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., Ohio State University Impact Biomechanics Symposium and 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: Biomechanics of movement and position of child occupants

Mentor: Aditya Belwadi, PhD

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 experimental and computational biomechanics with demonstrated capability in application of mechanical engineering concepts.

Job responsibilities may include designing and conducting experiments, interacting with pediatric subjects, image analysis using specialized software, finite element modeling, and data analysis using Matlab and/or MS Excel. Previous coursework in solid and/or fluid mechanics and experience with Matlab is preferred.

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 including machine design, Finite element Modeling, motion capture data of human movement and 3-D position and posture data of actual children in a naturalistic motor vehicle environment. 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:  Analysis of Movement and Position of Child Occupants

Mentors:  Kristy Arbogast, PhD and Thomas Seacrist, MBE

Research Description:  Crash test dummies are currently the primary tool by which the automotive industry innovates and evaluates new safety systems in vehicles.  The degree to which they represent humans – i.e. their biofidelity – is critical to ensuring that new safety advances have a positive effect on occupant protection in real crashes.  For pediatric crash test dummies in particular, limited data exists upon which to evaluate their biofidelity.  In response to this need, the Center for Injury Research and Prevention has engaged in a line of research quantifying the movement and position and posture of actual children in sub-injurious and naturalistic automotive environments in order to provide a quality data set upon which to measure the biofidelity of current and future crash test dummy designs.

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 develop his/her skills with data analyses of a diverse set of data types including motion capture data of human movement and 3-D position and posture data of actual children in a naturalistic motor vehicle environment.  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., International Study for Traumatic Stress Society Annual Conference, 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 3:  Web-based intervention for risky driving

Mentor:  Catherine C. McDonald, PhD, RN
**Research Description:** Motor vehicle crashes (MVCs) are the leading cause of death for U.S. teens, accounting for more than one in three deaths in this age group. A complex interplay of adolescent development, inexperience, and risky driving behaviors contributes to teen MVC injury and death. Risky driving involves illegal or dangerous behind-the-wheel behaviors associated with operating a motor vehicle in a manner that may lead to harm or injury to oneself or others. Driver inattention, or the insufficient attention to the activities critical for safe driving, includes recognition errors, inadequate surveillance, and distractions inside the vehicles (such as cell phone use, texting or the presence of peer passengers) and is a major source of MVCs in teens. Risky driving behaviors that draw attention away from the roadway can be particularly dangerous for teens. Theoretically grounded, evidenced-based, efficacious interventions to reduce distracted driving in teens are needed in order to decrease MVC morbidity and mortality, and improve the health of teens and safeguard other road users.

**REU Project Description:** The REU student will become a member of a research study team that is conducting studies on a web-based intervention to prevent risky driving in novice teen drivers. The student will develop his/her skills with exposure to a diverse set of study procedures and data types including interfacing with participants, the driving simulator protocol and eye tracking device, use of web-based delivery systems, in-vehicle monitoring and regulatory protocols. The student will also gain experience in data collection, 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.

**Project 4:** Translational research to develop & evaluate aggression and bullying prevention programs for urban youth

**Mentors:** Stephen Leff, PhD, and Tracy Waasdorp, PhD

**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. 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, 3) programming for lunch-recess staff, parents, and teachers, and 4) a brief
multi-media program that addresses bullying and promotes positive bystander behaviors among middle school students.

**REU Project Description:** In general, the REU student will gain a thorough understanding of the scientific foundation and content of the aforementioned interventions and the ongoing research to assess their acceptability, feasibility, and effectiveness. In addition to providing data organization and entry across projects, the student has the opportunity to examine data, run analyses, and review/summarize literature for one of the following research projects listed below:

1. Implementation integrity data to better understand the utility of our new systems related to the measurement of process variables such as group dynamics, social validity, treatment engagement, therapeutic alliance, and cultural competence.
2. Youth-, teacher- and parent-report databases of psychosocial and behavioral measures for theoretical questions of interest related to aggression and bullying.
3. Youth data collected from multiple school systems via the multi-media bullying prevention program.

**Project 5: Assessment of Hospital-based Violence Intervention Program Outcomes**

**Mentor:** Joel Fein, MD; Rachel Myers, MS

**Research Description:**
The CHOP Violence Intervention Program (VIP) promotes a trauma-informed approach to young patients who are hospitalized for an injury due to interpersonal violence. A trauma-informed approach considers the impact of an individual’s prior traumatic experiences on how he or she responds to clinical treatment. As part of this program, Violence Prevention Specialists assess the immediate needs of assaulted youth and his or her family who are treated in the Emergency Department or Trauma Unit at CHOP. Goals for community-focused, post-discharge case management are developed in partnership with patients and their families with the aim of reducing the negative sequelae of violent injuries and reduce the likelihood for retaliation and re-injury. As part of a broader network of over two dozen similar programs across the country, which provide hospital-based violence prevention services to injured youth and young adults, the CHOP VIP has led efforts to develop a mutually-agreed upon set of programmatic outcomes. The goal is that such outcomes can be measured across diverse programs to better understand best practices and areas of programmatic success and strengths. Through an iterative qualitative research process, we have identified outcomes and appropriate measures to assess each outcome. Next steps will include pilot testing the measures both locally and nationally in Emergency Department and other clinical settings with patients to enable assessment of measure reliability and validity.

**REU Project Description:** The REU student will work collaboratively with members of the CHOP VIP team to contribute to several projects related to the CHOP VIP. Activities may include: collecting, coding, entering and analyzing data from quantitative and qualitative data sources; maintaining participant tracking
logs; developing databases; attending training activities and project team meetings; performing literature searches; retrieving and summarizing pertinent articles; making follow-up phone calls; and assisting with basic office duties (typing, copying, and filing). Projects may include: data collection in support of validation of a common outcome measurement tool to be used nationally by hospital-based violence intervention programs, qualitative analysis regarding barriers and facilitators to resolution of participant identified needs, chart reviews to describe clinical outcomes of VIP participants. Competitive candidates for this position will have a demonstrated interest in healthcare and child/adolescent health issues. Prior coursework in at least one undergraduate-level statistics course offered through any department (e.g., psychology, public health, or statistics) and coursework in public health, psychology, social work, health policy, behavioral health, nursing, or health sciences are preferred but not required.

**Project 6:  Promoting the disclosure of concussion symptoms in adolescent and emerging adult athletes**

**Mentors:** Jessica Mirman, PhD (Primary); Kristy Arbogast, PhD, Catherine McDonald, PhD, RN

**Research Description:** In recognition that student-athletes often fail to report concussions and adhere to treatment recommendations, new interventions and communication strategies are needed to change the culture that leads to and perpetuates these behaviors. In the current project, we are focusing on how individual athletes and key adults perceive the social structures (e.g., team, league) in which they are imbedded and how those structures influence disclosure of concussion symptoms among emerging adult athletes. In other words, we want to better understand the pattern of social interactions among athletes and care providers as they relate to symptom disclosure.

In this project we will characterize athletes’ disclosure, or non-disclosure of concussion symptoms, how they view and value these kinds of disclosures, and their perceptions of the consequences of these disclosures within the broader context of being an athlete. We will accomplish this goal by conducting in-depth qualitative interviews with athletes and care providers that will tell us about the range of different types of beliefs that exist. We will then quantitatively measure the frequency of these beliefs in a national sample and statistically associate the strength of each belief with athletes’ intentions to disclose concussion symptoms.

**Project Description:** The student will become a member of our multidisciplinary project team based in the Center for Injury Research and Prevention and Division of Adolescent Medicine. He or she will receive mentorship from several of the lead investigators of this study, with primary mentorship from Dr. Jessica H Mirman, PhD. The student will assist with data collection including: informed consent, interviewing athletes, transcribing interviews, coding, and interpreting qualitative data. The student will also perform literature reviews, assist with project management, and attend team meetings. Competitive candidates for this position will have prior course work in the behavioral and social sciences (e.g., psychology, anthropology, sociology, communication, or public health). **Student athletes and ROTC cadets are strongly encouraged to apply.**
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., American Public Health Association) 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 7: Public health epidemiologic study of teen drivers

Mentor: Allison Curry, PhD,

Research Description: Motor vehicle crashes are the leading cause of death and injury for teens. Investigators at the Center for Injury Research and Prevention (CIRP) are conducting a variety of epidemiologic studies to examine driving outcomes among teen drivers in New Jersey. These studies include: (1) evaluating the effect of a new Graduated Driver Licensing (GDL) decal provision on crashes, citations, and compliance, (2) examining the effect of attention-deficit/hyperactivity disorder (ADHD) on the risk of citation and crash outcomes as well as comparing licensing trajectories of adolescents with and without ADHD, and (3) examining the effect of autism spectrum disorder (ASD) on the risk of citation and crash outcomes as well as comparing licensing trajectories of adolescents with and without ASD.

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, public health law, health sciences, policy, epidemiology, or scientific research. The student may be involved in and responsible for tasks related to: literature reviews; data collection and management; medical records abstraction; policy and law 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. The student should be motivated, enthusiastic, dependable, and detail-oriented. Prior experience working with policy, scientific data or in a scientific research setting is also a plus, but is not necessary.

Project 8: Natural history of youth concussions

Mentors: Kristy Arbogast, PhD, Ronni Kessler, MS

Research Description: In the United States, approximately 700,000 children sustain traumatic brain injuries (TBIs) each year. Although nearly 90% of these injuries are considered “mild” and are mostly
treated on an outpatient basis, they can still lead to poor neurological outcomes that adversely affect the child’s quality of life. Therefore, it is important that institutions and care networks have standardized, evidenced-based management of mild TBIs and concussions. Understanding current practice can help guide development of a comprehensive clinical care model for diagnosis, treatment, and follow-up management of children with concussion.

We are working to leverage the CHOP Electronic Health Record (EHR) system to compile a dataset of children aged 0-17 years who were seen within the CHOP healthcare network for concussion. Over the course of the next year we will continue to abstract and analyze this data (including an additional year’s worth of data from 2014-2015) in order to better understand concussions in children.

**Project Description:** The student will become a member of our research team based in the Center for Injury Research and Prevention. The student will conduct medical record abstractions utilizing both the CHOP EHR and RedCAP. The student will also perform literature reviews, assist with project specific tasks, and attend team meetings. We are looking for a motivated, detail oriented, confident, and enthusiastic student that is looking to expand their research experience.