



# WPI

## Interactive Qualifying Project

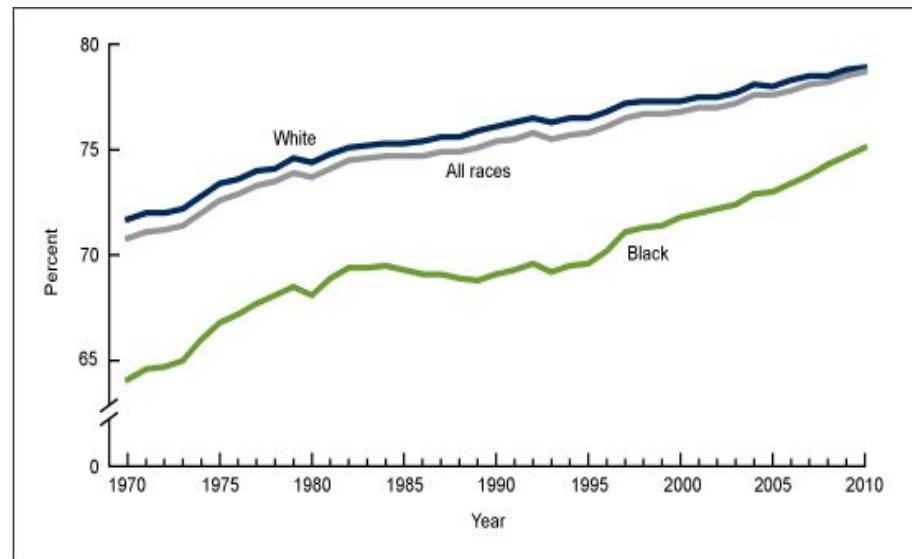
# A preliminary analysis of healthcare disparities curriculum at WPI

Lily Cordner, Sammy Hankaoui, Delainey O'Connor,  
Emily Pollock, Blake Wofford

Advisor: Kristen Billiar, PhD

# Healthcare Disparities in the US

- Varying qualities of treatment and care
- Persistent disparities in life expectancy <sup>1</sup>
- Minimal increases in awareness <sup>2</sup>



[1] Kochanek, K.D. (2013)

[2] Benz (2011)

# Problems with Online Media Sources

---

- Leading source of health information <sup>1</sup>
- Hard to find credible sources <sup>1</sup>
- Bias in online healthcare reporting <sup>2</sup>



[1] Budak, C. et al., 2014, SSRN Electronic Journal

[2] Library Home: News Literacy, n.d.

# Current Ethics Education Elsewhere

---

- Formal structural racism curriculum <sup>1</sup>
- Pre-medical education <sup>1</sup>



- 2017 study of 400 institutions <sup>2</sup>
- Ethical and social impacts in engineering <sup>2</sup>
- Integration vs. standalone ethics course <sup>2</sup>

[1] Metzl, J., Petty, J., & Olowojoba, O. 2017.

[2] Bielefeldt, A., Polmear, M., Knight, D., Swan, C. (2017).

# Project Goals

---

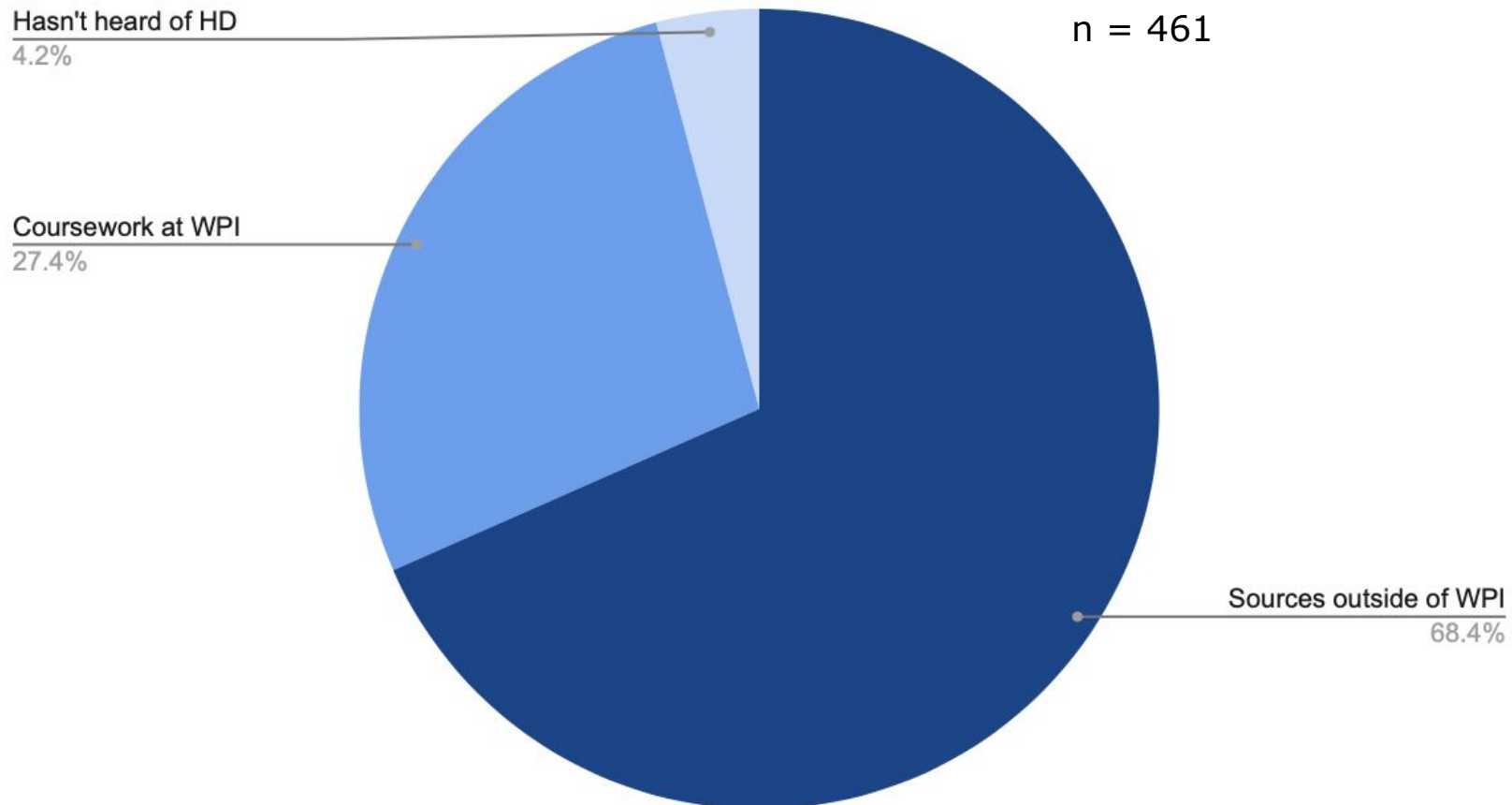
- 1.** Research status of healthcare disparities in WPI curriculum
- 2.** Develop an educational module for WPI undergraduates to increase awareness and understanding of healthcare disparities



**WPI**

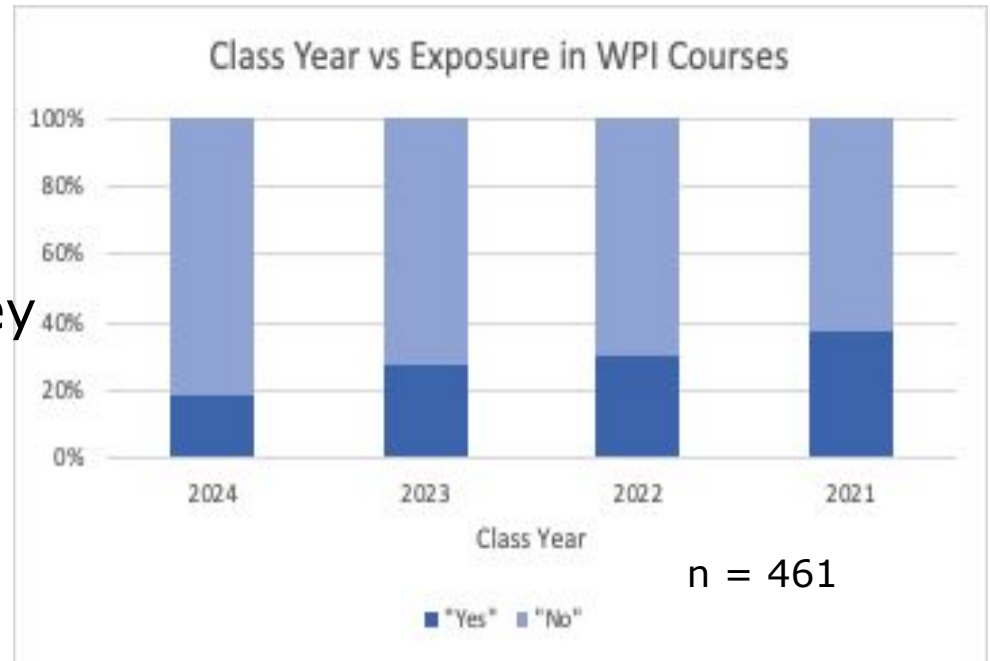
# Healthcare Disparities Coverage in Undergraduate Curriculum

## Healthcare Disparities Information Sources



# Outcomes of Lack of Education

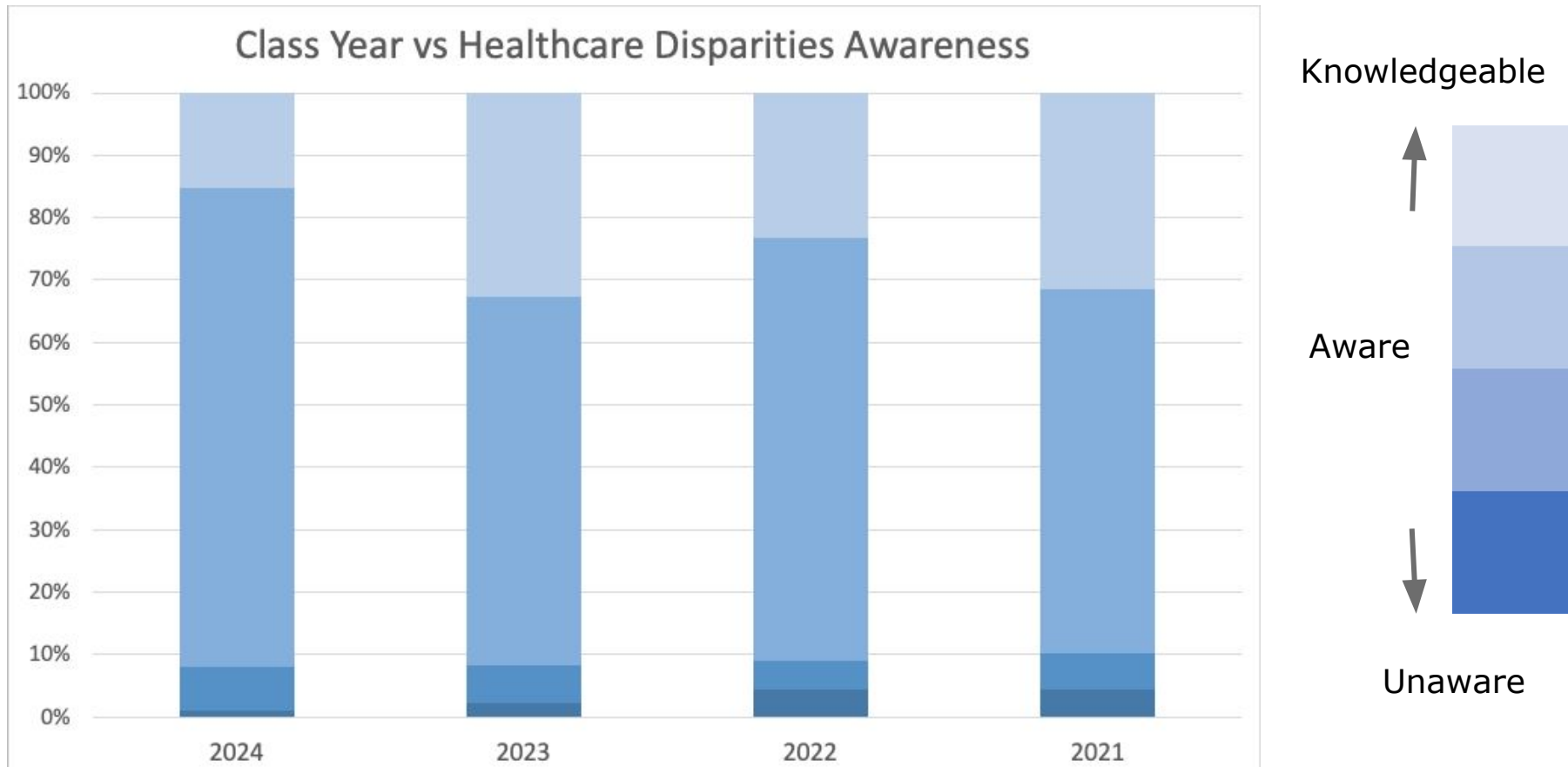
- Consistent education for a “lasting learning opportunity” <sup>1</sup>
- Association between training and patients they consider at risk <sup>2</sup>
- Overestimate of the quality of education <sup>1</sup>



[1] Dupras, D. et al., 2020, *JAMA Network Open*

[2] PatientEngagementHIT, 2020

# Students' understanding of healthcare disparities do not increase with class year

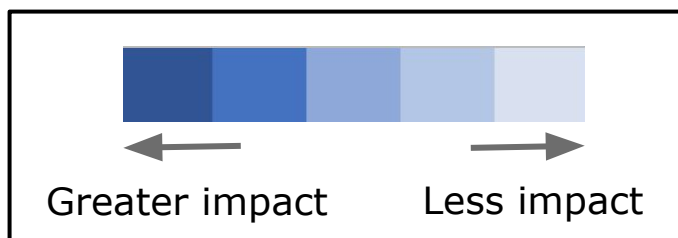
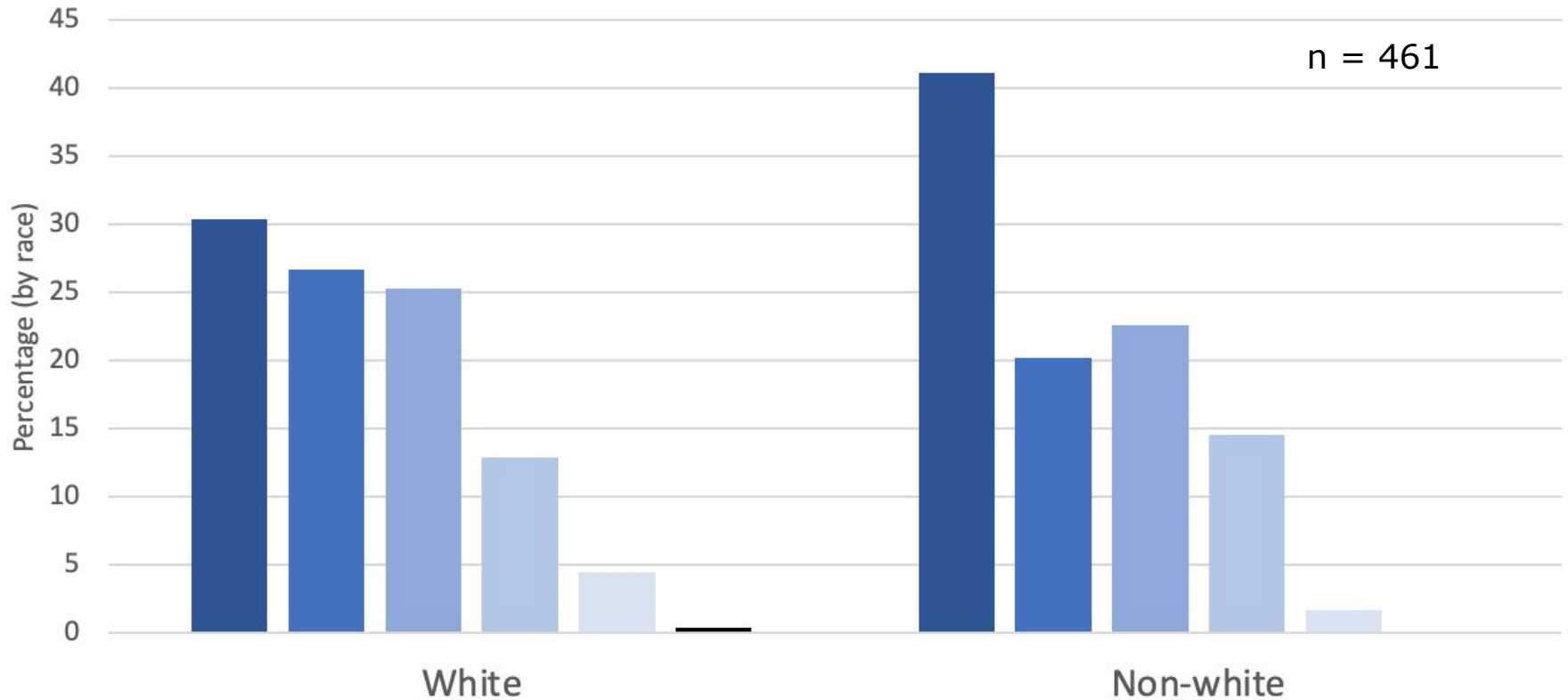


n = 461

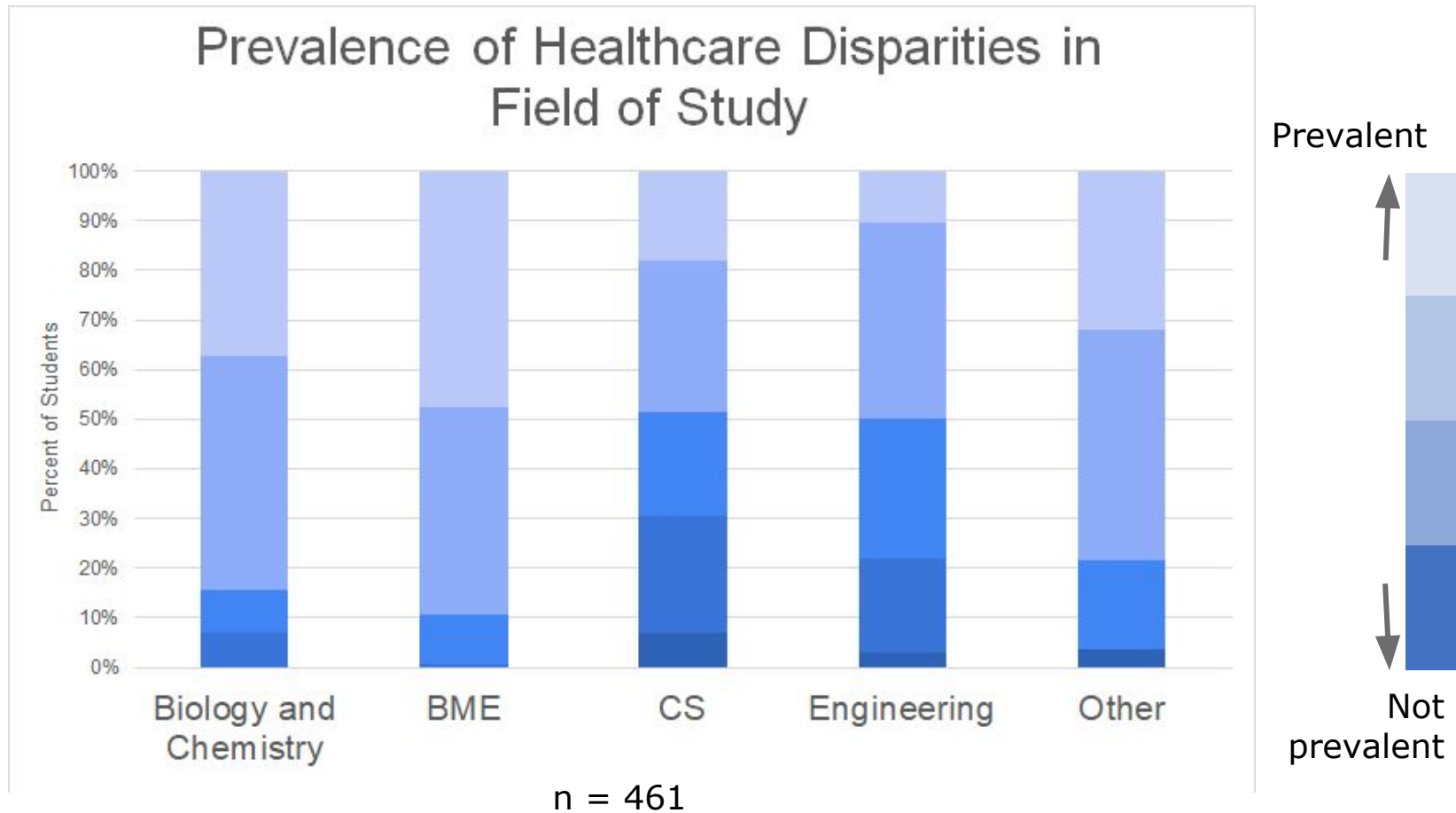


# WPI Students' Perception of Impact

## Students' Perceptions of the Effects of Healthcare Disparities



# Students' Perception of Healthcare Disparities



# Educational Module Breakdown

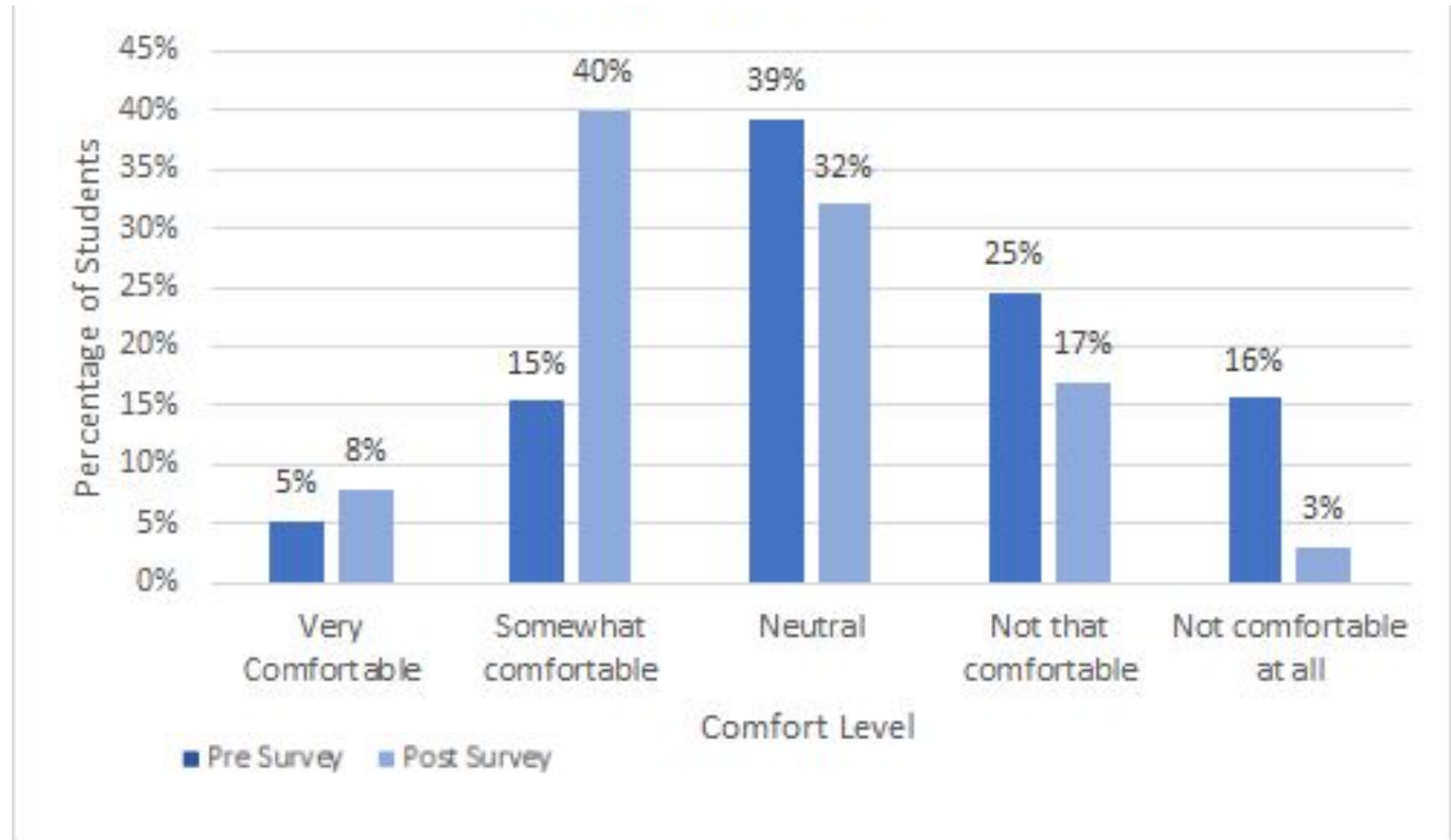
---

- Addressing the issue
- In depth breakdown of healthcare disparities
- Five major problems
  - Western bias
  - Implicit bias
  - Demographic bias
  - Inconsistent medical diagnoses
  - Clinical trial populations
- Course selection <sup>1</sup>

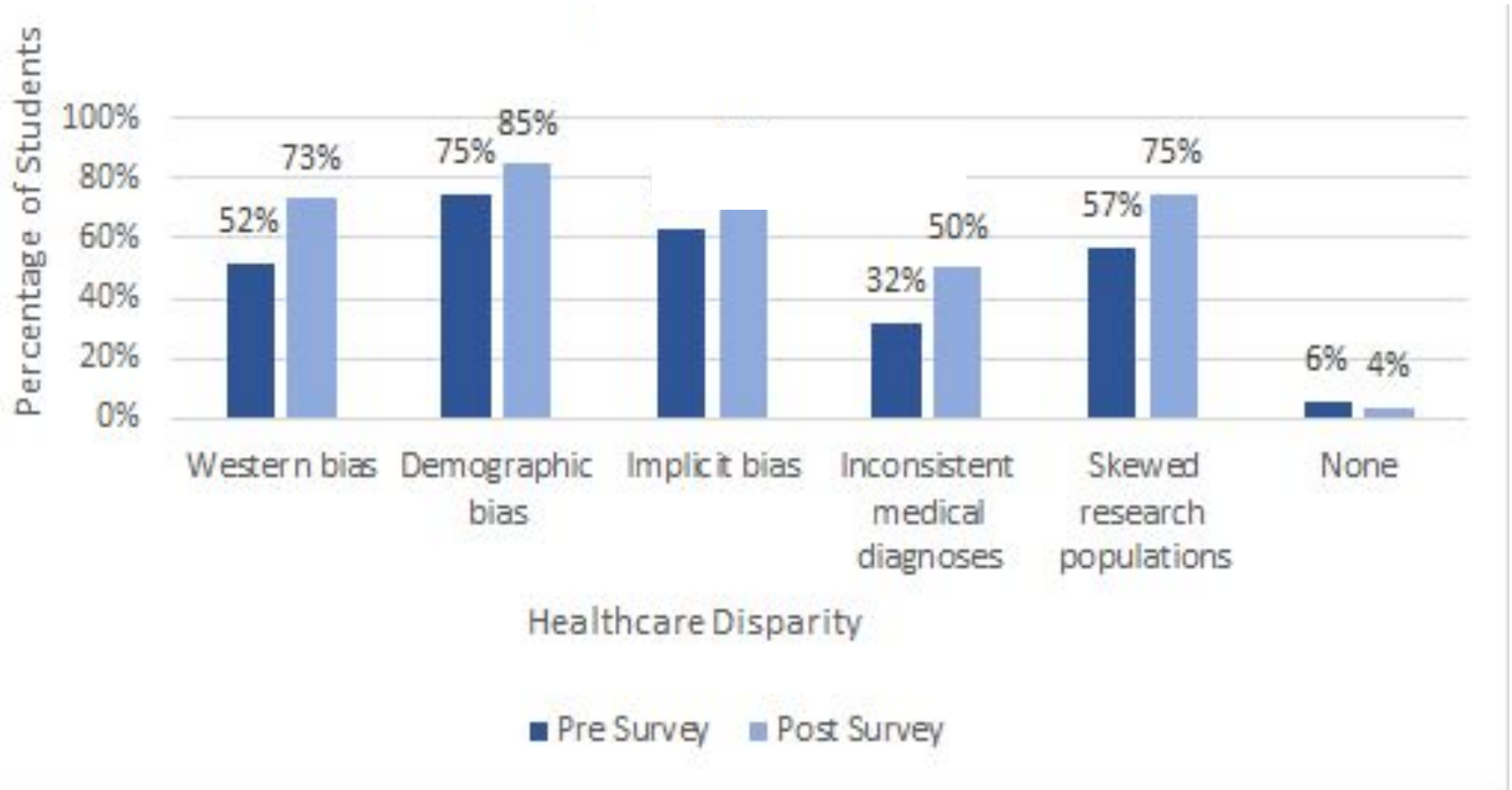


[1] Brendan Murphy News Writer. "Which Undergrad Majors Are Best for Med School?"

# Understanding of ethical theories will improve with participation



# Understanding of healthcare disparities will improve with participation



# Limitations and Future Work

---

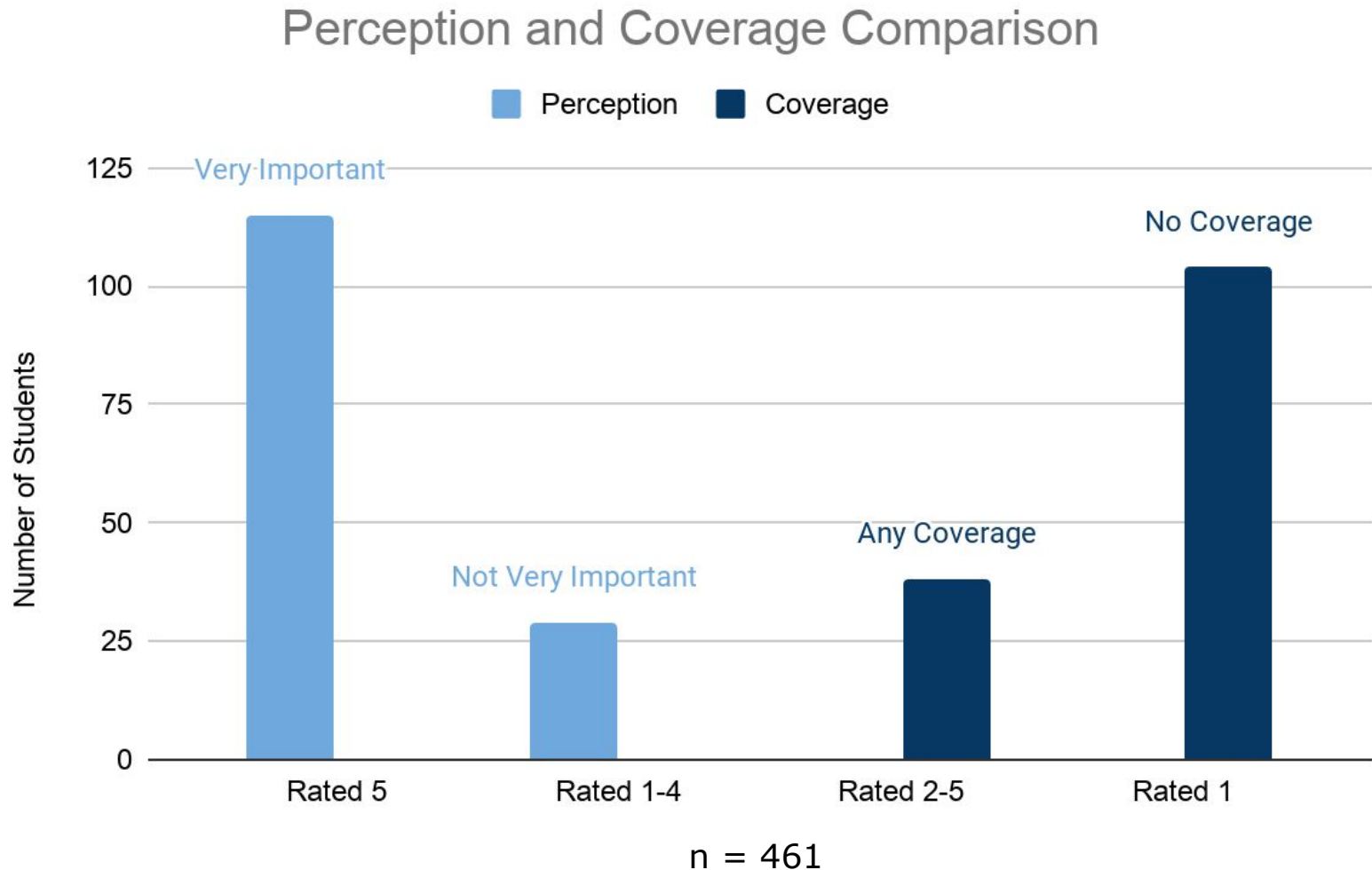
## Limitations

- Biased self-reported survey responses
- Varied engagement with material among disciplines and class year
- Time constraints

## Future Work

- Integrate healthcare disparities education throughout 7-week term
- Work with more non-biomedical engineering or life science courses

# Comparing Perception and Coverage



# Conclusion

- Actively fight healthcare disparities through education
- Disparity between coverage and care
- Explicitly outlining students' needs to address social problems
- A consistent educational module is necessary
  - Supported by WPI Professors



# Acknowledgments

---

Advisor: Kristen Billiar, PhD

- Mohammed Shazeeb, PhD
- Lou Roberts, PhD
- Dirk Albrecht, PhD
- Zoe Reidinger, PhD
- Liz Ryder, PhD
- Natalie Farny, PhD
- Jill Rulfs, PhD
- Angela Rodriguez, PhD
- Bethel Eddy, PhD
- Solomon Mensah, PhD
- Catherine Whittington, PhD
- Geoffrey Pfeifer, PhD

# References

---

- Bielefeldt, A., Polmear, M., Knight, D., Swan, C. (2017). Ethics across the curriculum? Integrating ethics and societal impact topics into core engineering courses. Researchgate.  
[https://www.researchgate.net/publication/319999091\\_Ethics\\_Across\\_the\\_Curriculum\\_Integrating\\_Ethics\\_and\\_Societal\\_Impact\\_Topics\\_into\\_Core\\_Engineering\\_Courses](https://www.researchgate.net/publication/319999091_Ethics_Across_the_Curriculum_Integrating_Ethics_and_Societal_Impact_Topics_into_Core_Engineering_Courses).
- Budak, C., Goel, S., & Rao, J. M. (2014). Fair and Balanced? Quantifying Media Bias Through Crowdsourced Content Analysis. SSRN Electronic Journal. doi:10.2139/ssrn.2526461
- Dupras, D. M., Wieland, M. L., Halvorsen, A. J., Maldonado, M., Willett, L. L., & Harris, L. (2020). Assessment of Training in Health Disparities in US Internal Medicine Residency Programs. *JAMA Network Open*,3(8). doi:10.1001/jamanetworkopen.2020.12757
- Hajjar, A. F., Skillings, K. D., Soto, M., & Kelly, B. R. (2017). TEACHING OF ETHICS TO ENGINEERING STUDENTS THROUGH THE USE OF ROLE PLAYING. Retrieved March 15, 2021.
- Health Affairs 2011 30:10, 1860-1867
- Jackson, X., Jasensky, Z., Liang, V., Moore, M., Rogers, J., Pfeifer, G., & Billiar, K. L. (2015). A Joint-Venture Approach in Teaching Students How to Recognize and Analyze Ethical Scenarios. *Ethics in Biology, Engineering and Medicine: An International Journal*,6(3-4), 197-209. doi:10.1615/ethicsbiologyengmed.2016014325
- Jennifer K. Benz, Oscar Espinosa, Valerie Welsh, and Angela Fontes Awareness Of Racial And Ethnic Health Disparities Has Improved Only Modestly Over A Decade
- Kochanek, K.D. (2013). How Did Cause of Death Contribute to Racial Differences in Life Expectancy in the United States in 2010? CDC US Dep. of Health. pp. 1-10.
- Library Home: News Literacy: News Views & Fact Checking Resources: Media Bias. (n.d.). Retrieved March 16, 2021, from <https://library.fvtc.edu/News/BiasCheck>
- Metzl, J., Petty, J., & Olowojoba, O. (2017, June 22). Using a structural competency framework to teach structural racism in pre-health education. Retrieved January 16, 2021, from <https://www.sciencedirect.com/science/article/pii/S0277953617303982>
- PatientEngagementHIT. (2020, August 11). Medical Education About Health Disparities Needs Improvement. Retrieved March 15, 2021, from <https://patientengagementhit.com/news/medical-education-about-health-disparities-needs-improvement>

## Image References

- <https://worldvectorlogo.com/logo/university-of-minnesota>  
<https://www.logolynx.com/topic/vanderbilt+university#&qid=1&pid=2>  
<http://clipart-library.com/free/scale-transparent.html>  
<https://www.pinterest.com/pin/595108538231825916/>  
<https://www.wpi.edu/offices/marketing-communications/resources>



# WPI

# Thank you!

Questions?



# Student Pre-Survey

## Student Survey

Baseline Examination of students understanding of healthcare disparities and ethics

\* Required

### Baseline Questions

Please answer the questions to the best of your knowledge.

How prevalent do you think healthcare disparities are in your field? \*

- Very prevalent
- Somewhat prevalent
- Neutral
- Not very prevalent
- Not prevalent at all

How much do you think healthcare disparities affect people in your field or members of your community? \*

- Affects many people greatly
- Affects many people somewhat

### Definition of Healthcare Disparities

Healthcare disparities are differences in opportunities to achieve optimal health, typically experienced by socially disadvantaged populations. These inequalities can be seen as gaps in access, quality, and affordability of healthcare, as well as differences in the presentation of disease and health outcomes, associated with specific populations.

Where have you heard about healthcare disparities before? Check all that apply. \*

- Coursework at WPI
- Coursework outside of WPI
- News programs
- Online media
- Books
- I have not heard about healthcare disparities before.
- Other: \_\_\_\_\_

Healthcare disparities are sometimes the result of biases. Which types of biases have you heard of before? Check all that apply. \*

- Western bias
- Implicit bias
- Demographic bias
- Erroneous medical diagnoses
- Skewed research populations
- None
- Other: \_\_\_\_\_

# Lecture Material

**WPI**

## Introduction to Healthcare Disparities

Lily Cordner, Sammy Hankaoui, Delainey O'Connor, Emily Pollock, Blake Wofford

1

## Healthcare disparities broken down

Healthcare disparities are defined as the differences in opportunities to achieve ultimate health, typically experienced by socially disadvantaged populations.

2

## Examples of Disparities in Healthcare

- Gaps in access to healthcare
- Differences in quality of healthcare
- Varying affordability of healthcare
- Differences in disease presentation
- Altered mortality rates

3

## Terminology

4

## Prejudice, Discrimination, and "Color-Blind"

**Prejudice** | prejudgment or preconceived opinion, feeling, or belief, usually negative, often based on stereotypes, that includes feelings such as dislike or contempt and is often reacted as discrimination or other negative behavior; OR, a set of negative personal beliefs about a social group that leads individuals to prejudge individuals from that group or the group in general, regardless of individual differences among its members or that group.

**Discrimination** | The denial of justice and fair treatment by both individuals and institutions in many areas, including employment, education, housing, banking, and political rights. Discrimination is an action that can follow prejudiced thinking.

**Color Blind** | The belief in treating everyone "equally" by treating everyone the same, based on the proposition that differences are by definition not problematic, and therefore best ignored (i.e., "I don't see race, gender, etc.)."

5

## Ethnicity, Race, and Culture

**Ethnicity** | A social construct which divides individuals into smaller social groups based on characteristics such as a shared sense of group membership, values, behavioral patterns, language, political and economic interests, history and ancestral geographical base.

**Race** | refers to the concept of dividing people into populations or groups on the basis of various sets of physical characteristics that result from genetic ancestry.

**Racial Equity** | Racial equity is the condition that would be achieved if one's racial identity no longer predicted, in a statistical sense, how one fares. When this term is used, the term may imply that racial equity is one part of racial justice, and that also include work to address the root causes of inequity, not just their manifestations. This includes the eradication of prejudice, prejudice, attitudes and cultural messages that reinforce differential outcomes by race or their analogous traits.

**Culture** | Culture is the pattern of daily life learned consciously and unconsciously by a group of people. These patterns can be seen in language, governing practices, arts, customs, holiday celebrations, food, religion, clothing choices, and customs.

6

## Equity vs. Equality

**Equity** | Takes into consideration the fact that the social identifiers (race, gender, socioeconomic status, etc.) do, in fact, affect equality. In an equitable environment, an individual or a group would be given what was needed to give them equal advantage. This would not necessarily be equal to what others were receiving. It could be more or different. Equity is an ideal and a goal, not a process. It means that everyone has the resources they need to succeed.

**Equality** | A state of affairs in which all people within a specific society or defined group have the same status in certain respects, including civil rights, freedom of speech, property rights and equal access to certain social goods and services.

7

## Types of Biases

- Western Bias
- Implicit Bias
- Demographic Bias
- Skewed Research Populations
- Erroneous Medical Diagnoses

8

## Western Bias

- Making decisions based on own culture
- i.e. language barriers, cultural expectations of medicine
- Cultural competence
- Biocultural variation<sup>2</sup>

9

## Implicit Bias

- Predisposed ideas<sup>1</sup>
- Prejudice and racism<sup>1</sup>
- Natural and inevitable<sup>1</sup>
- Introspective evaluation<sup>2</sup>
- Broad spectrum of biasing<sup>2</sup>

10

## Demographic Bias

- Certain populations disproportionately affected<sup>1</sup>
- African Americans and COVID-19<sup>1</sup>
- Clinical trials and underrepresented populations<sup>1</sup>

11

## Skewed Research Populations

- Misrepresentation of participants
- Unequal access to trials
- Lack of knowledge in participating patients
- Disparity between participants
- Researchers look to have 'dean' data
- New medications have evidence of being tested on only healthy people.

12

# Example Case Study

## Scenario:

SARS COVID-19 is a viral infection that affects different people in various ways. A common symptom of this virus is respiratory distress. This has led to a large number of Americans purchasing small medical devices for their homes. Along with a thermometer to monitor for fever or chills, many Americans have purchased pulse oximeter devices.

## Case Study Discussion:

What kinds of healthcare disparities can you identify from the information given in this case study? Can you identify where these disparities are apparent in this scenario.

Can you identify any ethical theories that would have contributed to the original design process?

Imagine you are designing a device to replace the pulse oximeter. How would you account for different biases and prevent them with your design? What would the process be in creating the device and testing it?

Other than the pulse oximeter, can you think of another medical device that could have the same or similar presented issues? Think of accessibility, overall cost, location, and design process? Was it designed for equal populations?

# Importance of Implementing Healthcare Disparities Education

- Lack of education leads to biases
- Counteract their own implicit biases
- Ethics in engineering <sup>1</sup>
- Role Playing <sup>2</sup>
- Pilot educational module
  - Break down complex topic



[1] 2015 IQP by Jackson et al.  
[2] 2017 IQP by Hajjar et al.