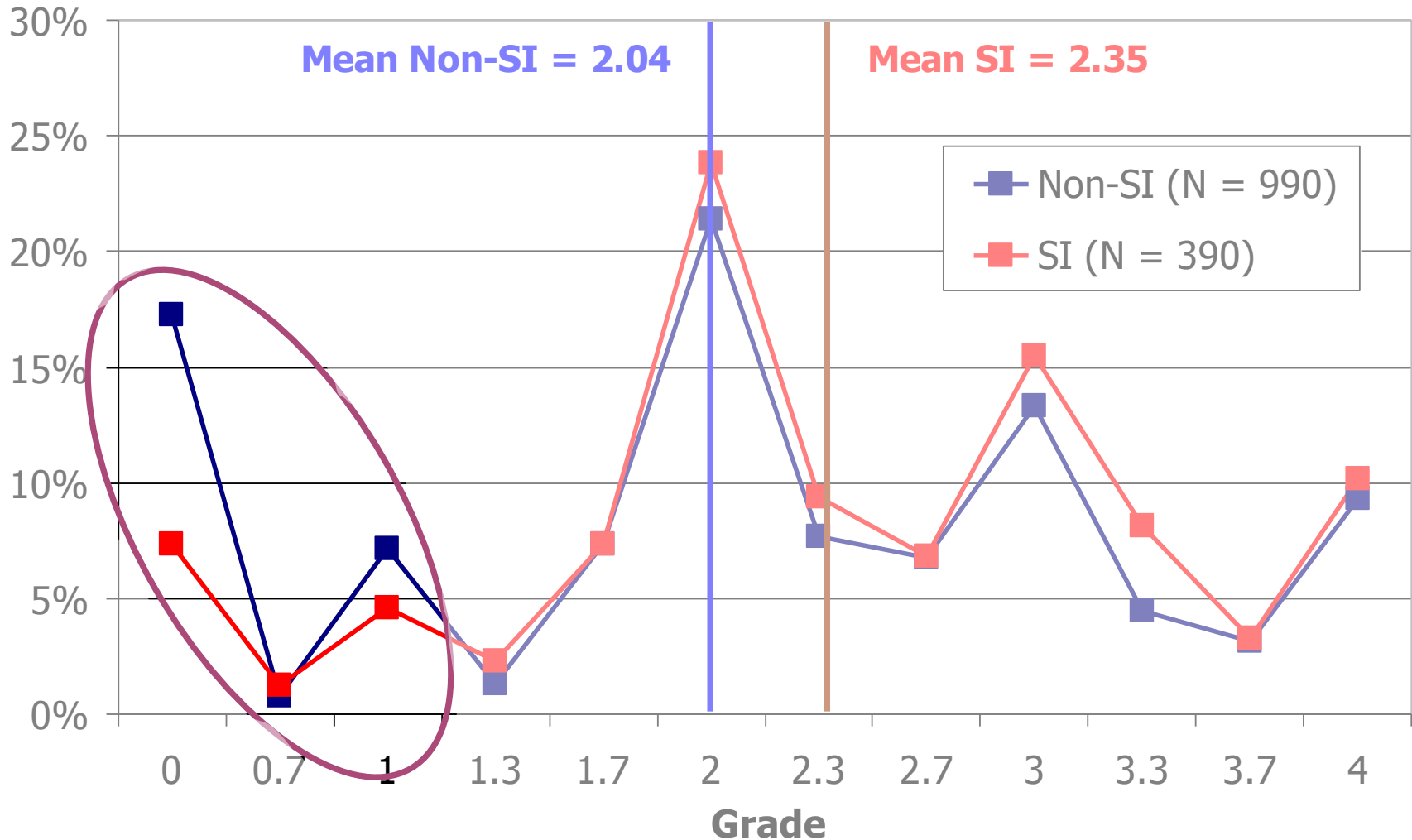
Intro to Biology I – Course Grades



SI C- or better – 85%
Non C- or better – 73%

Difference in means is statistically significant.

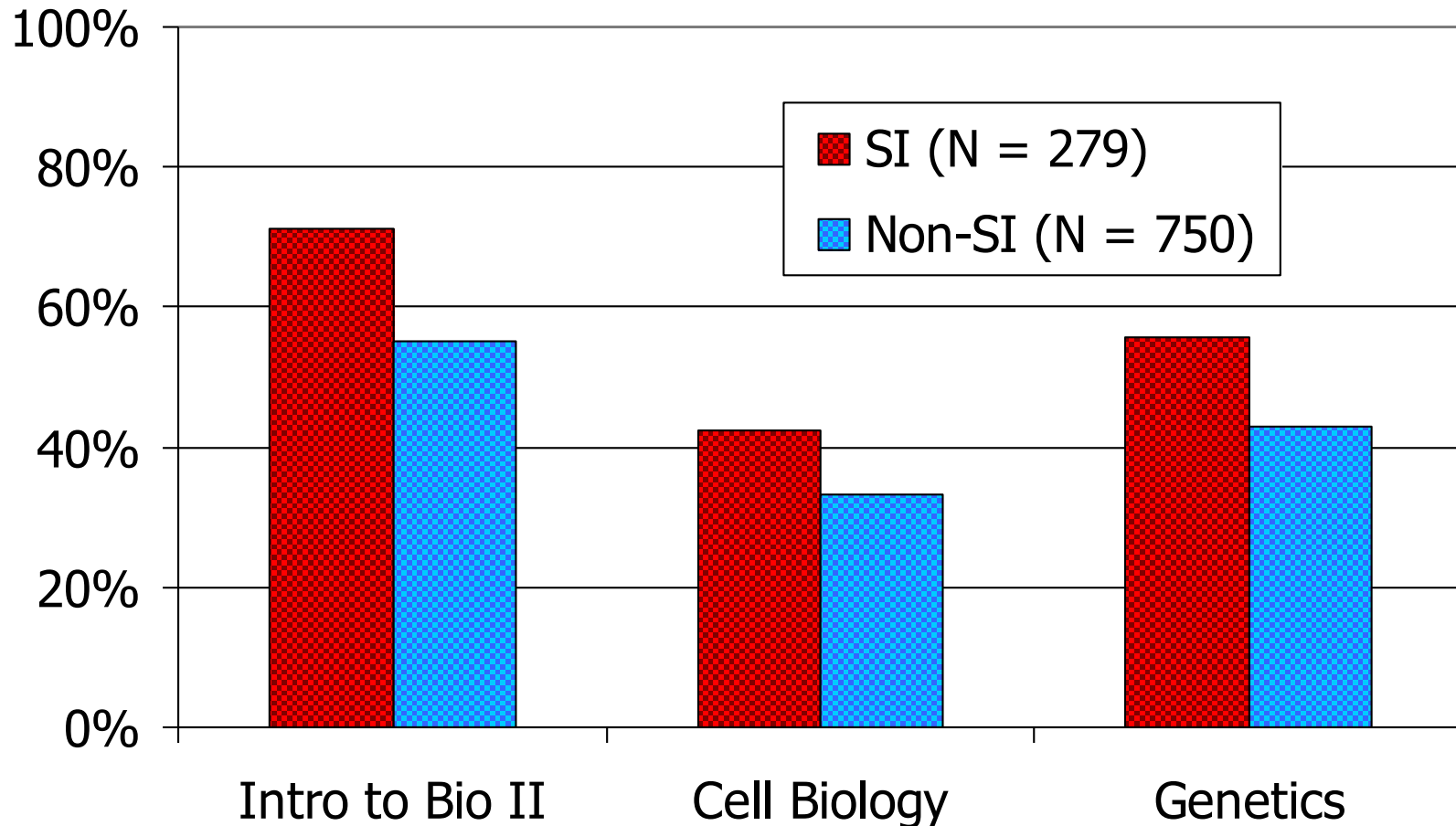
Intro to Biology I – Course Grades



SI C- or better – 85%
Non C- or better – 73%

Difference in “pass rate” is statistically significant.

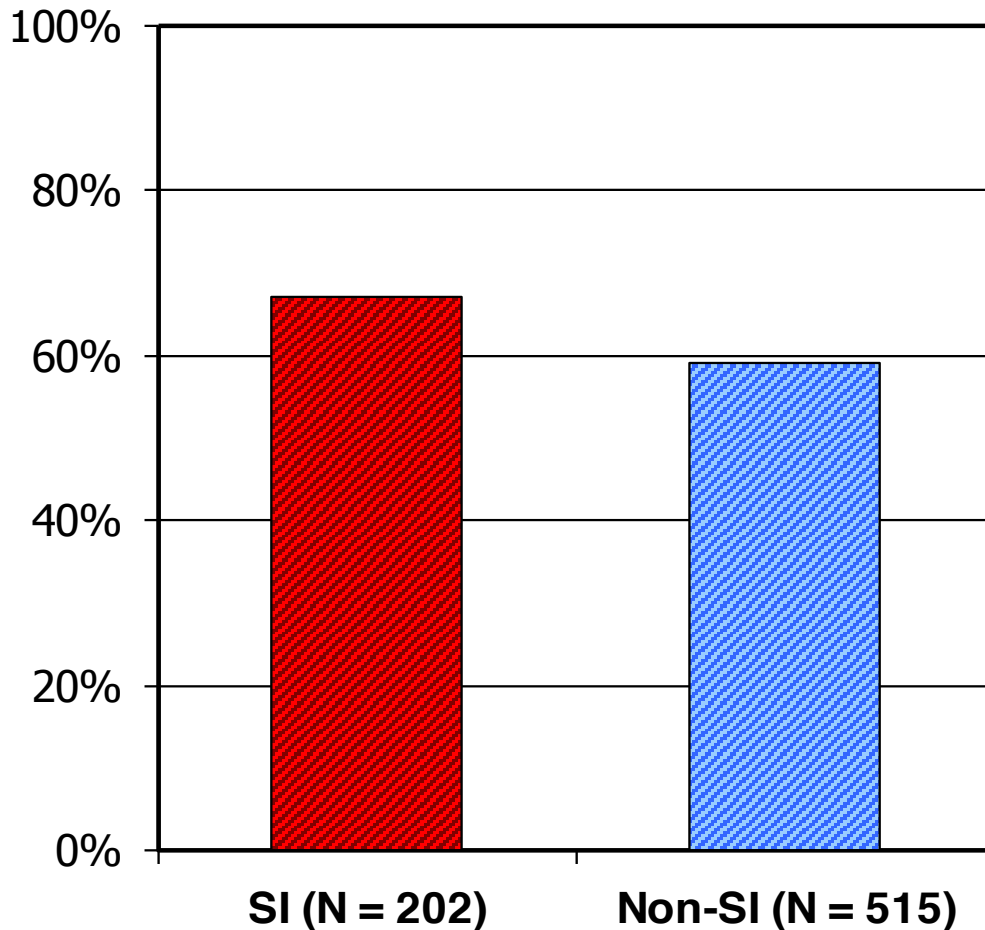
Intro to Biology I – Taking of Subsequent Classes



Data only include individuals taking Intro to Bio I before Spring 2004.

All Differences between groups are statistically significant.

Intro to Biology I – Graduation Rates



Percent graduating from SFSU by Summer 2005

Only includes data from those taking Intro to Bio I prior to Fall 2002.

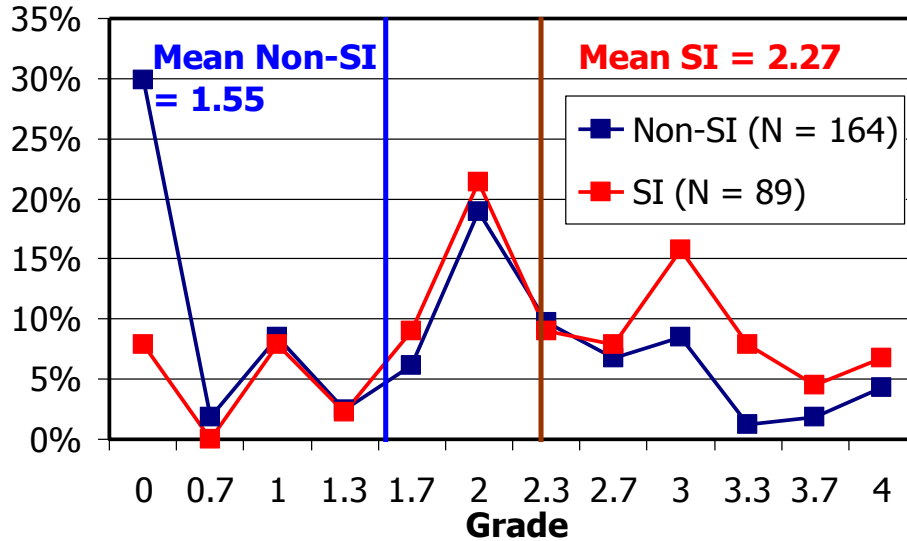
Difference in graduation rate is not statistically significant ($p = 0.06$).

Intro to Biology I – Student Background

	SI	Non-SI
SAT I Math	490 N = 251	518 N = 565
SAT I Verbal	473 N = 251	498 N = 565
High School GPA	3.21 N = 331	3.17 N = 767

Highlighted differences are statistically significant.

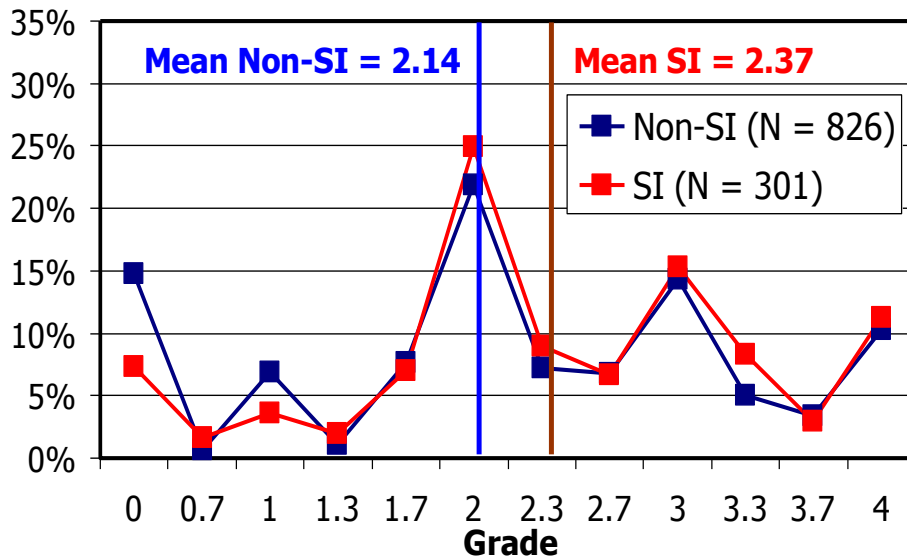
Intro to Biology I – Course Grades by Underrepresented Minority Status



Underrepresented Minorities

SI C- or better – 82%

Non C- or better – 57%

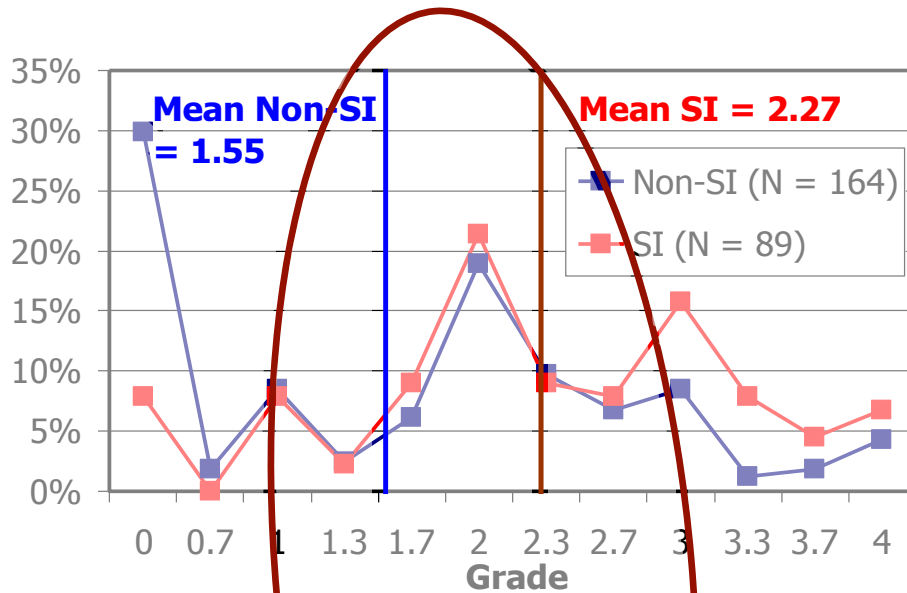


Other Students

SI C- or better – 85%

Non C- or better – 77%

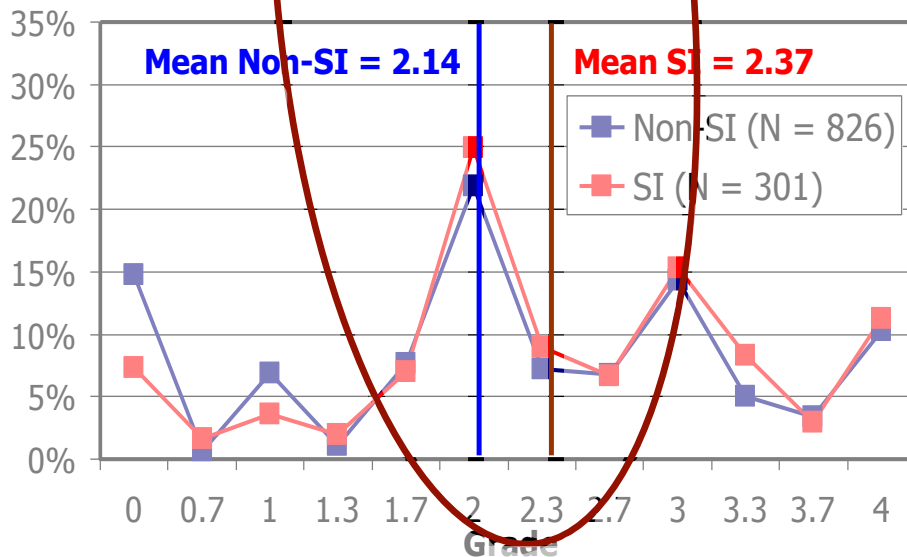
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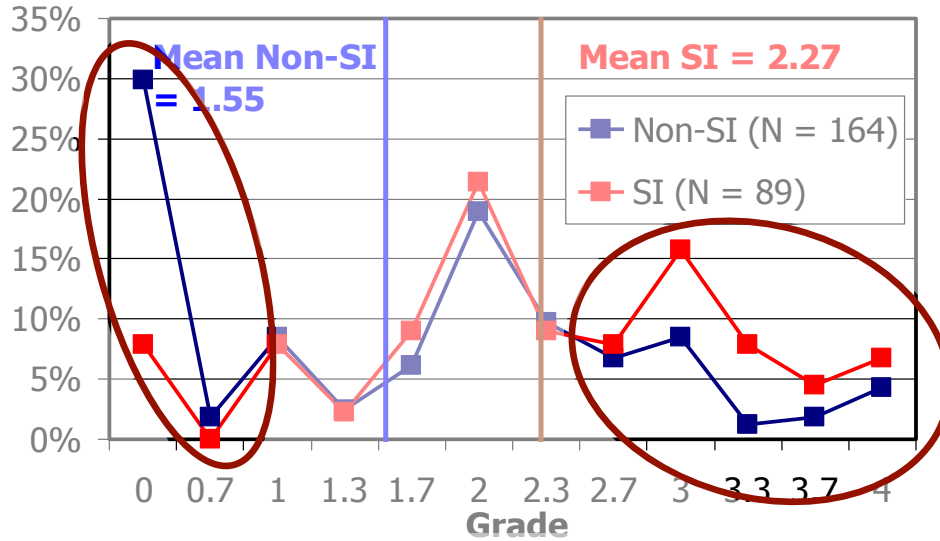
Other Students

SI C- or better – 85%

Non C- or better – 77%

Differences between SI and Non-SI groups are statistically significant in both cases.

Intro to Biology I – Course Grades by Underrepresented Minority Status

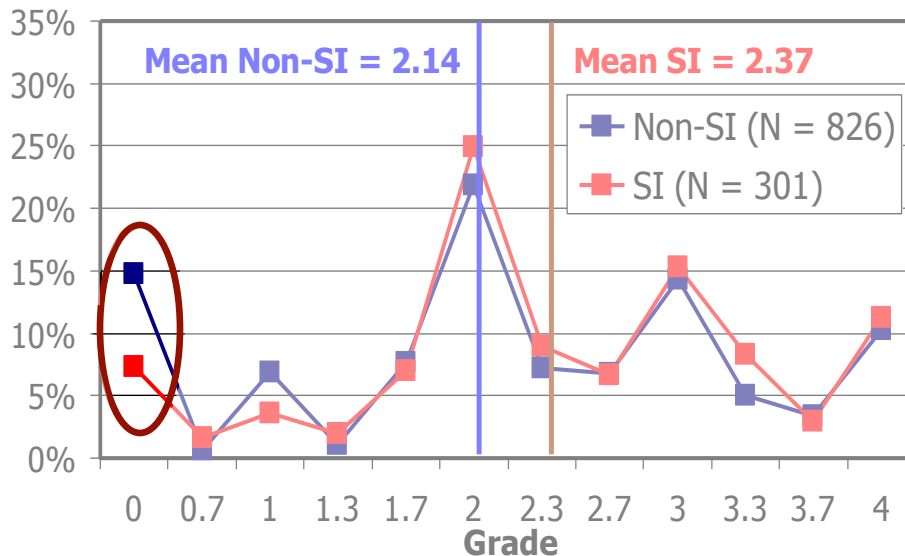


Underrepresented Minorities

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Difference is statistically significant



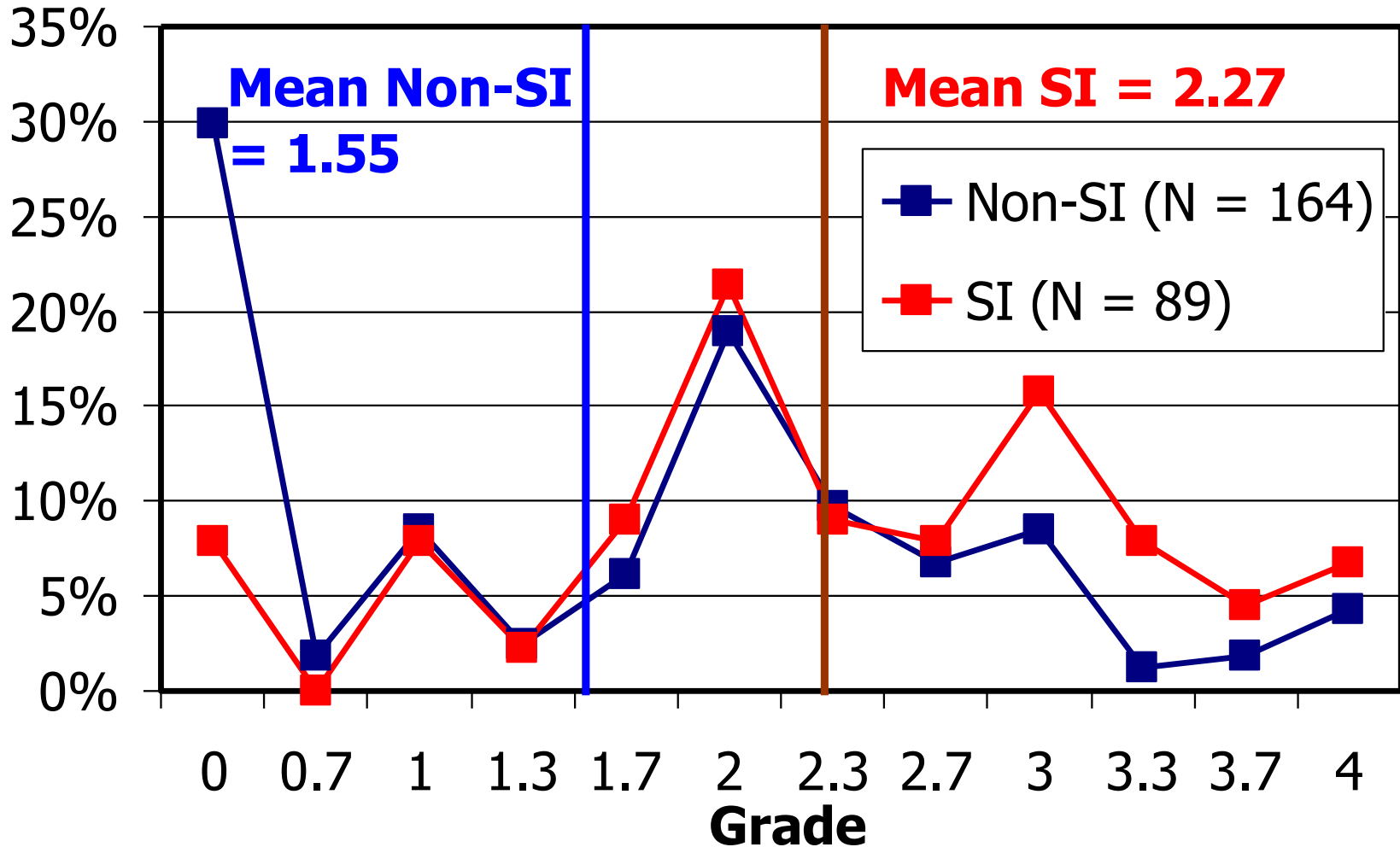
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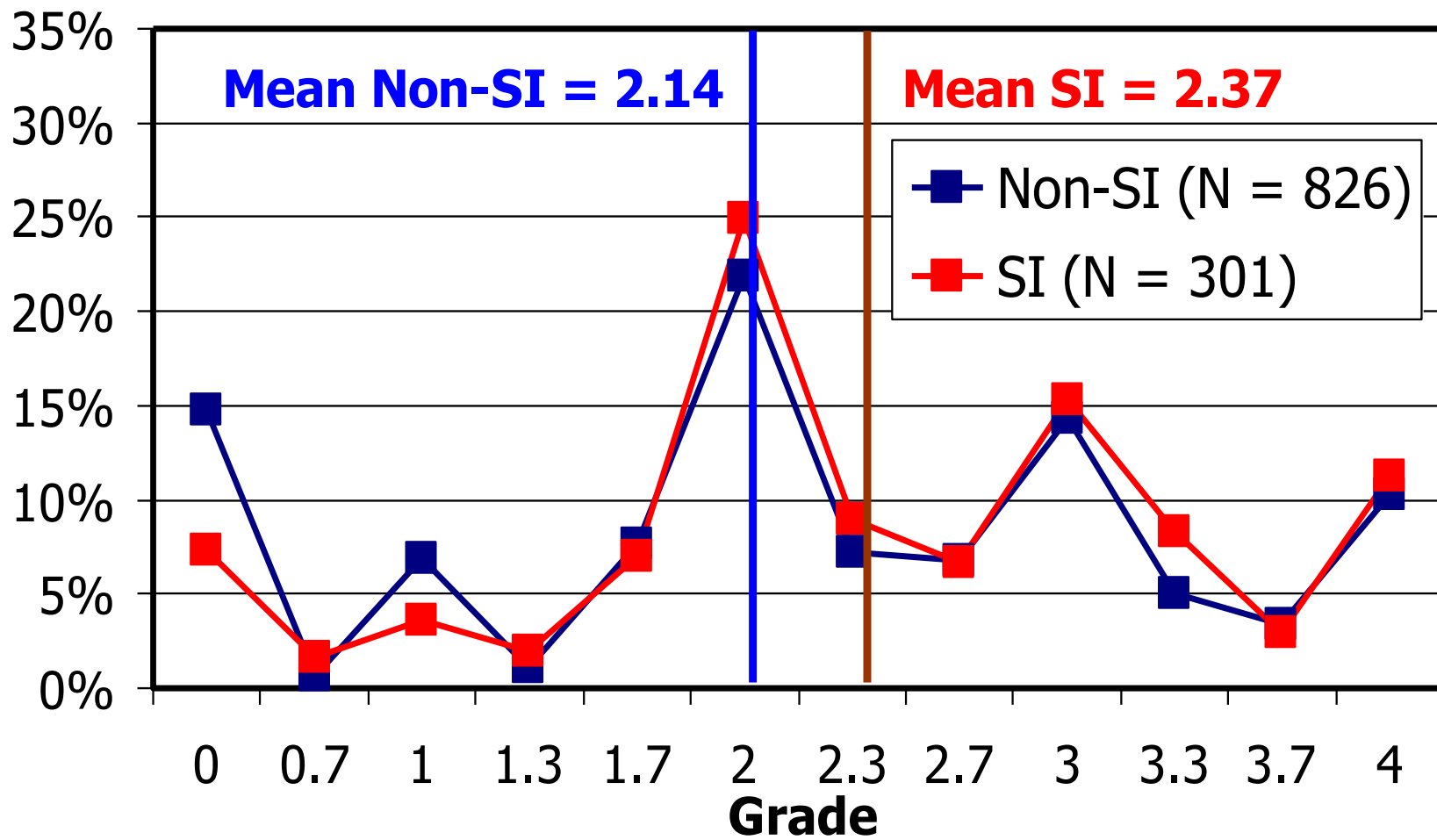
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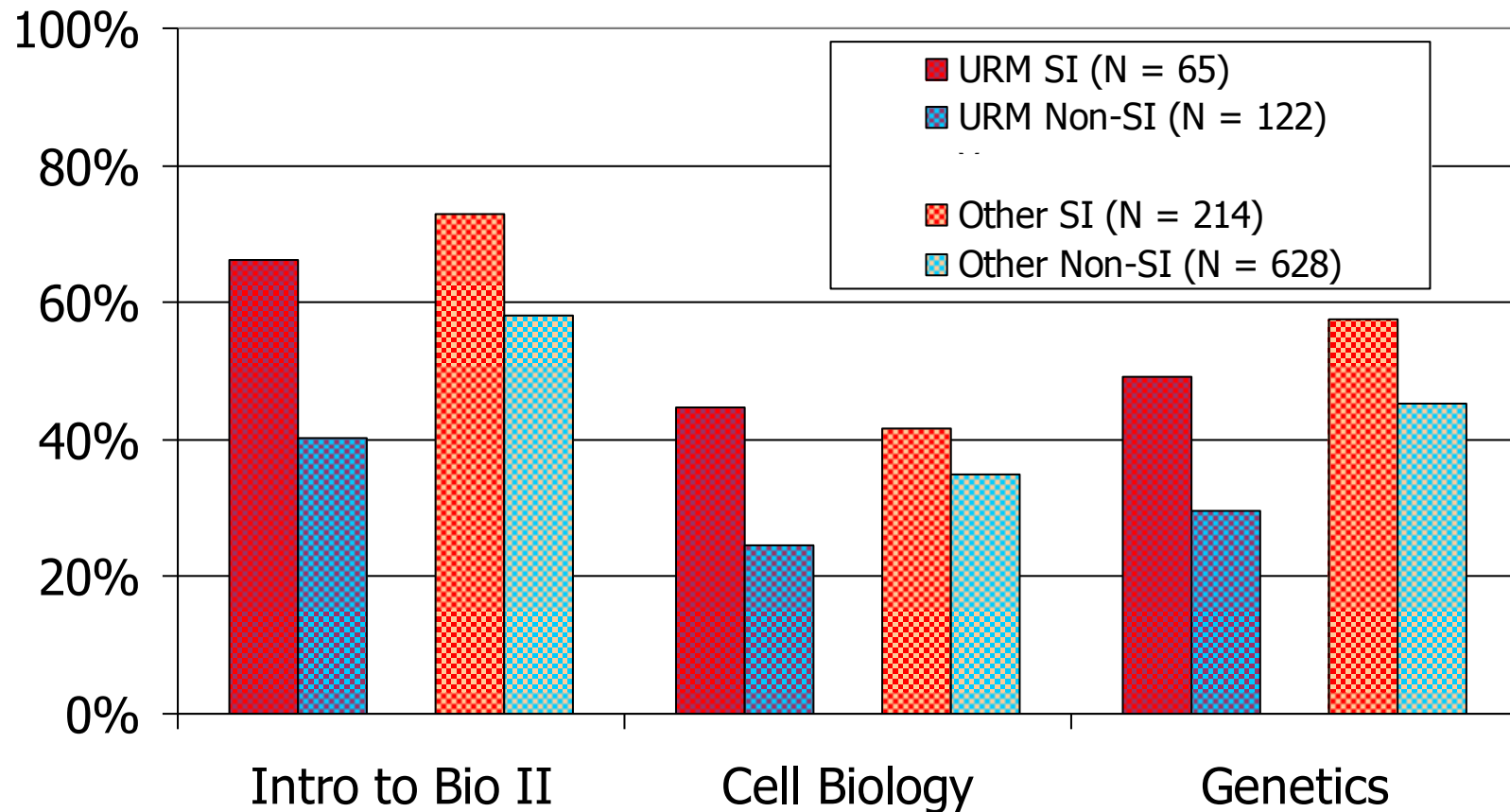
Underrepresented Minorities



Other Students

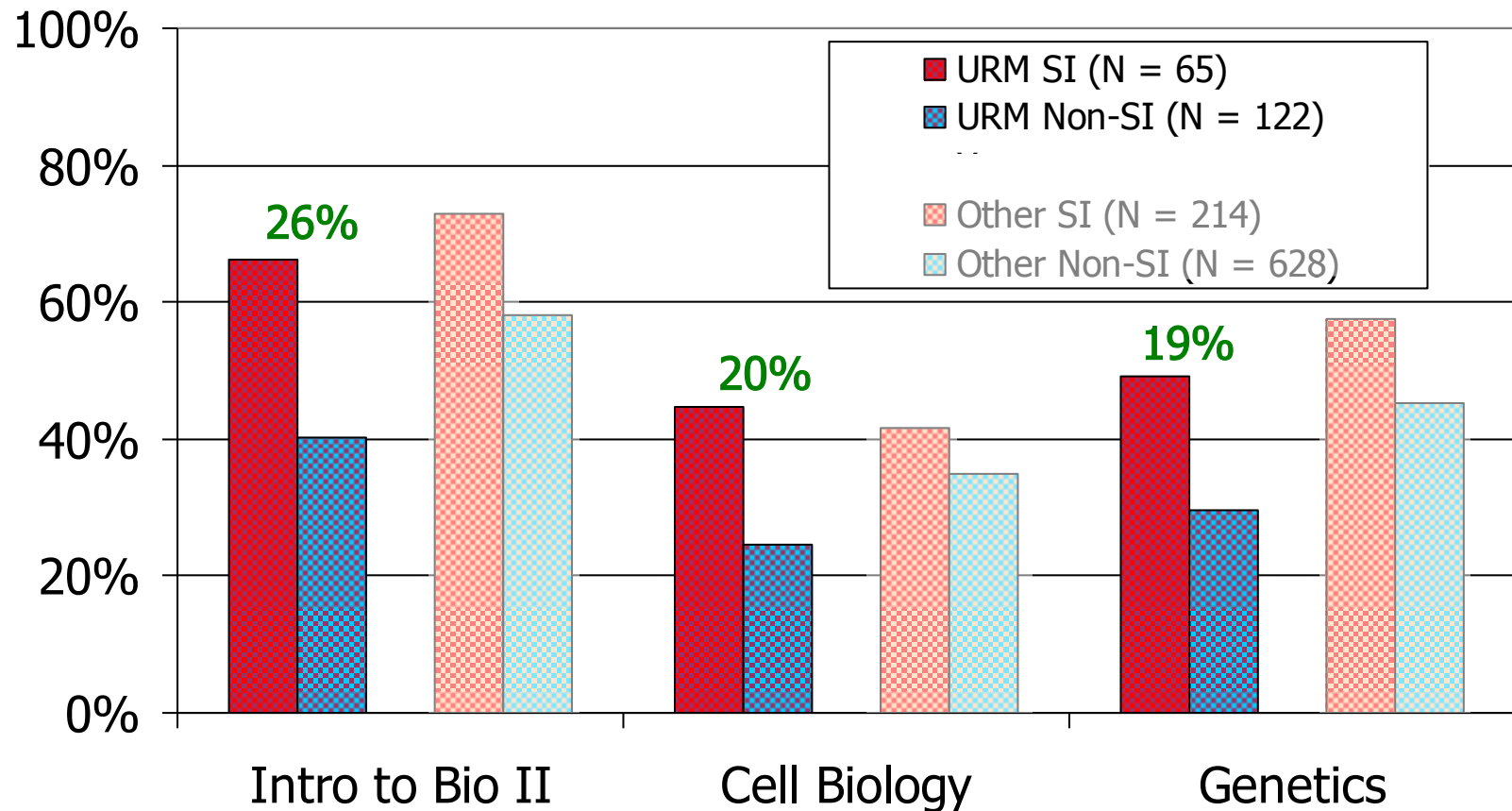


Intro to Biology I – Taking of Subsequent Classes by Underrepresented Minority Status



Data only includes individuals taking Intro to Bio I before Spring 2004.

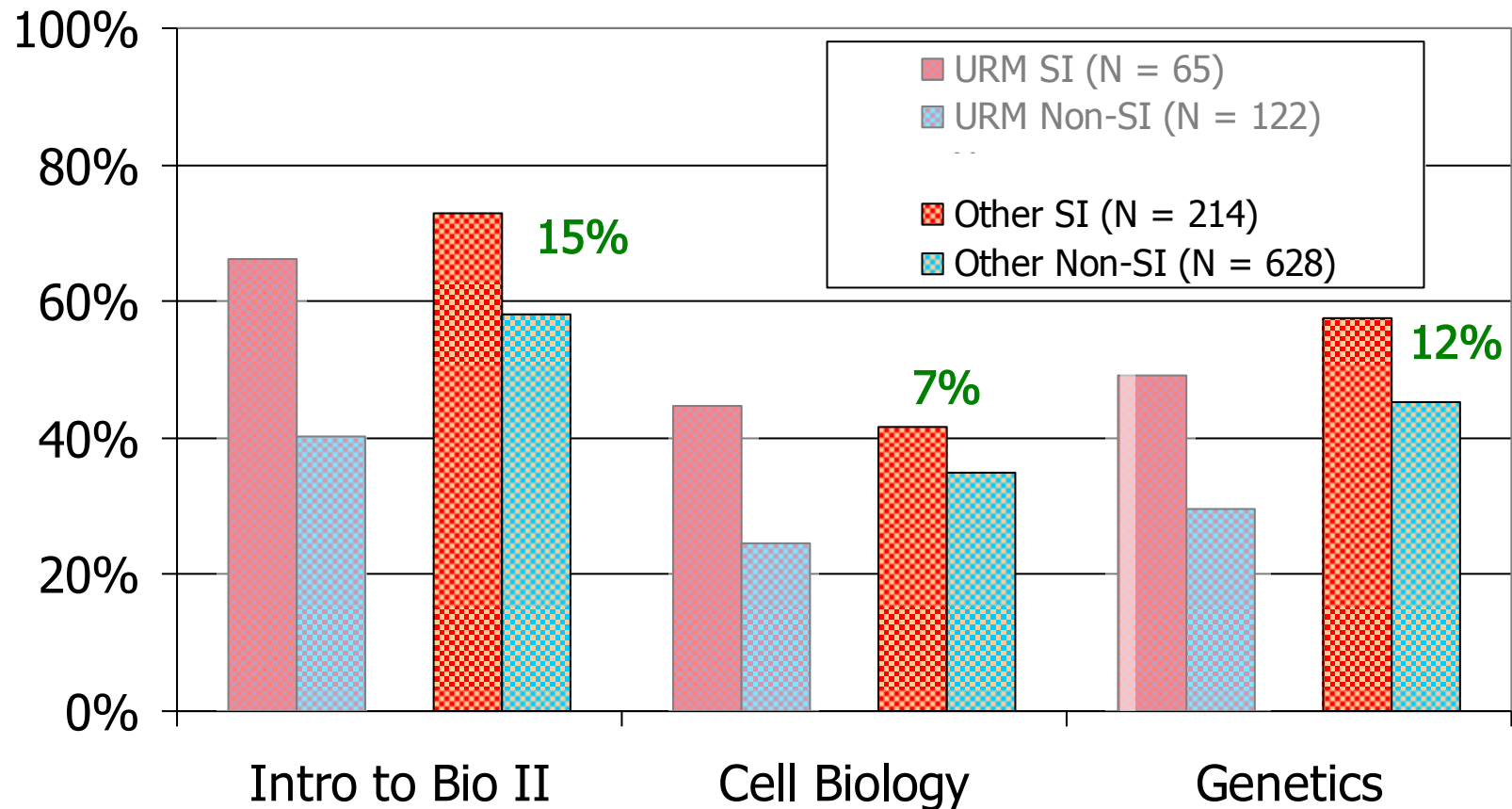
Intro to Biology I – Taking of Subsequent Classes by Underrepresented Minority Status



Data only includes individuals taking Intro to Bio I before Spring 2004.

All differences are statistically significant

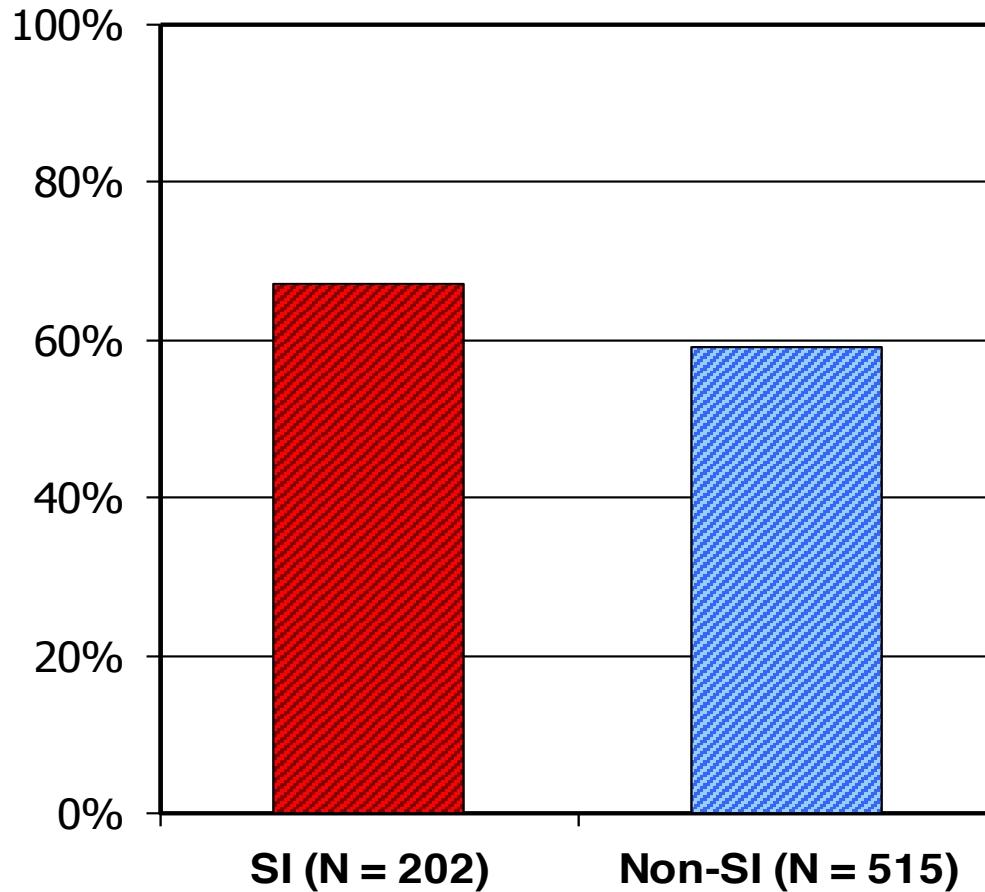
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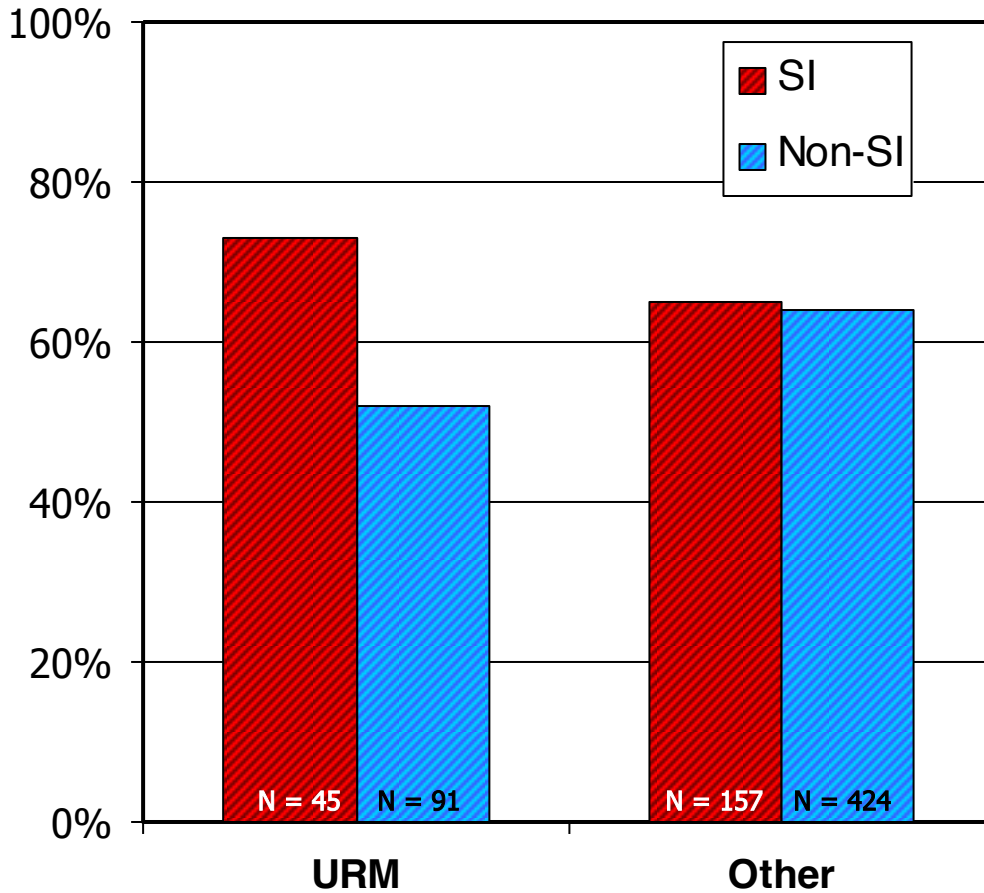
Data only includes individuals taking Intro to Bio I before Spring 2004.

Differences in Intro to Bio II and Genetics are statistically significant.

Intro to Biology I – Graduation Rates



Intro to Biology I – Graduation Rates by Underrepresented Minority Status



Percent graduating from SFSU by Summer 2005

Only includes data from those taking Intro to Bio I prior to Fall 2002.

Difference in graduation rate is statistically significant for URM students but not others.

Intro to Biology I – Student Background by Underrepresented Minority Status

	URM SI	URM Non-SI	Other SI	Other Non-SI
SAT I Math	469 N = 56	486 N = 93	496 N = 195	524 N = 472
SAT I Verbal	456 N = 56	508 N = 93	477 N = 195	495 N = 472
High School GPA	3.08 N = 71	3.05 N = 131	3.24 N = 260	3.19 N = 636

Highlighted differences are statistically significant.

**Why is there such a big
difference
between URM students and
other students?**

Contextualizing Results

SI works, but why and for whom? Differences:

- Courses/disciplines
- Student cohorts
- Student characteristics
- Institutional culture

Part of broader study with multiple data sources

- Surveys
- Student profiles
- Interviews/focus groups

Replication at NMSU

Evaluation vs. Research

Evaluation

- Short-term analysis often defined by period of funding
- Limited scope
- Budget constrained

Research

- Longitudinal analysis
- Multi-course, multi-year scope
- Exploratory analysis
- Examination of detailed questions

Research efforts allowed development of a methodology that can be used under evaluation time-scale and budget