

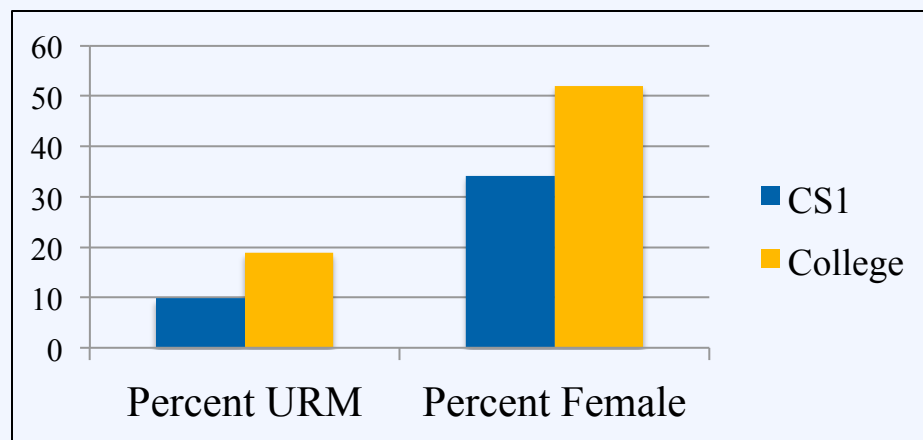
# A Comprehensive Support Program for Introductory CS Courses: Improved Student Performance and Retention of Underrepresented Groups

Tia Newhall, Lisa Meeden, Andrew Danner,  
Ameet Soni, Frances Ruiz, Richard Wicentowski

Computer Science Department  
Swarthmore College  
Swarthmore, PA USA

# Identifying What to Address

**Problem 1:** not getting underrepresented students in the door



**Problem 2:** not retaining students from underrepresented groups at the same rate

# Identifying what to Address

**Problem 3:** a CS culture that was not always friendly and welcoming to everyone

lab culture: nights and weekends

**Problem 4:** CS1 assumed a level of math preparedness

**Problem 5:** not always identifying students who were struggling in time

# Our Goals

1. Creating a welcoming and helpful environment for students who may be intimidated by CS culture

Increase retention, particularly underrepresented groups

2. Accommodate a wider range of backgrounds in CS1

Serve both majors and non-majors

3. Increase support to help students succeed

# Our Changes

## 1. To the structure of CS1

- Python
- Many quizzes instead of single midterm
- Weekly lab session with professor

## 2. Structured Student Mentoring Program

- Full-time coordinator
- Course-integrated student mentors
- Multiple student support resources
- Focus on diversity and interaction

# What Student Mentors Do

- Attend class they are mentoring
  - Hear how faculty present (consistent message)
  - Help students during in-class activities
- Run weekly evening help sessions
  - Help with lab assignments & quiz prep
- Meet weekly with coordinator and faculty
  - Receive mentoring training
  - Discuss upcoming lab goals
  - Relay information about how students doing

# Choosing Student Mentors

- Diversity
  - Always at least 50% female, high % URM
  - Students see a diverse group of “CS Experts”
- Personality
  - Helpful, friendly, patient
- Retention
  - To encourage the mentors to continue in CS
  - Being a mentor increases their confidence

# Student Mentor Coordinator

- Student mentor training
- Attends many classes, labs, evening sessions
  - IDs students who are struggling
  - Observes mentors for feedback & training
  - IDs potential future mentors
  - Provides feedback to faculty on teaching
- Student Support
  - Helps students during labs and evening sessions
  - Weekly office hours
  - Finds tutors



# Evaluation of our Changes

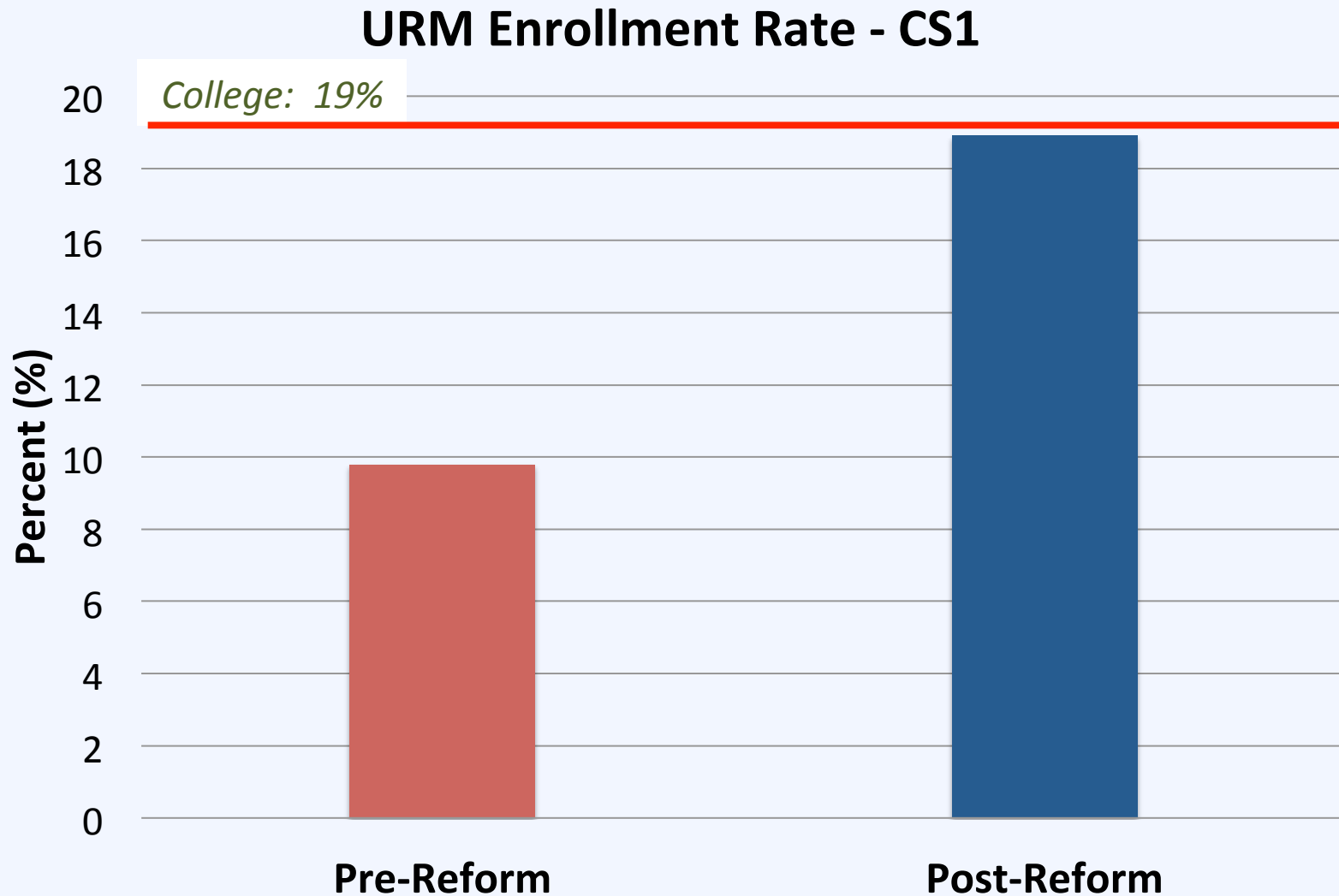
## Longitudinal Data Analysis

13 years of data (Fall 1999- Spring 2013)

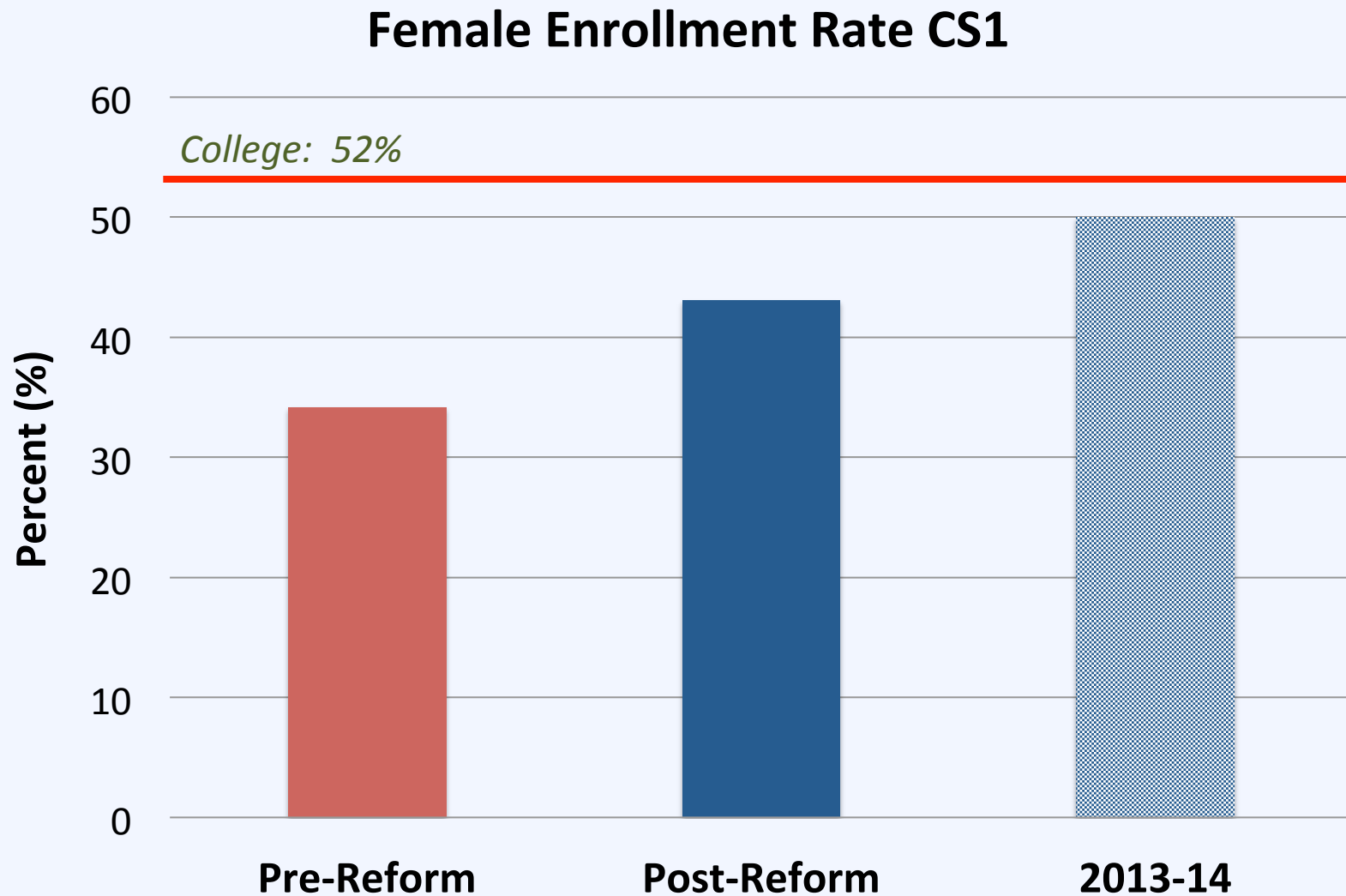
- Data: grades, demographic, SAT, attendance
- Changes implemented starting in **Fall 2006**

The college's IR staff carried out analysis

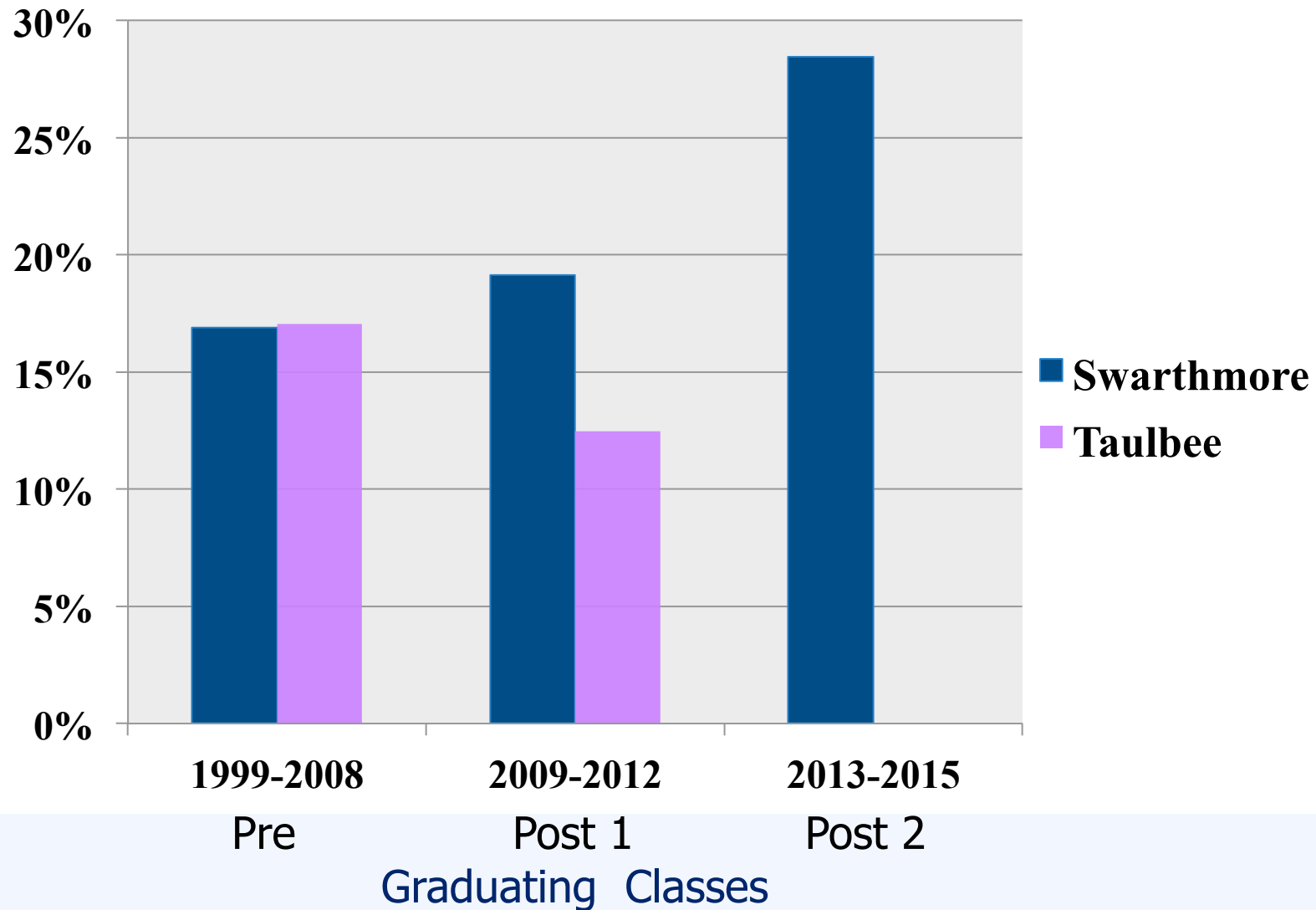
# Results: Recruitment of URM Students



# Recruitment of Female Students



# Retention Results: Percent Female CS Majors



# Student Mentor Survey

- Administered to all current and former student mentors
- Quantitative:
  - Rate overall experience highly (4.5 out of 5)
- Qualitative:
  - Unanimously positive

# Common Themes in Responses

## 1. Feel more a part of the department

“Being a student mentor made me feel I was more deeply a part of the department than I had been before. I ended up getting to know more people, and feeling more connected to the department.”

## 2. Help solidify their knowledge in CS:

“My understanding of the [CS] material is deeper after spending time teaching it and thinking of multiple ways to explain it, particularly more abstract concepts.”

# Common Themes in Responses

3. A boost to their self confidence
4. A major factor in their decision to major

“I decided to major in CS partially as a result of student mentoring. The confidence shown in me by recommending me as a student mentor made me think that I was smart enough to do computer science, and that kept me going when the course work got difficult.”

# Summary

- **Real Diversity Improvements:**
  - In whom we serve: future CS majors & non-majors
  - In enrollment and retention of women & URM
- **Real Change in Environment:**
  - More friendly, helpful, fun than ever
    - Evening sessions helped changed evening lab culture
- **CS1 successfully serving majors & non-majors:**
  - 50% of Swarthmore students will take a CS class
  - Support program helps success across a diverse group
- **Expanded into our 2 intermediate courses**



# Applying Elsewhere

- Coordinator is essential
  - Liaison between students, faculty, mentors
  - This is a full time job
- Focused and trained student mentors a key
- Foster culture of feedback & interaction
  - Faculty, Mentors, Coordinator, Students

## Added costs

- **Time**: for faculty (meetings, labs, quizzes)
- **Money**: coordinator salary, student mentors, food



Thank you.  
Questions?

