

2018 POTENTIAL INJURY SCIENCE REU SUMMER RESEARCH PROJECTS

ENGINEERING CORE

All Engineering Core REU students will learn the design and conduct of laboratory-based and real-world engineering studies and the analysis and interpretation of the data collected. They will have opportunities to submit and present their work at conferences (e.g., the Ohio State University Impact Biomechanics Symposium and the Annual Meeting of the Human Factors and Ergonomics Society) with support from their mentors and participate in the preparation of publications. They will be encouraged to work independently with appropriate mentorship and to generate enthusiasm and future career interest in engineering research that incorporates medicine and behavior for injury prevention.

ENGINEERING RESEARCH PROJECTS

Project 1: Data Engineer: Analysis of Crash Data

Mentor: Aditya Belwadi, MS, PhD, CPST

Students: Catherine Krawiec, Rochester Institute of Technology (50% on Tom Seacrist and Valentina Graci's project)

Sophia Tushak, North Carolina State University/University of North Carolina Chapel Hill

Research Description: Motor vehicle crashes are the leading cause of death and a leading cause of injury for children worldwide. As long as there are childhood injuries, there will be a need to apply the tools of science to prevent them. The Center for Injury Research and Prevention is a comprehensive pediatric trauma research facility at The Children's Hospital of Philadelphia dedicated to addressing injury, the leading cause of death for children and adolescents. The center is seeking highly motivated and innovative undergraduate students in biomedical engineering to participate in several exciting new projects focused on pediatric biomechanics, machine design and computational modeling. Candidates should have interest in data analysis with demonstrated capability in application of mechanical engineering concepts.

REU Project Description: The student will become a member of the Engineering Research Core at the Center for Injury Research and Prevention and will receive mentorship from several of the lead investigators of the Core. The student will develop his/her skills with data analyses of a diverse set of data types. Previous experience using Matlab is critical and the student will have opportunity to increase their skills in this area. The student will also gain experience in problem solving, data analyses, interpreting findings, and developing new research ideas. There will also be opportunities to submit and present their work at conferences and to participate in the preparation of journal publications.

Project 2: Safe Mobility: A User-Based Approach to Transportation Safety

Mentor: Megan Ryerson, PhD

Student: Michelle Kim, Swarthmore College

Research Description: From bike lanes to pedestrian plazas, the urban transportation systems of American cities – and Philadelphia specifically – are becoming more multimodal. Yet the increasing number of cyclists and pedestrians has led to a rise in conflicts and crashes. The research project proposed here is a collaboration between the 1) The Center for Injury Research and Prevention is a comprehensive pediatric trauma research facility at The Children's Hospital of Philadelphia dedicated to addressing injury, the leading cause of death for children and adolescents and 2) Mobility21, the National University Transportation Research Center on Safety and Mobility housed here at Penn. The centers are seeking highly motivated and innovative undergraduate students in public health and transportation engineering/planning to participate in an exciting, innovative new project to measure safe mobility for vulnerable populations. Understanding the safety and public health impact of infrastructure improvements requires understanding how vulnerable road users -pedestrians and cyclists – interact and respond to infrastructure. REU students will assist with a project that will involve instrumenting pedestrians and cyclists while they are traveling along urban transportation infrastructure in Philadelphia. Eye tracking technology will capture their moment-by-moment glances, and physiology monitors will capture their physical responses. The combined qualitative and quantitative data will be used to develop and estimate metrics of value to road designers. Job

responsibilities may include designing and conducting experiments and collecting data out in the field, image and data analysis using specialized software, Matlab and/or MS Excel. Previous coursework in statistics, engineering/design, and mathematics and experience with Matlab is preferred.

REU Project Description: The student will become a member of the Engineering Research Core at the Center for Injury Research and Prevention and will receive mentorship from several of the lead investigators of the Core. The student will develop his/her skills with data analyses of a diverse set of data types. Previous experience using Matlab is critical and the student will have opportunity to increase their skills in this area. The student will also gain experience in problem solving, data analyses, interpreting findings, and developing new research ideas. There will also be opportunities to submit and present their work at conferences and to participate in the preparation of journal publications.

Project 3: Biomechanical Response and Driver Reaction Time during Pre-Crash Maneuvers

Mentors: Thomas Seacrist, MS; Valentina Graci, PhD

Student: Catherine Krawiec, Rochester Institute of Technology, (50% on Aditya Belwadi's project)

Research Description: Motor vehicle crashes remain the leading cause of death for children, youth, and young adults. Historically, automotive safety research and advancements have focused on the mitigating injuries once the crash has occurred. However, more recently automotive safety research is shifting its focus to studying events prior to the crash. Previous research has shown that more than 60% of crashes involve some form of pre-crash maneuver (braking, swerving, skidding) prior to the crash. This number is likely to increase with the advent of early warning systems and autonomous vehicles. Such maneuvers, be they initiated by the driver or by an autonomous vehicle, may change the position of the occupants relative to the seat belt, thus altering their biomechanical response if a crash still occurs. Additionally, an unintentional consequence of autonomous safety features is that drivers may become more inattentive or distracted. Therefore, the reaction time required to take over the control of a vehicle in event of an emergency may be further delayed. This is particularly true for novice

teen drivers, who may need to time to understand and react to an emergency take-over situation given their inexperience. At the Center for Injury Research and Prevention, we are interested in understanding how pre-crash maneuvers affect child occupant position and motion prior to a crash. Additionally, we are interested in developing warning systems that could decrease reaction time and lead to timely corrective driving actions, with a particular emphasis on young teen drivers.

REU Project Description: The REU student will become a member of the Engineering Research Core at the Center for Injury Research and Prevention and will receive mentorship from several of the lead investigators of the Core. The student will be involved in various aspects of the research process including primary data collection on human volunteers, post-processing, data analysis, and interpretation of the results. The student will develop his/her skills with data analyses of a diverse set of data types including motion capture data of actual children and young adults in a laboratory and naturalistic motor vehicle environments, crash test dummy data, as well as naturalistic data from real world driving. Machine design and electronic circuitry knowledge would be beneficial for this research. Previous experience using MATLAB is critical and the student will have opportunity to increase their skills in this area. The student will also gain experience in problem solving, data analyses, interpreting findings, and developing new research ideas. There will also be opportunities to submit and present their work at conferences and to participate in the preparation of journal publications.

BEHAVIORAL SCIENCE CORE

All Behavioral Science Core REU students will be exposed to core behavioral science research methods – quantitative and qualitative – and will apply them in settings involving human subjects. They will have opportunities to submit and present their work at conferences (e.g., the International Study for Traumatic Stress Society Annual Conference, the CHOP LEND Research Day) with support from their mentors and participate in the preparation of publications. They will be encouraged to work independently with appropriate mentorship, and to generate enthusiasm and future career interest in behavioral science research that links

behavior to medicine and engineering for injury prevention and prevention of traumatic stress among injured children.

BEHAVIORAL SCIENCE RESEARCH PROJECTS

Project 4: Translational Research to Develop & Evaluate Aggression and Bullying Prevention Programs for Urban Youth

Mentors: Stephen Leff, PhD; Tracy Waasdorp, PhD

Student: Ananda Easley, Luther College

Research Description: Peer aggression and bullying occur frequently in schools and have a harmful impact at the student, classroom, and school-wide level. Further, aggression and bullying are associated with poor psychosocial adjustment, feelings of being unsafe at school, lower levels of academic achievement, and school dropout as students reach adolescence. These issues are especially concerning for minority youth living in inner-city, under-resourced communities who are also exposed to stressors including poverty, single-parent homes, drug use, and community violence.

Dr. Leff and colleagues have developed several aggression and bullying prevention programs, many of which were designed in partnership with key stakeholders through a community-based participatory research approach to specifically address the aforementioned concerns for urban minority youth. In addition, the programs are unique in their focus on multiple forms of bullying/aggression (including relational and cyber-bullying), attention to broader classroom and school climate factors, focus on unstructured school settings such as the lunchroom and playground, and examination of intervention integrity (i.e., assessment of content & process variables and whether the program was implemented as intended).

Specifically, we have 1) a small-group pull-out program for relationally aggressive 3rd-5th grade girls, 2) a classroom-based program for 3rd-5th grade boys and girls, and 3) a 90- minute 3D interventional assembly (and accompanying App) designed to improve knowledge of bullying and

promote positive bystander behaviors among middle school students. Our newest lines of research include transitioning our small-group intervention to a coaching and training model (training the school counselor and classroom teachers to run the program), developing virtual simulations for youth to practice strategies outside of sessions, and the development of a relational aggression prevention program for 1st and 2nd grade students.

REU Project Description: This intern will be able to explore our current datasets (topics such as: self-report of bullying, aggression, problem solving skills, victimization, cyberbullying, as well as teacher report and parent data) to choose his/her own research question to be answered. The intern must have basic statistical knowledge and be comfortable using SPSS or STATA. The intern will learn how to formulate a research question using extant literature and secondary data, run basic statistical analyses, utilize literature to support findings and learn to present the research project.

Project 5: Identifying Risk and Protective Factors of Youth Violence Exposure

Mentors: Joel Fein, MD, MPH; Leah Brogan, PhD

Student: Auriel Jasper Morris, Xavier University of Louisiana

Research Description: Violence is a national public health epidemic. Youth are at heightened risk of exposure to various forms of violence, such as physical assault, bullying, sexual victimization, maltreatment, and domestic and community violence. Violence can have a diverse, long-lasting impact on youth, including re-injury, psychiatric issues, academic failure, neurobiological changes, delinquency, and substance misuse. Reducing the incidence and impact of violence on youth can eliminate these negative and chronic outcomes and, ultimately, promote and preserve their long-term well-being.

Fein and colleagues at The Children's Hospital of Philadelphia's Violence Prevention Initiative (VPI) have addressed the youth violence epidemic through a tiered-risk approach that matches a youth's needs and level of risk for violence and trauma exposure to an appropriate level of intervention that maximizes limited resources for optimal and meaningful impact. Paramount

to this approach is identifying risk and protective factors of youth violence exposure and traumatic stress. We intend to leverage multiple systems [i.e., the CHOP Electronic Health Record (EHR), Behavioral Health-Works (BH-Works), and the Pennsylvania Department of Corrections data] to compile a dataset of youth seen within the CHOP ED as a way to identify specific factors increasing a youth's vulnerability to violence exposure and posttraumatic stress. We intend to abstract and analyze these data in order to 1) better understand youth exposure and response to violence; 2) refine existing interventions to be more effective, sustainable, and appropriate for the youth and families served; and 3) identify new populations of youth and families in need of evidence-based violence prevention programming and traumatic stress interventions.

REU Project Description: The student will become a member of The CHOP VPI research team within the Center for Injury Research and Prevention. The student will gain a thorough understanding of the scientific foundation and content of VPI prevention programming and traumatic stress interventions. The student will also learn about ongoing research to evaluate the acceptability, feasibility, and effectiveness of these aforementioned programs and interventions. The student will assist with data extraction and organization from multiple sources, including electronic medical records, behavioral health databases, and state correctional databases. Further, the student will perform literature reviews, assist with project specific tasks, and attend research team meetings. The student will also have the opportunity to analyze data and submit findings for presentation at a national professional conference and/or publication in a peer-reviewed journal. We are looking for a detail-oriented and motivated student with prior experience in data management (i.e., entry, coding, and cleaning), using statistical software (i.e., SPSS preferred), and conducting literature reviews.

Project 6: Examining the Neural and Neuropsychological Factors Underlying Risky Driving Behavior and Crashes in Developing Teen Drivers.

Mentor: Elizabeth A. Walshe, PhD

Student: Aileen Kangavary, California State University, Northridge

Research Description: Compared to adults, young novice drivers are three times more likely to be involved in a motor vehicle collision, which remain the leading cause of death and injury among adolescents. While inexperience certainly plays a role, the ongoing neurocognitive development of the frontal lobe of the brain during the adolescent years (and into young adulthood) may also contribute to the disproportionate number of crashes among young drivers. The ability to direct and maintain attention, make decisions and control behaviour (related to distractibility, impulsivity, risk-taking) all continue to develop with maturation of the frontal lobe, and each of these cognitive abilities are important for the complex skill of driving. We are currently conducting a number of studies examining the relationship between crashes and the development of the neural and cognitive processes necessary for safe driving in adolescents and young drivers.

REU Project Description: The REU student will join a research team that uses neuroscience, neuropsychology and cognitive science approaches to understand risky driving behavior and the increased crash risk among young novice drivers. As part of this quantitative research team, the student will have the opportunity to gain skills and experience with a wide range of measures and different types of data including: neuroimaging data, neuropsychological tests of brain function, neurophysiological measures (e.g. eye-tracking), simulated/virtual driving assessment as well as self-report measures of driving behavior and individual characteristics (e.g. personality).

The student will also have an opportunity to develop a number of valuable skills for a career in research by joining research team meetings and scientific discussions, and assisting with a number of stages of the scientific research process, such as: participant recruitment, data management and analyses, as well as literature reviews and manuscript preparation. We are looking for students who are interested in quantitative research, want to expand their research experience and who are motivated and excited to work on this team's projects examining the brain and behavior of young drivers

Project 7: Project 7: Reducing Health Risks in Adolescents

Mentor: Catherine C. McDonald, PhD, RN, FAAN

Student: Chloe Georges, University of the Sciences in Philadelphia

Research Description: Injury is the leading cause of death and disability in adolescents. Mechanisms such as motor vehicle crashes (MVCs), concussion and opioid overdoses are frequent contributors to poor outcomes in adolescents. Adolescent risky behaviors contribute to injury risk, such as unsafe driving behaviors or illicit drug use. Efforts to reduce health risks during adolescence include individual and community driven initiatives that may need to be tailored for high risk groups.

REU Project Description: The REU student will become a member of a research study team conducting a number of studies on risky driving behaviors, driving after concussion and efforts to reduce opioid overdoses. The student will develop his/her skills with exposure to a diverse set of study procedures and data types including data management and analysis with self-report, driving simulation and eye tracking. The student will also gain experience in data management, data analyses, literature reviews, video coding of data, and manuscript preparation. We are looking for motivated, confident and excited students that are looking to expand their research experiences.

EPIDEMIOLOGY CORE

All Epidemiology Core REU students will be exposed to survey design and administration and data analysis and interpretation. They will have opportunities to submit and present their work at conferences (e.g., the American Public Health Association's annual conference) with support from their mentors and participate in the preparation of publications. Students will be encouraged to work independently with appropriate mentorship, to generate enthusiasm and future career interest in epidemiology, statistics, demography, and ethnography research that links the fields of medicine and behavior to injury prevention.

EPIDEMIOLOGY RESEARCH PROJECTS

Project 8: Objective Diagnostic Tools for Youth Concussions

Mentors: Catherine McDonald, PhD, RN, FAAN; Ronni Kessler, MS

Student: Elana Kaplan, Elon University

Research Description: Concussion in youth has received heightened attention owing to emerging evidence that this common injury can affect academics and cause behavioral changes and neurocognitive deficits in working memory, concentration, processing speed, and eye and motor function. As the incidence and awareness of sports-related concussions and multiple sub-concussive loads raises concern about long-term effects of repeated exposures, scientific approaches to injury prevention and treatment are hampered by the subjective, non-specific, symptom-based aspects of concussion diagnosis, and a lack of knowledge about the role that age, sex and biomechanics have in exacerbating outcomes. We are addressing this gap by collecting data using an objective suite of diagnostic measurements, both pre- and post-season for high school age athletes as well as for adolescents with concussion seen at CHOP Sports Medicine clinics.

REU Project Description: The student will become a member of our research team based in the Center for Injury Research and Prevention. The student will help analyze baseline neurofunctional data collected pre- and post-season during the previous school year through a partnership with a local high school. Activities will include data management, query resolution, data cleaning, and data analyses focused on specific research questions. Additionally they will assist in developing an annual progress report that will be presented to the school administration. The ideal candidate will be interested in learning how to use statistical software and developing the skills need to conduct the various elements of data analysis. We are looking for a motivated, detail oriented, confident, and enthusiastic student that is looking to expand their research experience.

Project 9: Epidemiologic Study of Pedestrian and Bicycle Injuries

Mentor: Aimee J. Palumbo, PhD, MPH

Student: Mirjam Keochakian, Mt. Holyoke College

Research Description: Bicycle and pedestrian injuries and fatalities have increased in recent years. As more and more cities promote “complete streets” designs and cities implement bicycle share programs to work to improve bicycle and pedestrian infrastructure, the impact of area-level policies and programs on pedestrian and bicyclist safety in relation to motor-vehicle crashes has not been fully evaluated. Investigators at the Center for Injury Research and Prevention (CIRP) are conducting a variety of epidemiologic studies to describe local and statewide trends in pedestrian and bicyclist motor-vehicle injury crashes.

REU Project Description: This student will participate in many aspects of a scientific research study and will have the opportunity to gain experience in applying various skills valuable to a future career in public health, health sciences, policy, epidemiology, or scientific research. The student will have the opportunity to develop skills related to developing research questions; conducting literature reviews; data collection, management, and analysis; and assisting in the development of manuscripts for publication. In addition, the student will be able to participate in research meetings, scientific discussions, and CIRP-wide research meetings. We are looking for students who are motivated and enthusiastic to learn more about epidemiology and work on a collaborative research team.

ONLY STUDENTS FROM CHEYNEY UNIVERSITY OF PENNSYLVANIA AND THE LINCOLN UNIVERSITY, PA ARE ELIGIBLE TO APPLY FOR THE FOLLOWING PROJECTS:

Project 10: TBA

Mentor: Declan Patton, PhD

Student: Umar Saaba, Lincoln University

Research Description:

REU Project Description:

Project 11: Urinary Biomarker in Mild Traumatic Brain Injury

Mentors: Akiva Cohen, PhD; Gary Beauchamp, PhD

Student: Gabriel Nah, Lincoln University

Research Description: Traumatic brain injury (TBI) is the leading cause of death and disability in children and young adults. A TBI occurs on average every 21 seconds and afflicts approximately two million people annually in the United States. No effective therapy currently exists to treat TBI. A profound obstacle to the diagnosis and treatment of TBI is the absence of an objective, quantitative test for TBI. The difficulty in diagnosing TBI is due in large part to the overlap in symptoms between TBI and other conditions (e.g. stroke, migraine, PTSD, depression and non-convulsive seizures), as well as variability in the initial injury and clinical presentation. Therefore, we are determining the nature of a biomarker in mice that have received a mild TBI.

REU Project Description: The REU student will become a member of the Cohen lab at the Center for Injury Research and Prevention and Children's hospital of Philadelphia and Beauchamp lab at the Monell Center for Chemical Senses. The student will receive mentorship from the lead investigators, as well as from members of their laboratories. The student will learn how to collect urine from mild brain injured mice and conduct olfactory test in the Y-maze. The student will also gain experience in problem-solving, data analyses, interpreting findings, and developing new research ideas. There will also be opportunities to submit and present their work at conferences and to participate in the preparation of journal publications.