

# Applying Phenomenography to Understand Practicing Engineers' Lived Experiences About Ethics in Engineering and its Implications for Ethics Education

Andrew O. Brightman, Dayoung Kim, Michael C. Loui, Carla B. Zoltowski  
Purdue University

Alison J. Kerr  
University of Tulsa

Justin L. Hess  
Indiana University Purdue University Indianapolis

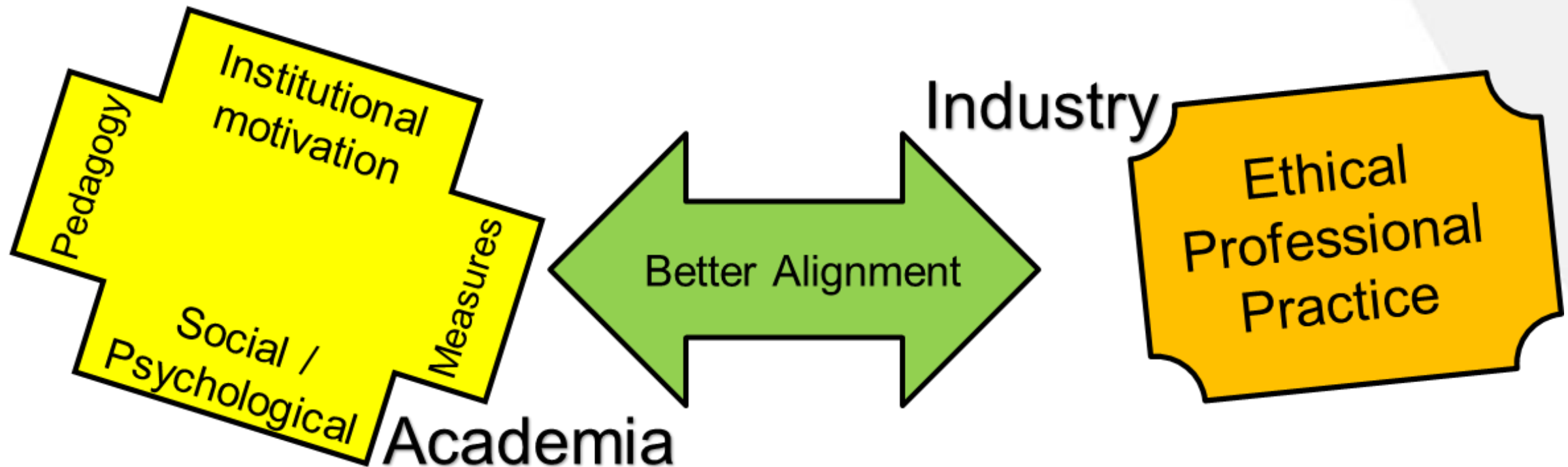
Nicholas D. Fila  
Iowa State University

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# Can we better align engineering ethics education with engineering practice?

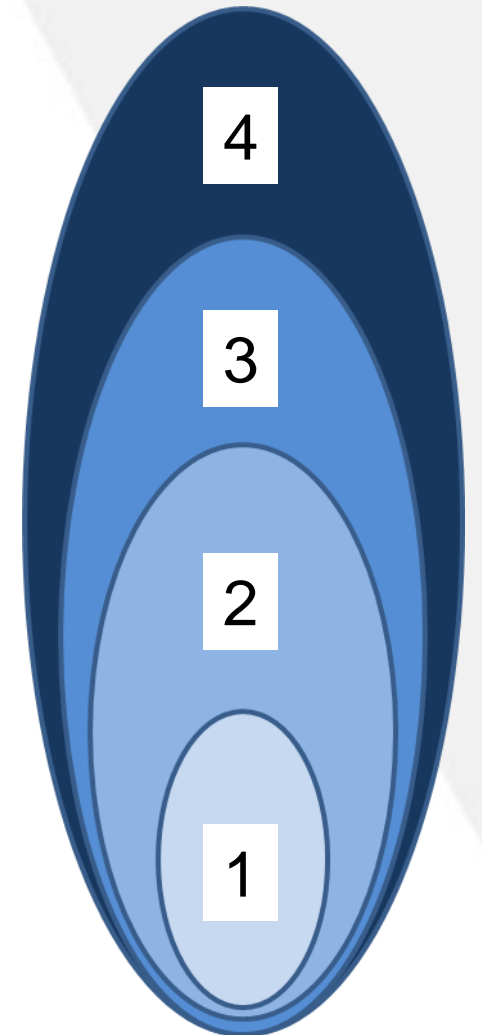


1. What are the qualitatively different ways engineers experience ethical issues in their engineering practice in the health products industry?
2. What patterns of individual and environmental factors contribute to or limit an engineer's experience of ethical engineering practice?
3. How are current frameworks of ethics education aligned with a comprehensive and situated understanding of ethical engineering practice?

1. What are the qualitatively different ways engineers experience ethical issues in their engineering practice in the health products industry?

## We used phenomenography as our research methodology

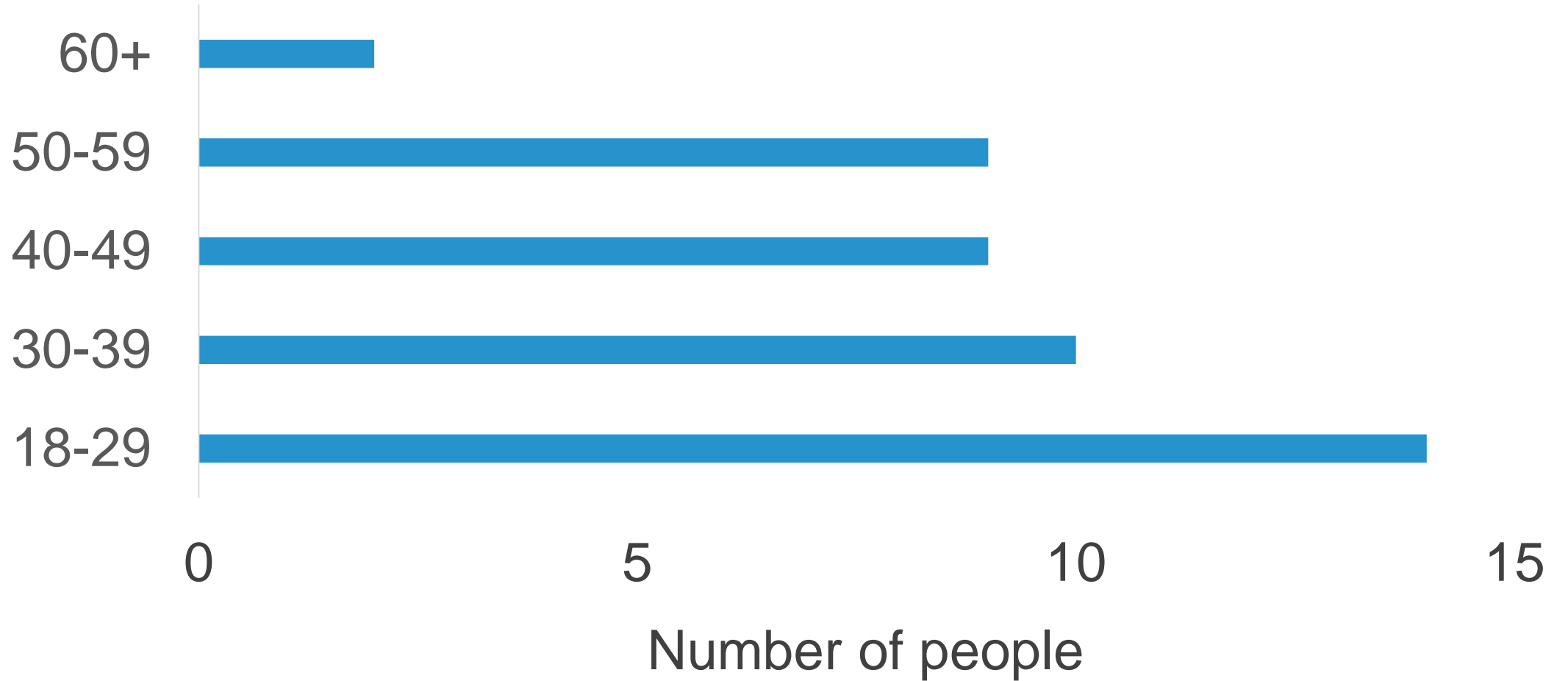
- Goal: To understand the variation in how people experience a phenomenon
- Outcomes
  - Categories of description
  - Relationships between categories



## **We interviewed 42 engineers in the health products industry**

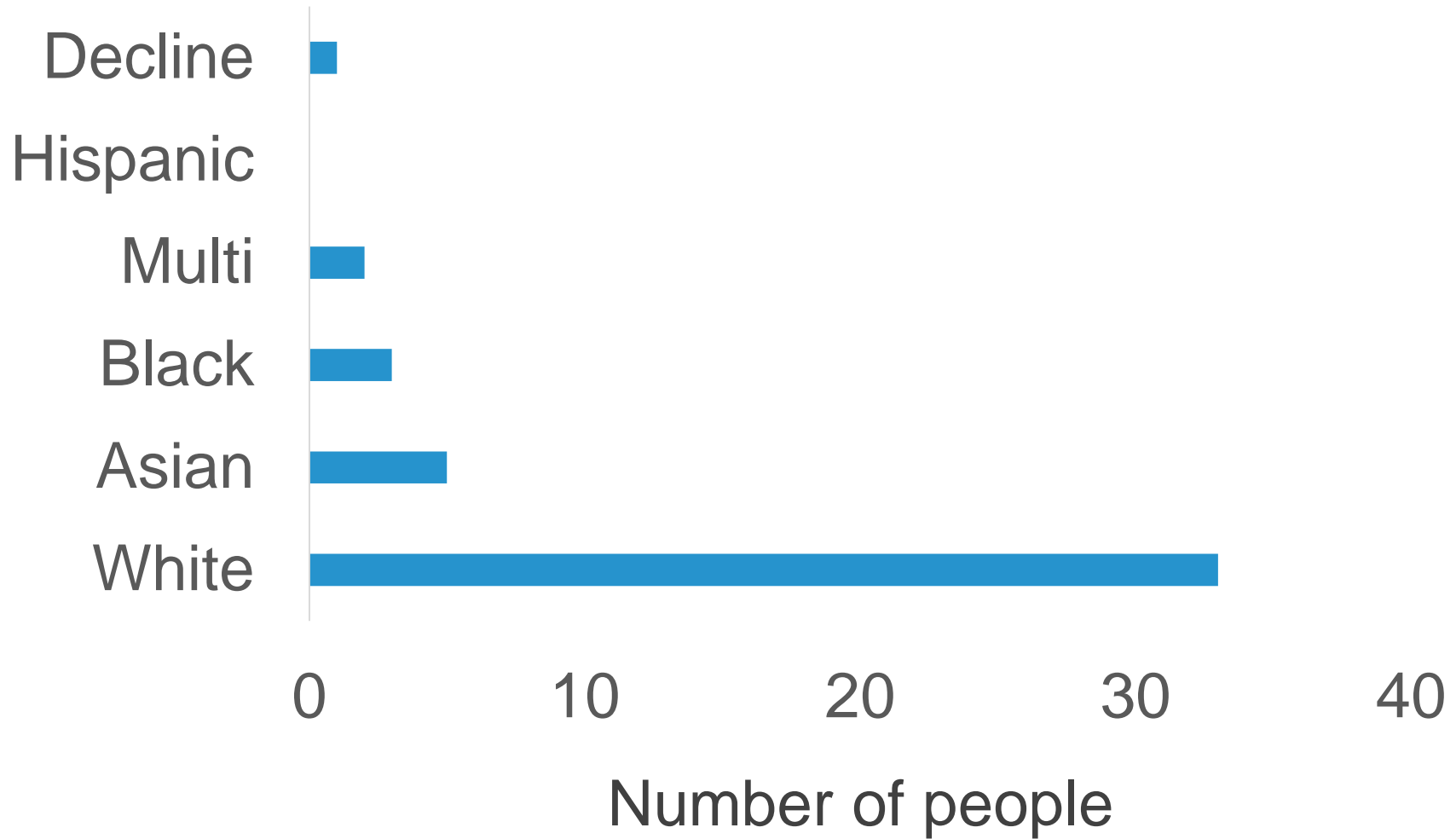
- Six companies: medical devices, orthopedic devices, pharmaceuticals
- Used a screening survey to select for variation across nine key attributes

# Age Ranges

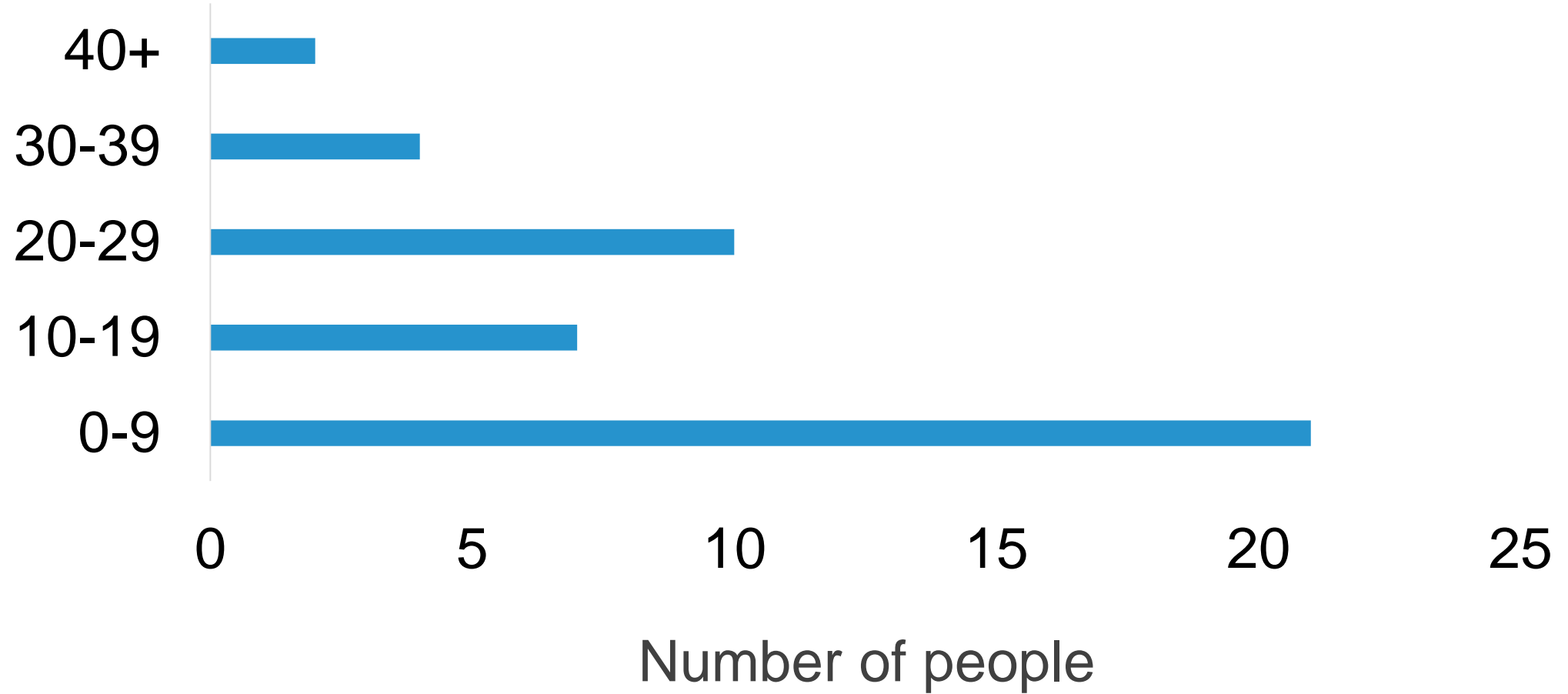




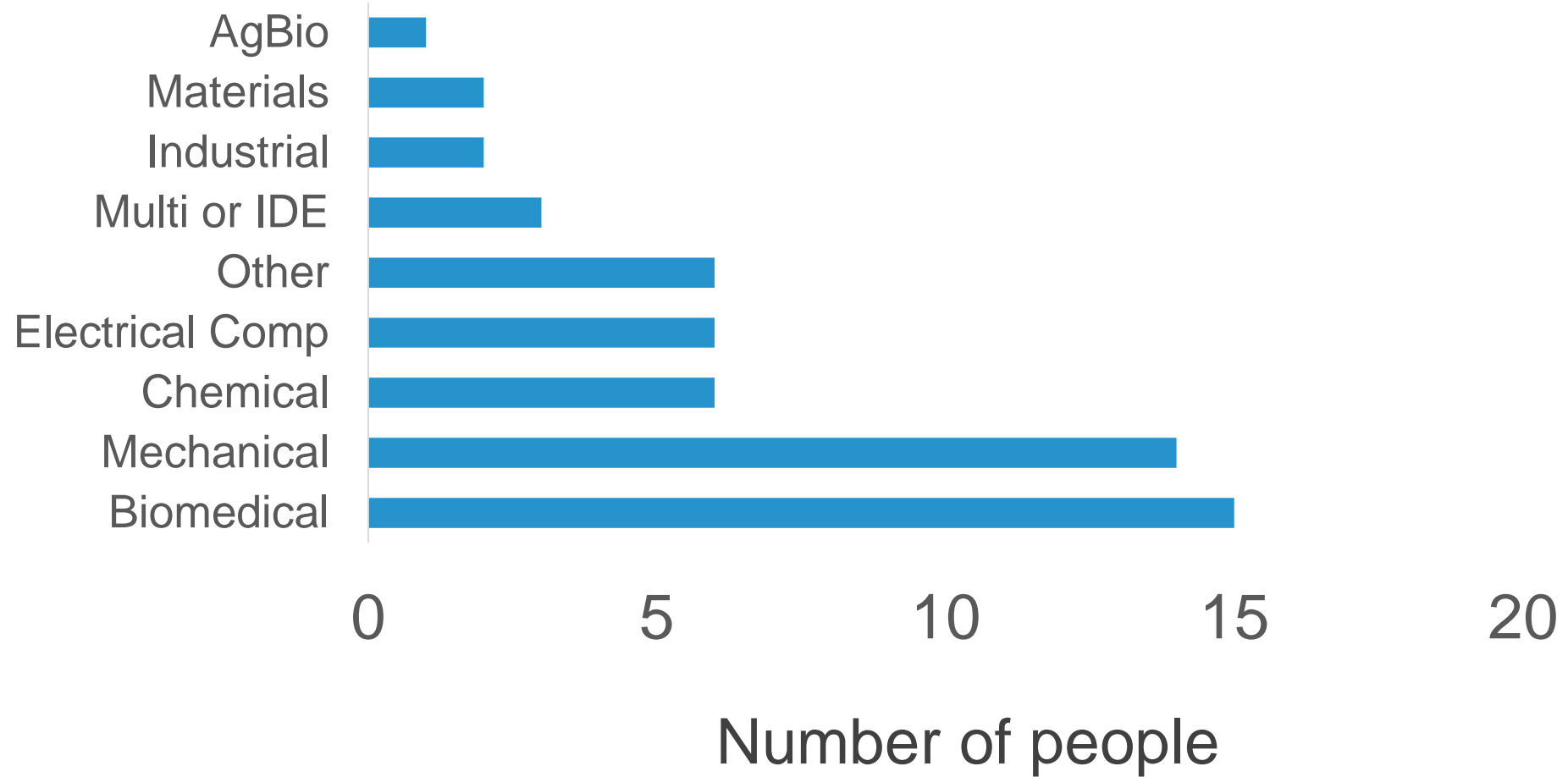
# Race/Ethnicity



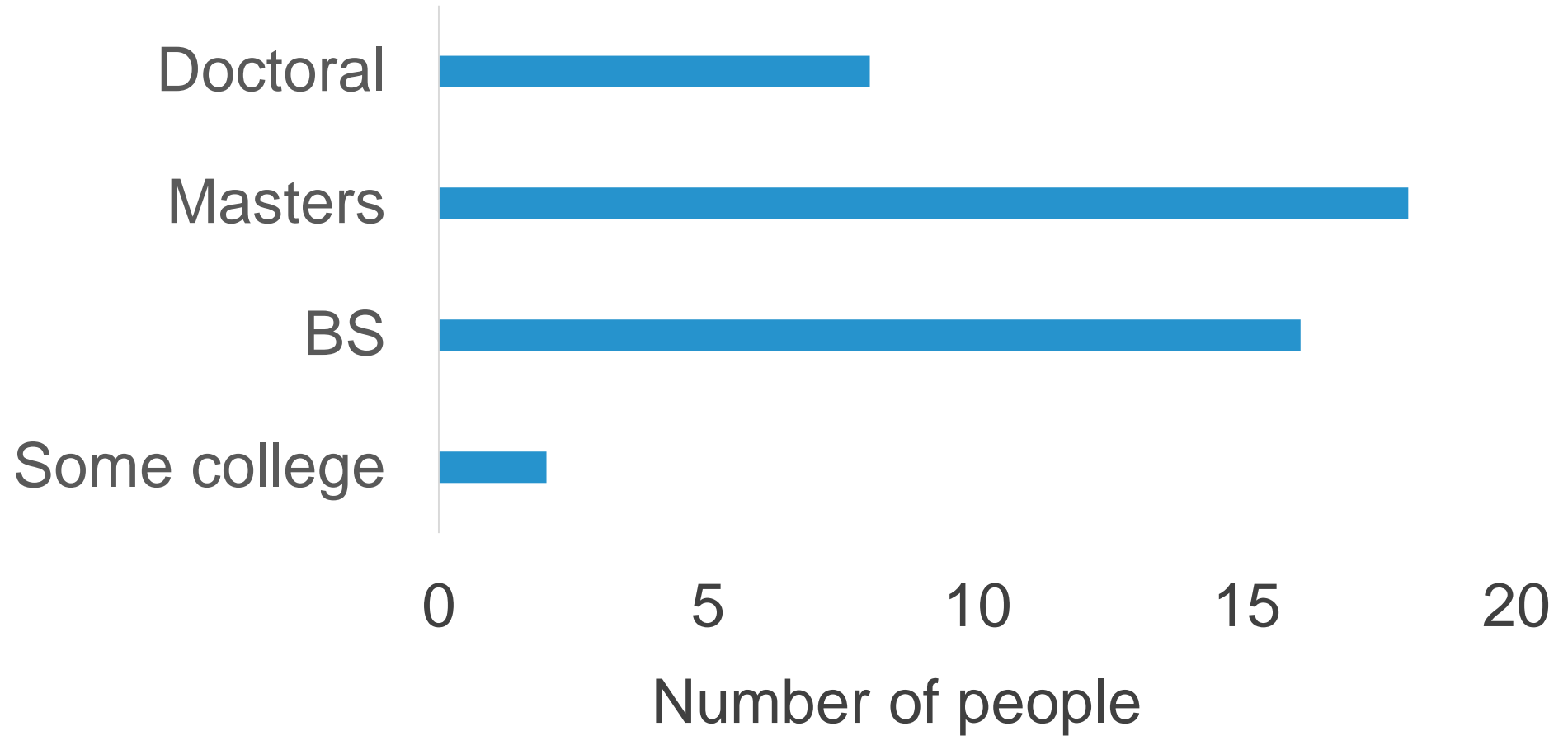
# Years in Engineering



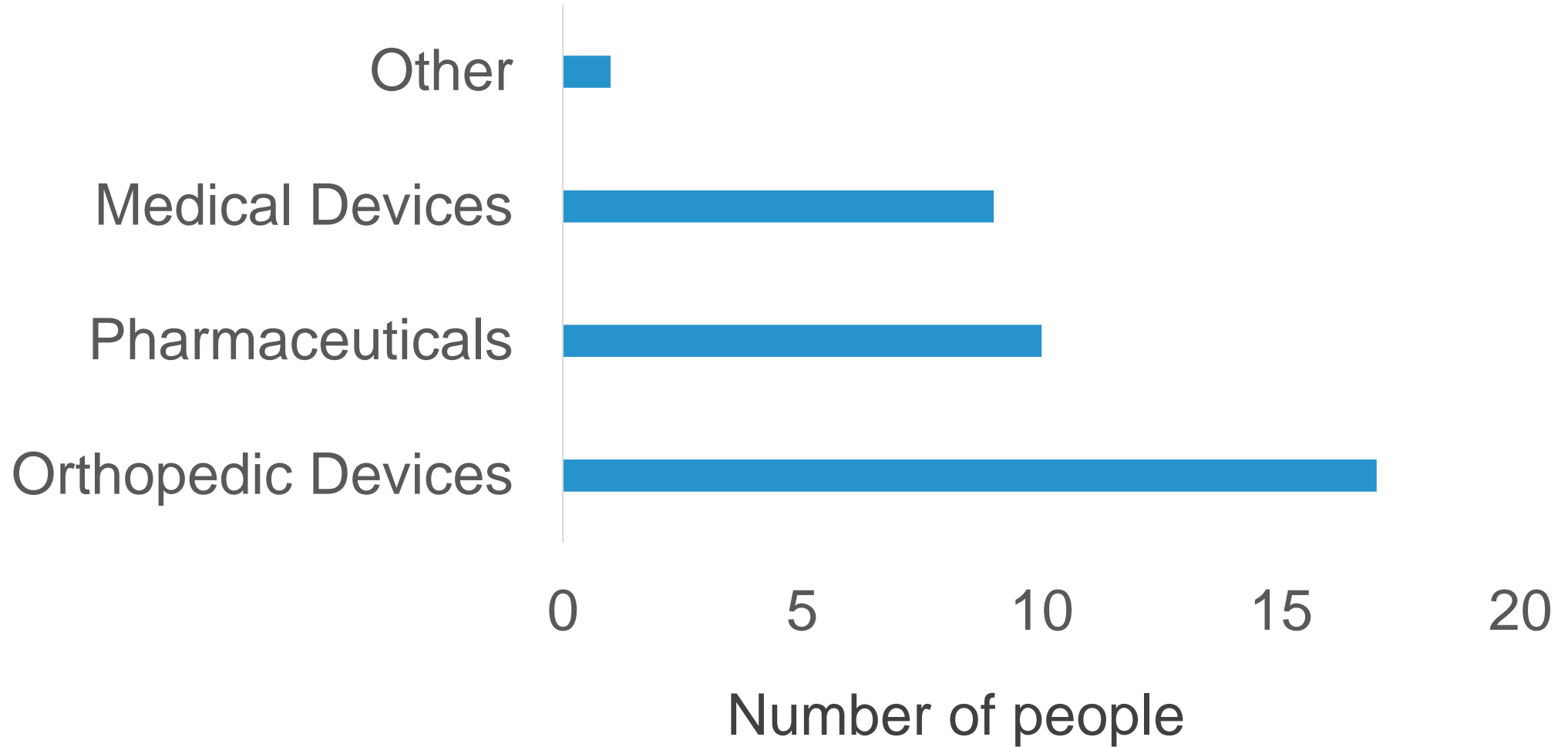
# Disciplinary Training



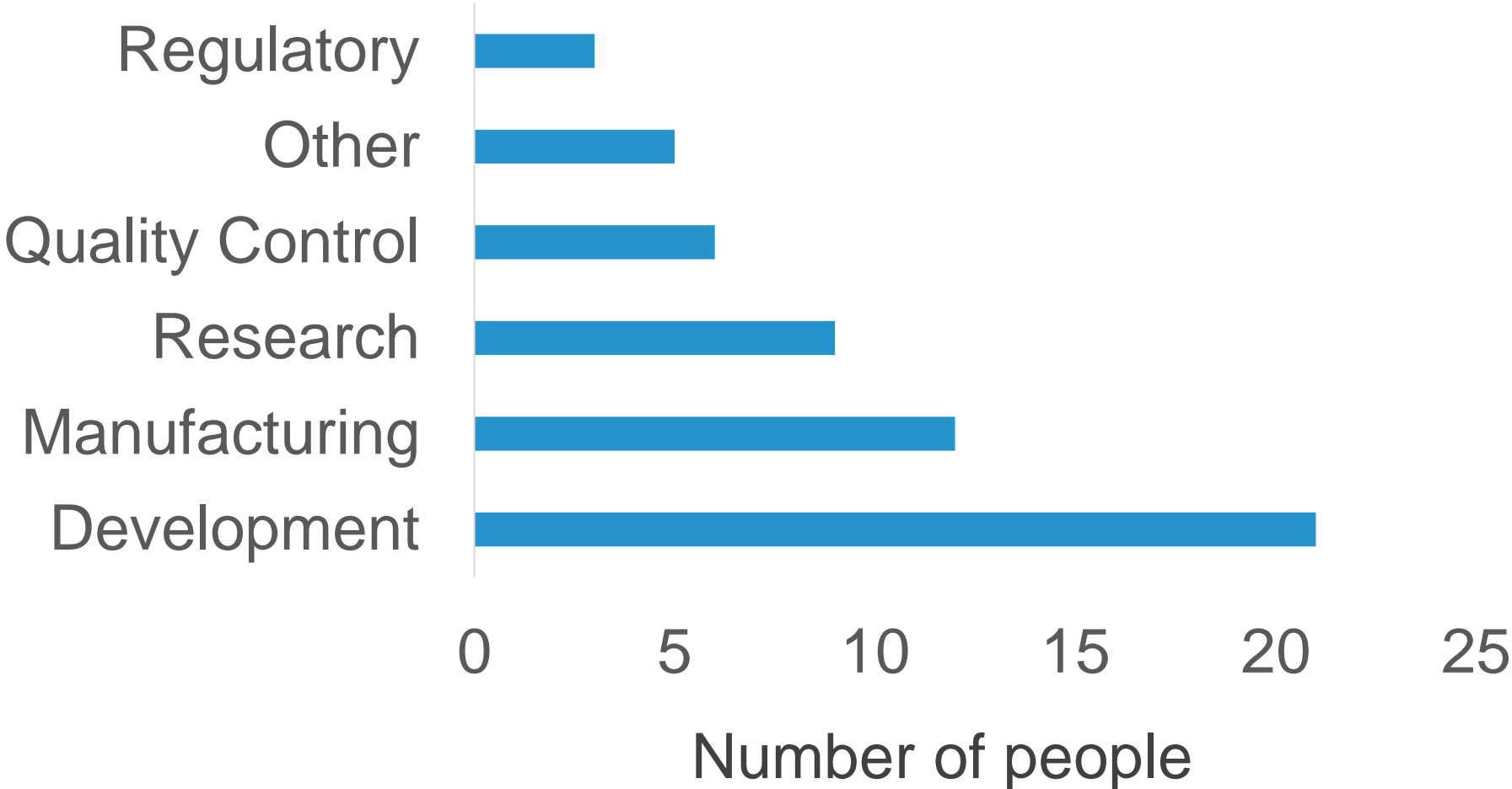
# Highest Degree



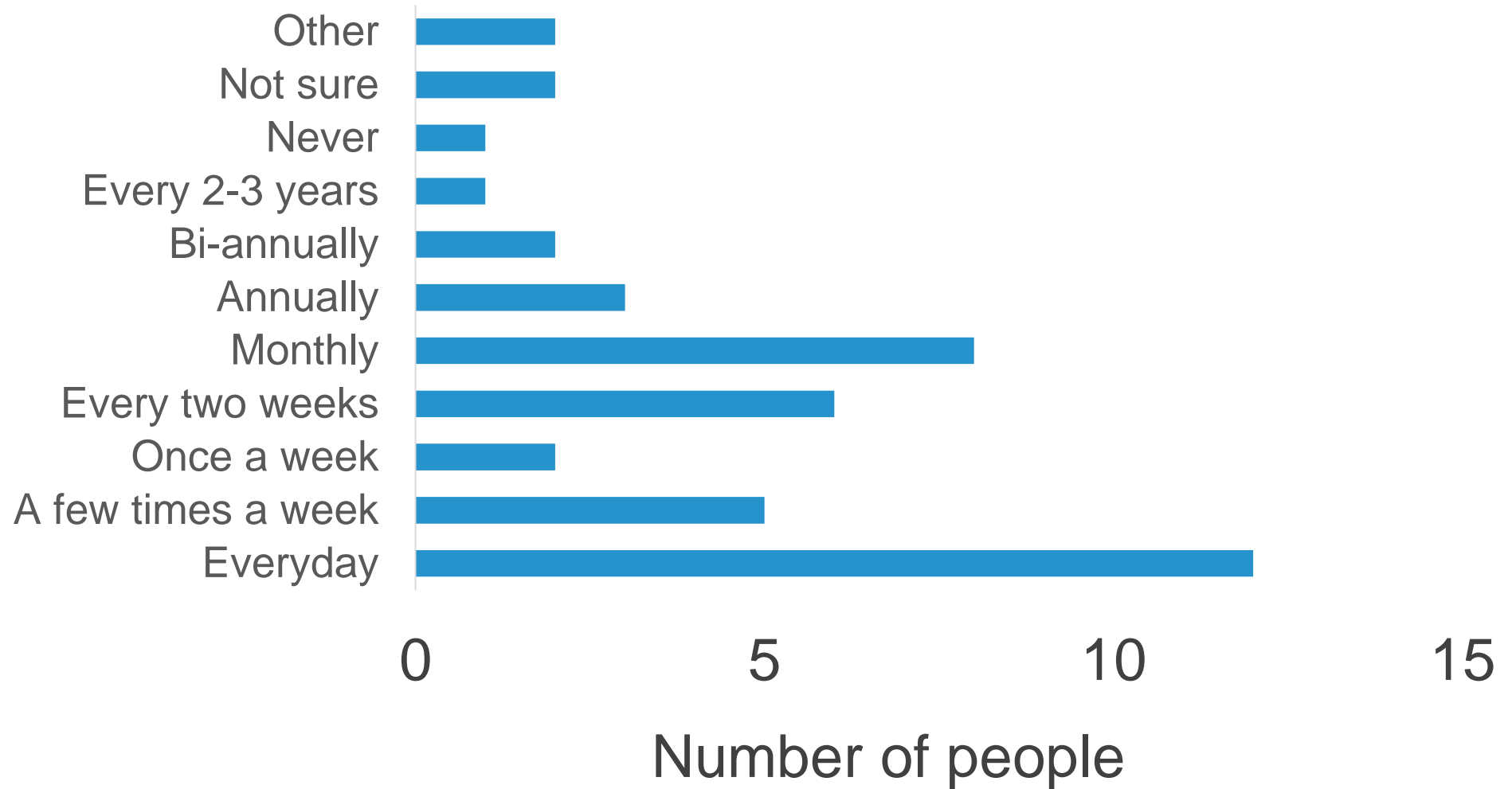
## Current Field



# Role in Company



# Frequency of Ethical Issues



## **The interview protocol asked about experiences related to ethics**

- “Can you describe an experience you have had with ethics in engineering?”
- “Can you describe an experience you had, within engineering practice, that did not involve ethics?”
- “What would you say ethical engineering practice is?”
- “What ethical considerations are important to think about when practicing engineering?”



**Ethical engineering  
practice is ...**

Complying with  
rules and your  
supervisor

**FOLLOW  
THE  
GUIDELINES**

Producing  
accurate, complete  
documentation

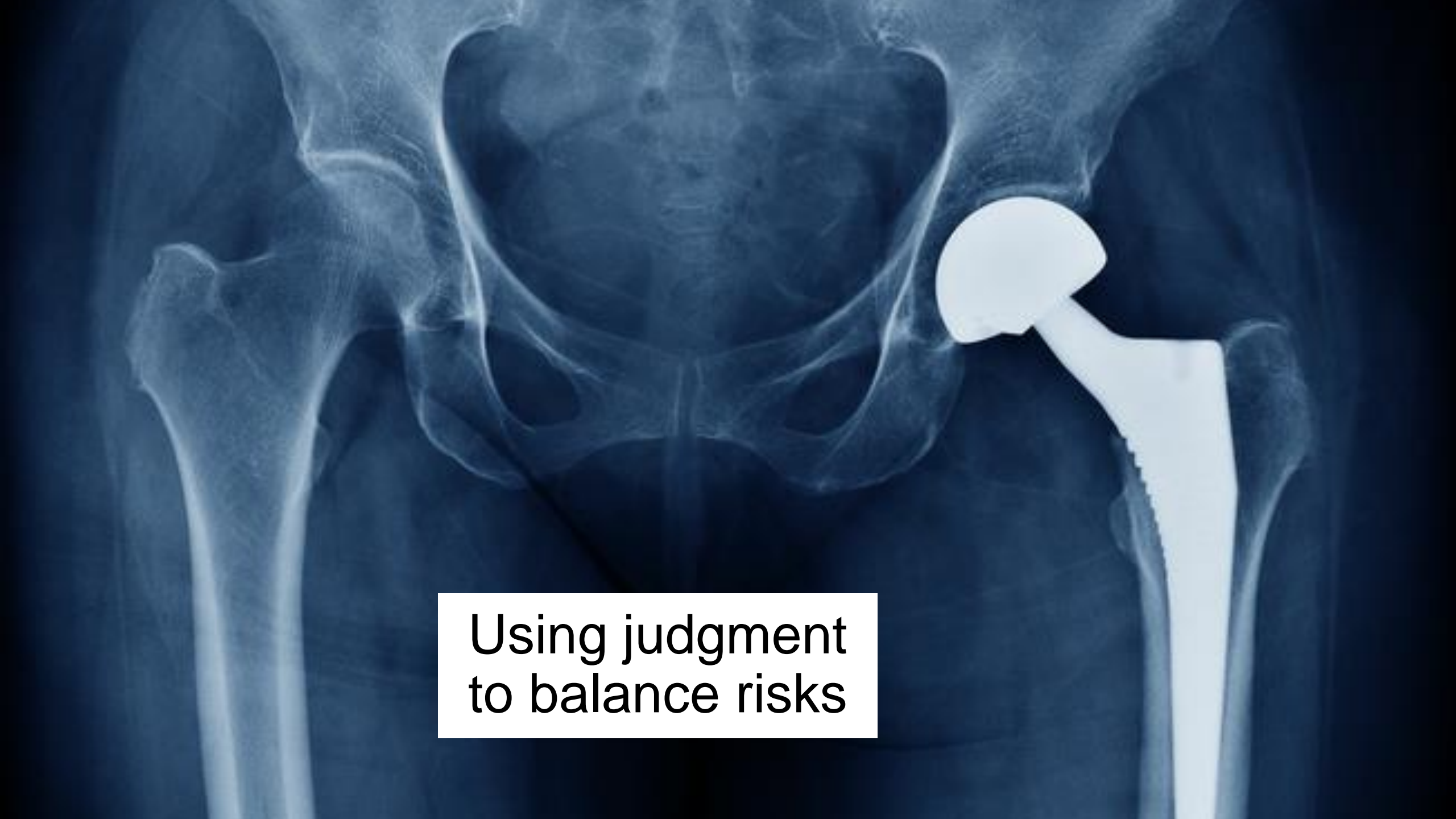




Treating  
competitors  
fairly

Balancing the  
needs of the patient  
and the employer





Using judgment  
to balance risks



Talking with others through disagreements, beyond legal requirements

## In summary ...

- Professional engineers have a range of experiences of ethical engineering practice
- Our category scheme, with dimensions of variation, will help align instruction in engineering ethics with the requirements of actual engineering practice
- Questions: [mloui@purdue.edu](mailto:mloui@purdue.edu)