Research Update

2024 Vol. 2

A semi-annual look at select DLH research activities.

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DLH is excited to share the latest volume of the DLH Research Update, a semi-annual look at select research activities from across our organization.

In an ever-changing world, innovative research is vital to unlocking crucial progress. 2024 was filled with key findings, methodologies, and insights. This compilation shares highlights of DLH's research work in our core capabilities of Science, Research, & Development, Cybersecurity & Digital Transformation, and Systems Engineering & Integration.

DLH researchers and technologists hold invaluable talent and expertise that contribute to a deeper understanding of the world around us. Our research is broad. We examine diabetes complications, spotlighting critical discoveries that shape prevention, treatment, and outcomes. We play a crucial role in advancing medical care for military personnel by enhancing data collection and analysis to enable more effective decision-making in battlefield medicine. Our researchers also identify disparities and risk factors for cardiovascular disease, HIV, cancer, and other health challenges.

Research such as that illustrated in the pages ahead takes dedication and a relentless pursuit of knowledge. DLH thanks every member of our team for their countless efforts, passion, and commitment to excellence. Their contributions spark significant change that positively impacts the communities in which we live and work.

Thank you for reading.

NTP Technical Report on the Toxicology and Carcinogenesis Study of Triclosan (CASRN 3380-34-5) Administered Dermally to B6C3F1/N Mice
DLH researchers **Laura Betz**, **Shawn Harris**, and **Sandra McBride** were among the authors of a National Toxicology Program NTP technical report published as Technical Report 604 (Online: May 2024). Triclosan is an antibacterial and antifungal agent present in consumer products, including toothpaste, soaps, detergents, and toys. This report presents results from a 2-year dermal mouse study and concludes that there was some evidence of carcinogenetic activity in the exposed male mice and equivocal evidence of carcinogenetic activity in the exposed females. The report will help policymakers determine what, if any, regulatory limits should be placed on triclosan. *Other authors include researchers from the Division of Translational Toxicology at the National Institute of Environmental Health Sciences and the National Center for Toxicological Research at the U.S. Food and Drug Administration.*

Residential Natural Hazard Risk and Mental Health Effects
DLH researchers **Marina Sweeney**, **Kate Christenbury**, **Ian Buller**, and **Braxton Jackson** were among the authors of an article published in the *American Journal of Epidemiology* (Online Ahead of Print: July 2024). Mental health effects are frequently reported following natural disasters. However, little is known about effects of living in a hazard-prone region on mental health. The authors analyzed data from 9,312 Gulf Long-term Follow-up Study participants who completed standardized mental health questionnaires including the Patient Health Questionnaire-9, Generalized Anxiety Disorder Questionnaire-7, and Primary Care PTSD Screen. Geocoded residential addresses were linked to census-tract level natural hazard risk scores estimated using the National Risk Index (NRI). The authors considered an overall risk score representing 18 natural hazards, and individual scores for hurricanes, heatwaves, coastal flooding, and riverine flooding. Increasing hurricane and coastal flooding scores were associated with all mental health outcomes in a suggestive exposure-response manner. Associations were strongest for PTSD, with prevalence ratios for the highest vs. lowest quartile of hurricane and coastal flooding risks of 2.29 and 1.59, respectively. High heatwave risk was associated with anxiety and depression and suggestively with PTSD. Results suggest that living in areas prone to natural disasters is one factor associated with poor mental health status. *Other authors include researchers from the National Institute of Environmental Health Sciences and the Federal Emergency Management Agency.*

Familial Clustering of Dysbiotic Oral and Fecal Microbiomes in Juvenile Dermatomyositis
DLH researcher **Nastaran Bayat** was among the authors of an article published in *Scientific Reports* (Online: July 2024). Juvenile dermatomyositis (JDM) is a rare immune-mediated disease of childhood with putative links to microbial exposures. In this multi-center, prospective, observational cohort study, the authors evaluated whether JDM is associated with discrete oral and gut microbiome signatures. 16S rRNA sequencing data was generated from fecal, saliva, supragingival, and subgingival plaque samples from JDM probands (n = 28). To control for genetic and environmental determinants of microbiome community structure, the authors also profiled microbiomes of unaffected family members (n = 27 siblings, n = 26 mothers, and n = 17 fathers). Sample type (oral-vs-fecal) and nuclear family unit were the predominant variables explaining variance in microbiome diversity, more so than having a diagnosis of JDM. The oral and gut microbiomes of JDM probands were more similar to their own unaffected siblings than they were to the microbiomes of other JDM probands. In a sibling-paired within-family analysis, several potentially immunomodulatory bacterial taxa were differentially abundant

in the microbiomes of JDM probands compared to their unaffected siblings, including Faecalibacterium (gut) and Streptococcus (oral cavity). While microbiome features of JDM are often shared by unaffected family members, the loss or gain of specific fecal and oral bacteria may play a role in disease pathogenesis or be secondary to immune dysfunction in susceptible individuals. *Other authors include researchers from the Fred Hutchinson Cancer Center, University of Washington, National Institute of Dental and Craniofacial Research, and the National Institute of Environmental Health Sciences.*

Industry of Employment and Occupational Class in Relation to Cardiovascular Health by Race/Ethnicity, Sex/Gender, Age and Income Among Adults in the USA: A Cross-Sectional Study

DLH researcher **Braxton Jackson** was among the authors of an article published in *BMJ Public Health* (Epub: July 2024). Racially minoritized groups tend to have poorer cardiovascular health (CVH) than non-Hispanic (NH)-White adults and are generally more likely to work in laborer or support service positions where job strain—associated with cardiovascular disease—is often high. Yet, few studies have included racially/ethnically diverse samples. Using 2004-2018 National Health Interview Survey cross-sectional data, the authors investigated standardized occupational classifications in relation to "ideal" CVH using a modified "ideal" CVH (mICVH) metric among US adults (n=230,196) by race/ethnicity, sex/gender, age, and income. mICVH was defined as a report of "yes" to the following: never smoked/former smoker; body mass index (≥18.5-25 kg/m^2); physical activity (≥150-300 min/week moderate or ≥75-150 min/week vigorous); sleep duration (7-9 hours/night); and no prior diagnosis of dyslipidemia, hypertension, or diabetes/pre-diabetes. Latinx (53%) and NH-Black (37%) adults were more likely than NH-White adults (29%) to report laborer positions and had the lowest prevalence of mICVH (5.2% (Latinx) and 3.9% (NH-Black)). Laborer versus professional/management occupational class positions were associated with a lower mICVH prevalence among NH-Asian, NH-White, and NH-Black, but with no evidence of an association among Latinx. In conclusion, working in laborer versus professional/management positions was associated with lower mICVH, except among Latinx adults. Given the higher likelihood of laborer occupations and lower prevalence of mICVH among minoritized racial/ethnic groups, social determinants related to occupational class should be considered in future studies of racial and ethnic disparities in CVH. *The other authors are researchers from the National Institute of Environmental Health Sciences and the National Institute on Minority Health and Health Disparities.*

Residential Air Pollution, Greenspace, and Adverse Mental Health Outcomes in the U.S. Gulf Long-term Follow-up Study

DLH researchers **Braxton Jackson**, **Kate Christenbury**, and **Ian Buller** were among the authors of an article published in *The Science of the Total Environment* (Epub: July 2024; Print: October 2024). Air pollution and greenness are environmental determinants of mental health, though existing evidence typically considers each exposure in isolation. The authors evaluated relationships between co-occurring air pollution and greenspace levels and depression and anxiety. They estimated cross-sectional associations among 9015 Gulf Long-term Follow-up Study participants living in the southeastern U.S. who completed the Patient Health Questionnaire-9 and Generalized Anxiety Disorder Questionnaire-7. Participant residential addresses were linked to annual average concentrations of particulate matter (PM) and nitrogen dioxide, as well as satellite-based greenness (Enhanced Vegetation Index [EVI]). In mutually adjusted models, the highest quartile of PM2.5 was associated with increased prevalence of depression, whereas the

highest quartile of greenness was inversely associated with depression. Joint exposure to greenness mitigated the impact of PM2.5 on depression and anxiety overall and in subgroup analyses. Observed associations were stronger in urbanized areas and among nonwhite participants, and varied by neighborhood deprivation. Nitrogen dioxide exposure was not independently associated with depression or anxiety in this population. Relationships between PM2.5, greenness, and depression were strongest in the presence of characteristics that are highly correlated with lower socioeconomic status, underscoring the need to consider mental health as an environmental justice issue. *The other authors are researchers from the National Institute of Environmental Health Sciences.*

Mortality Follow-up of Fernald Feed Materials Production Center Workers Exposed to Uranium from 1951 to 1985

DLH researcher **Sarah Cohen** was among the authors of an article published in *Occupational and Environmental Medicine* (Online Ahead of Print: August 2024; Print: October 2024). This follow-up study of uranium processing workers at the Fernald Feed Materials Production Center examines the relationship between radiation exposure and cancer and non-cancer mortality among 6403 workers employed for at least 30 days between 1951 and 1985. The authors estimated cumulative, individual, annualized doses to 15 organs/tissues from external, internal, and radon exposures. Vital status and cause of death were ascertained in 2017. Competing risk analysis was conducted for cardiovascular disease (CVD) mortality risk given several assumptions about risk independent of competing outcomes. Emphysema was examined to assess the potential for confounding by smoking. Vital status was confirmed for 98.1% of workers, with 65.1% deceased. All-cause mortality was less than expected in salaried but not hourly workers when compared with the US population. A statistically significant dose response was observed between external (but not total or internal) lung dose and lung cancer mortality. Significantly increased mortality rates at 100 mGy dose to heart were observed for CVD and ischemic heart disease. CVD risk remained elevated regardless of competing risk assumptions. Both external and internal radiation were associated with emphysema. The authors concluded that lung cancer was associated with external dose, though positive dose responses for emphysema imply residual confounding by smoking. Novel use of competing risk analysis for CVD demonstrates leveraging retrospective data for future risk prediction. *Other authors include researchers from Vanderbilt University Medical Center, the National Cancer Institute, Memorial Sloan Kettering Cancer Center, and the National Council on Radiation Protection and Measurements.*

Cardiovascular Disease Risk Factors and Their Associations With Inflammation Among US Adolescents: NHANES, 2015 to March 2020

DLH senior epidemiologist and researcher **Sarah Casagrande** was the lead author of an article published in *BMJ Open Diabetes Research & Care* (Online: August 2024). The prevalence of obesity and glycemic dysfunction in adolescents has increased over the past several decades but less is known on how these conditions are associated with systemic inflammation in this population. This study determined the associations between cardiovascular disease (CVD) risk factors and inflammation among a nationally representative sample of US. adolescents. Cross-sectional analyses were conducted among 2693 adolescents aged 12-19 years who participated in the 2015 to March 2020 National Health and Nutrition Examination Surveys. Chronic inflammation was determined using laboratory measures for high-sensitivity C reactive protein (hs-CRP). Adjusted ORs (aOR, 95% CI) were calculated from logistic regression models to determine the association between CVD risk factors (obesity, overweight, dysglycemia, hypertension, hyperlipidemia) and elevated hs-CRP (>3.0 mg/L) while controlling for sociodemographic characteristics and other CVD risk factors. Overall, 15.3% of adolescents had elevated

hs-CRP. Adolescents who were older (16-19 years vs 12-15 years), obese, had A1c ≥5.7%, high total cholesterol, or low high-density lipoprotein had hs-CRP distributions that were more high risk. Adolescents with obesity or A1c ≥5.7% had a sixfold and a nearly twofold higher odds of elevated hs-CRP compared those without obesity and A1c <5.7% after full adjustment. Adolescents with hypertension or hyperlipidemia were significantly more likely to have elevated hs-CRP compared with those without these conditions after adjustment for sociodemographic characteristics, but the association was not significant after further adjustment for obesity. Among US adolescents, obesity was strongly associated with elevated hs-CRP, a marker for future CVD risk. Given the obesity epidemic and the marked proportion with elevated CRP, concern should be given to future CVD risk in younger adults. *The other author is a researcher from the National Institute of Diabetes and Digestive and Kidney Diseases.*

Pitavastatin Is Well-Tolerated With No Detrimental Effects on Physical Function
DLH researcher **Jhoanna Roa** was among the authors of an article published in *Clinical Infectious Diseases* (Online Ahead of Print: August 2024). Little is known about the potential benefits or harms of statins on physical function among people with HIV (PWH). REPRIEVE was a double-blind randomized controlled trial evaluating pitavastatin for primary prevention of major adverse cardiovascular events (MACE) in PWH. Time to complete 10 chair rises, 4-meter gait speed, grip strength, and a modified short physical performance test were assessed annually for up to 5 years in the ancillary study PREPARE and analyzed using linear mixed models. Of 602 PWH, 52% were randomized to pitavastatin and 48% to placebo. Median age was 51 years; 18% were female at birth; 2% transgender; 40% Black, and 18% Hispanic. Median PREPARE follow-up was 4.7 years. Muscle symptoms occurred in 5% of both groups. There was no evidence of decline in chair rise rate in either treatment group, and no difference in the pitavastatin group compared to placebo. Small declines over time were observed in other physical function tests in both treatment groups, with no apparent differences between groups. The authors observed minimal declines in physical function over 5 years of follow-up among middle-aged PWH, with no differences among PWH randomized to pitavastatin compared to placebo. This finding, combined with low prevalence of myalgias, supports the long-term safety of statin therapy on physical function, when used for primary prevention of MACE among PWH. *Other authors include researchers from the University of Colorado Denver, Harvard T.H. Chan School of Public Health, Johns Hopkins Bloomberg School of Public Health, and Massachusetts General Hospital and Harvard Medical School.*

"Honesty, Communication and Trust Are What Bring Peace of Mind": Narratives of HIV Risk Among Hispanic/Latino Men Who Have Sex with Men in the Southern United States
DLH researcher **Zaneta Gaul** was among the authors of an article published in the *Journal of Racial and Ethnic Health Disparities* (Online Ahead of Print: August 2024). For Hispanic/Latino MSM (HLMSM) in the South, HIV burden remains high, and HIV elimination is a national priority. Between July and September 2016, using a strengths-based approach informed by resilience theory, study researchers conducted qualitative interviews with HIV-negative HLMSM in five southern cities in the United States with elevated HIV prevalence. The authors analyzed data using a qualitative content analysis approach, assessing for interrater reliability. A brief behavioral survey was also conducted. The authors enrolled 51 HLMSM (mean age = 33 years, range = 15-63). HLMSM discussed the climate of fear about HIV and homosexuality impeding HIV prevention, including the impact of stigma and taboo. Three main strengths-based strategies emerged for preventing HIV: assessing partner risk, establishing boundaries for sexual interactions, and self-education. Future

HIV prevention efforts may benefit from balancing risk-based approaches with those that emphasize resilience, address partner trustworthiness and safety, and focus on providing novel outlets for HIV prevention education. *The other authors are researchers from the Centers for Disease Control and Prevention.*

Medication Use and Self-Care Practices in Persons With Diabetes
DLH senior epidemiologist and researcher **Sarah Casagrande** served as an editor for an article published in *Diabetes in America*, a National Institute of Diabetes and Digestive and Kidney Diseases compilation and assessment of epidemiologic, public health, clinical research, and clinical trial data focused on diabetes, its complications and treatment, health care utilization, and diabetes prevention in the United States. (Online: September 2024). *Excerpt:* Within the past 15 years, tremendous advances in diabetes care have occurred, including increases in the number of medication classes approved to treat type 2 diabetes and technologies to help manage type 1 and type 2 diabetes. In addition, many of the newer classes of medications have been used more extensively given their efficacy in terms of glycemia, weight loss, and cardiovascular and renal protection. None of these new agents have been approved for the treatment of type 1 diabetes, yet they are occasionally used off-label. This article reviews diabetes treatment and self-care practices for adults and youth with type 1 and type 2 diabetes in the U.S. population. Among insured adults with type 1 diabetes whose claims are included in the 2019 Optum Clinformatics Data Mart database, insulin is used as the single antihyperglycemic agent 88% of the time, with the remaining 12% of individuals using insulin plus another agent, most often metformin. In youth with type 1 diabetes, insulin remains the mainstay treatment. Use of continuous glucose monitors (CGMs) has become a common mode of glucose monitoring for both adults and youth with type 1 diabetes. From a public health perspective, diabetes technology, especially CGM, is underutilized by persons with type 1 diabetes, perhaps even more so in adults than children. For example, only 41% of adults with type 1 diabetes used CGM in 2020. Inequities in technology usage persist. Increased use of insulin pumps, CGM, sensor-augmented pumps, and automated insulin delivery is associated with a greater proportion of individuals achieving target glycated hemoglobin (A1C) in both adults and children with type 1 diabetes. For adults with type 2 diabetes, the most common antihyperglycemic drug class used was biguanide (i.e., metformin), followed by sulfonylurea and insulin, whereas thiazolidinedione was the least used medication in 2015–2020. In adults with type 2 diabetes, increased use of the GLP-1 receptor agonists and sodium-glucose cotransporter-2 inhibitors, when appropriate, could have a beneficial impact on cardiovascular and renal disease. Use of CGM has become more common among adults with type 2 diabetes and is now covered by most private insurance and by the Centers for Medicare and Medicaid Services. The cost of and access to these newer technologies and medications have been major barriers. Type 2 diabetes has become increasingly more common among youth over the past two decades, and compared to type 2 diabetes diagnosed in adults, it is a more aggressive disease and less responsive to metformin. Biguanides and insulin are antihyperglycemic medications approved for youth with type 2 diabetes in conjunction with lifestyle modifications. Very few data are available on technology use among youth with type 2 diabetes.

Bayesian Statistical Concepts With Examples From Rodent Toxicology Studies
DLH researcher **Gary Larson** was one of two authors of an article published in *Laboratory Animals* (Online Ahead of Print: September 2024; Print: October 2024). The theory and practice of statistics comprises two main schools of thought: frequentist statistics and Bayesian statistics. Frequentist methods are most commonly used to analyze animal-

based laboratory data, while Bayesian statistical methods have been implemented less widely and may be relatively unfamiliar to practitioners in experimental science. This paper provides a high-level overview of Bayesian statistics and how they compare with frequentist methods. Using examples in rodent toxicity research, the authors argued that Bayesian methods have much to offer laboratory animal researchers. They advocated for increased attention to and adoption of Bayesian methods in laboratory animal research. Bayesian statistical theory, methods, software, and education have advanced significantly in the last 30 years, making these tools more accessible than ever. *The other author is a researcher from the National Institute of Environmental Health Sciences.*

Simulation Methodologies to Determine Statistical Power in Laboratory Animal Research Studies

DLH researchers **Angela Jeffers**, **Kathryn Konrad**, **Gary Larson**, and **Katherine Allen-Moyer** were among the authors of an article published in *Laboratory Animals* (Epub: September 2024; Print: October 2024). Null hypothesis significance testing is a statistical tool commonly employed throughout laboratory animal research. When experimental results are reported, the reproducibility of the results is of utmost importance. Establishing standard, robust, and adequately powered statistical methodology in the analysis of laboratory animal data is critical to ensure reproducible and valid results. Simulation studies are a reliable method for assessing the power of statistical tests, however, biologists may not be familiar with simulation studies for power despite their efficacy and accessibility. Through an example of simulated Harlan Sprague-Dawley (HSD) rat organ weight data, the authors highlighted the importance of conducting power analyses in laboratory animal research. Using simulations to determine statistical power prior to an experiment is a financially and ethically sound way to validate statistical tests and to help ensure reproducibility of findings in line with the 4R principles of animal welfare. *The other authors are researchers from the National Institute of Environmental Health Sciences.*

Opioid Prescriptions for US Patients Undergoing Long-Term Dialysis or with Kidney Transplant from 2011 to 2020

DLH researcher **Chyng-Wen Fwu** was among the authors of an article published in the *Journal of the American Society of Nephrology* (Online Ahead of Print: September 2024; Print: January 2025). Pain is important for patients with kidney failure, but opioid medication prescriptions are associated with morbidity and mortality. The Centers for Disease Control and Prevention issued opioid prescription guidelines in 2016 and 2022, associated with dramatically decreased prescription rates in the United States. It is critical to know if nationwide opioid prescription rates for patients with kidney failure have decreased. The authors analyzed the United States Renal Data System database from 2011 to 2020 to describe trends in the proportion of end-stage kidney disease (ESKD) patients who received one or more, or long-term opioid prescriptions, examined factors associated with long-term opioid prescriptions, and evaluated associations of all-cause death with short-term or long-term opioid prescriptions. From 2011-2022, the percentage of patients with kidney failure (dialysis and kidney transplant) who received at least one or more, or who had received long-term opioid medication prescriptions decreased steadily, from 60% to 42%, and from 23% to 13%, respectively. The largest reductions in prescription rates were for hydrocodone and oxycodone. Similar trends existed for dialysis and kidney transplant patients. Women, the poor and those in rural settings were more likely to receive long-term opioid prescriptions. Prescription rates were highest in White patients and those 45 to 64 years old. Short-term and long-term opioid medication prescriptions were associated with higher mortality in both dialysis and kidney transplant patients.

The authors concluded that ESKD patients' opioid prescription rates decreased between 2011 and 2020. Higher mortality risk was associated with both short-term and long-term opioid prescriptions. Mortality risk was monotonically associated with morphine milligram equivalents in patients with kidney failure who received long-term opioid prescriptions. *The other authors are researchers from the National Institute of Diabetes and Digestive and Kidney Diseases and the University of Pittsburgh.*

HIV: California's 2018 Criminalization Reform and Testing Among Those Reporting Risk Behavior

DLH researcher **Avery Bourbeau** was among the authors of an article published in the *Journal of Public Health Policy* (Epub: September 2024; Print: December 2024). HIV criminalization laws may discourage HIV testing. The authors tested whether California's 2018 HIV criminalization law reform increased the likelihood of past-year HIV testing compared to Nevada, which did not reform its HIV criminalization law. The authors fitted two difference-in-differences logistic regression models: one for all respondents reporting behaviors that increase the chances of getting or transmitting HIV, and one for male respondents reporting these behaviors. All analyses accounted for the complex survey design of BRFSS. HIV criminalization reform was significantly associated with an increased likelihood of past-year HIV testing. After reform, the predicted marginal probability of past-year HIV testing increased by six percentage points. By comparison, probabilities of a past-year HIV test decreased in Nevada. HIV criminalization law reform may increase the likelihood of getting tested by individuals who engage in behaviors that increase the chances of getting or transmitting HIV. *The other authors are researchers from the Centers for Disease Control and Prevention.*

Partner Protections in HIV Cure-Related Trials Involving Analytical Treatment Interruption: Updated Toolkit to Mitigate HIV Transmission Risk

DLH researcher **Brittney Mauk** was among the authors of an article published in the *Journal of Virus Eradication* (Online: September 2024). Analytical treatment interruptions (ATIs) are widely used to evaluate HIV cure-related research interventions. However, sex partners of cure-related trial participants might be at risk of acquiring HIV during ATIs. Addressing this risk is key to ensuring the continued success of trials involving ATIs and offer greater acceptability across multiple trials sites. In 2022, the Advancing Clinical Therapeutics Globally (ACTG) Network convened a Partner Protections Working Group (PPWG) to update the 2020 HIV transmission risk toolkit developed by Michael J. Peluso and colleagues. In their review of the original toolkit, the researchers identified new challenges and needs at the participant, partner and study levels, as well as new evidence on measures to address these needs and more advanced ethical thinking on partner protections in HIV cure-related trials with ATIs. Based on these findings, the authors developed an updated toolkit that will provide trial participants and their partners with better support to address new and unfamiliar situations and protect partners from undue harm. The authors present this toolkit, making it available as a resource for cure-related trials with ATIs and discuss possible future directions. *The other authors include researchers from the University of California San Diego School of Medicine, Department of Bioethics at NIH, and the University of California-San Francisco's Division of HIV, Infectious Diseases, and Global Medicine.*

NTP Technical Report on the Toxicity Study of *Stachybotrys chartarum* (CASRN 67892-26-6) Administered by Inhalation to B6C3F1/N Mice (TOX-107)

DLH researchers **Laura Betz**, **Shawn Harris**, **Angela Jeffers**, **Guan Xie**, and **Sandra McBride** were among the authors of a National Toxicology Program NTP technical report published

as Toxicity Report 107 (Online: October 2024). *Stachybotrys chartarum*, also known as black mold, has many well-known impacts on health. Following recent natural disasters, public concern for potential illnesses associated with black mold caused by water-damaged indoor environments has been heightened. To evaluate toxicology responses, this report investigates health effects caused by black mold inhalation exposure and describes specific effects on the larynx, lung, and bronchial lymph nodes. *Other authors include researchers from the Division of Translational Toxicology at the National Institute of Environmental Health Sciences and the National Institute for Occupational Safety and Health.*

NIEHS Report on the Toxicity Studies of Nicotine Bitartrate Dihydrate (CASRN 6019-06-3) Administered in Drinking Water to Sprague Dawley Rats and Swiss Mice (NIEHS-11)
DLH researchers **Laura Betz**, **Shawn Harris**, and **Sandra McBride** were among the authors of a National Institute of Environmental Health Sciences NIEHS report (Online: October 2024). Historically, human nicotine exposures were associated with smoking, chewing, or sniffing various forms of tobacco, and abundant literature details the adverse effects of chronic exposures to these tobacco products. Less attention has been given to understanding the specific role nicotine plays in these adverse outcomes. This report examines the impact of nicotine, administered in drinking water, to rodents to inform the health impacts of nicotine on humans. *Other authors include researchers from the Division of Translational Toxicology at the National Institute of Environmental Health Sciences and the Cesare Maltoni Cancer Research Center (Bologna, Italy).*

Vitamin D Levels in the United States: Temporal Trends (2011-2018) and Contemporary Associations with Sociodemographic Characteristics (2017-2018)
DLH researcher **Jesse Wilkerson** was among the authors of an article published in *Nutrients* (Online: October 2024). The most recent vitamin D data from the National Health and Nutrition Examination Survey (NHANES) have not been examined. The authors used data from NHANES to describe trends in 25-hydroxyvitamin D [25(OH)D] from 2011 to 2018 and for the most recent cycle (2017-2018) to identify groups with lower levels of 25(OH)D and factors predictive of 25(OH)D. The 31,628 participants were weighted to represent the entire U.S. population. The median 25(OH)D (nmol/L) increased slightly from 2013-2014, and the prevalence of 25(OH)D <50 nmol/L decreased slightly. In 2017-2018, characteristics associated with lower 25(OH)D were age (12-39 years), male gender, non-Hispanic Black, higher BMI, lower income and education, winter season, not taking vitamin D supplements, or "never" using sunscreen. When stratified by age, race/ethnicity, and gender simultaneously, median 25(OH)D was lowest among non-Hispanic Black females aged 12-19 (38.5 nmol/L) or 20-39 (38.9 nmol/L). Predictors of 25(OH)D level differed by race/ethnicity, e.g., increasing BMI was associated with larger decrements in 25(OH)D among Mexican Americans. This analysis is the first to examine vitamin D levels stratified by multiple characteristics simultaneously. This strategy identified populations at higher risk for health sequelae due to low levels of vitamin D. For example, high levels of deficiency were found in non-Hispanic Black females of reproductive age. *The other authors include researchers from the National Institute of Environmental Health Sciences, National Institute on Minority Health and Health Disparities, and Vanderbilt University Medical Center.*

Use of an Ethinyl Estradiol/Etonogestrel Vaginal Ring Alters Vaginal Microbial Communities in Women with HIV
DLH researcher **Laura Moran** was among the authors of an article published in *The Journal of Infectious Diseases* (Online Ahead of Print: October 2024). HIV-1 antiretroviral therapy

(ART) alters hormonal contraceptive levels delivered via intravaginal ring (IVR) in a regimen specific manner. The authors explored the role of the IVR on vaginal microbial communities, vaginal short chain fatty acids (SCFAs), vaginal HIV shedding, and the effect of vaginal microbes on hormone concentrations in cisgender women with HIV (WWH). Vaginal microbes were assessed by 16S RNA sequencing of weekly vaginal swabs, vaginal SCFA by mass spectrometry, HIV-1 shedding by nucleic acid amplification on vaginal aspirates, and bacterial vaginosis by Nugent scoring from 74 participants receiving an etonorgestrel/ethinyl estradiol (ENG/EE) intravaginal ring while on no ART (N=25), efavirenz-based ART (N=25), or atazanavir-based ART (N=24). At baseline, microbial communities of the 64 substudy eligible participants robustly classified as Lactobacillus crispatus-dominant (n=8), L. gasseri-dominant (n=2), L. iners-dominant (n=17), or mixed anaerobic communities (n=37). During IVR therapy, there was an increased probability of Lactobacillus-dominant community state types (CSTs). Vaginal CSTs were associated with Nugent scores. Bacterial vaginosis-associated bacteria were associated with significantly higher and L. iners with lower Nugent Scores. Lactic acid levels were correlated with the relative abundance of Lactobacillus species. Vaginal shedding of HIV-1 was less common in women with L. crispatus-dominant microbiomes. Mixed anaerobic vaginal communities modulated EE concentrations in a regimen-specific manner. Combined ENG/EE IVR therapy was associated with an increase in Lactobacillus-dominant vaginal microbial communities in WWH and may benefit those with bacterial vaginosis. EE levels were altered by the vaginal microbiota. *The other authors include researchers from the University of California at Los Angeles, University of Washington at Seattle, Northwestern University, and researchers from institutions in Peru, Thailand, Brazil, and Botswana.*

A Million Person Study Innovation: Evaluating Cognitive Impairment and Other Morbidity Outcomes from Chronic Radiation Exposure Through Linkages with the Centers for Medicaid and Medicare Services Assessment and Claims Data

DLH researcher **Sarah Cohen** was among the authors of an article published in *Radiation Research* (Online Ahead of Print: October 2024; Print: December 2024). The study of One Million U.S. Radiation Workers and Veterans, the Million Person Study (MPS), examines the health consequences, both cancer and non-cancer, of exposure to ionizing radiation received gradually over time. Recently the MPS has focused on mortality patterns from neurological and behavioral conditions, e.g., Parkinson's disease, Alzheimer's disease, dementia, and motor neuron disease such as amyotrophic lateral sclerosis. A fuller picture of radiation-related late effects comes from studying both mortality and the occurrence (incidence) of conditions not leading to death. Accordingly, the MPS is identifying neurocognitive diagnoses from fee-for-service insurance claims from the Centers for Medicare and Medicaid Services (CMS), among Medicare beneficiaries beginning in 1999 (the earliest date claims data are available). Linkages to date have identified 540,000 workers with available health information. Such linkages provide individual information on important co-factor and confounding variables such as smoking, alcohol consumption, blood pressure, obesity, diabetes and many other health and demographic characteristics. The total person-level set of time-dependent variables, outcomes, organ-specific dose measures, co-factors, and demographics will be massive and much too large to be evaluated with standard software. Thus, development of specialized open-source software designed for large datasets (Colossus) is nearly complete. The wealth of information available from CMS claims data, coupled with individual dose reconstructions, will thus greatly enhance the quality and precision of health evaluations for this new field of low-dose radiation and neurocognitive effects. *The other authors include researchers from Memorial Sloan Kettering Cancer Center, Vanderbilt University Medical Center, Brown*

University School of Public Health, NASA Langley Research Center, National Council on Radiation Protection and Measurements, and the Oak Ridge National Laboratory.

Natural History of Menstrual Pain and Associated Risk Factors in Early Adolescence
DLH researchers **Samantha Molsberry** and **Sheri Denslow** were among the authors of an article published in the *Journal of Pediatric and Adolescent Gynecology* (Epub: November 2024; Print: February 2025). The study objectives were to determine the natural history of menstrual pain without pelvic pathology, the role of progesterone in its pathophysiology, and associated risk factors in a longitudinal study of early postmenarchal girls in North Carolina. Participants contributed daily urine samples for up to 3.5 years to measure pregnanediol-3-glucuronide (PdG), completed menstrual diaries, and reported menstrual pain using the Menstrual Symptom Questionnaire (MSQ) biannually. Forty-three girls, aged 12.6 ±1.1 years (mean ± SD) at enrollment with a gynecologic age 0.3 ±0.2 years, participated. Total MSQ scores were higher for every 1-year increase in gynecologic age. Overall MSQ and abdominal pain-specific scores were higher for every 1000 ng/mg creatinine increase in peak PdG in the preceding cycle. Overall MSQ scores were higher if the preceding cycle was presumed ovulatory. Menstrual pain was not associated with physical activity, anxiety, or depression. The authors concluded that, in early postmenarchal girls, gynecologic age and PdG were associated with menstrual pain, suggesting a pathophysiologic role for progesterone and other unknown factors in the development of menstrual pain. *The other authors include researchers from the University of North Carolina School of Medicine and the National Institute of Environmental Health Sciences (NIEHS).*

Kidney Disease and Diabetes
DLH senior epidemiologist and researcher **Sarah Casagrande** served as an editor for an article published in *Diabetes in America*, a National Institute of Diabetes and Digestive and Kidney Diseases compilation and assessment of epidemiologic, public health, clinical research, and clinical trial data focused on diabetes, its complications and treatment, health care utilization, and diabetes prevention in the United States. (Online: November 2024). *Excerpt:* Persons with diabetes make up the largest single group of kidney failure patients requiring dialysis or transplant in the United States. The high count reflects the growth in diabetes prevalence and increased access to dialysis and transplantation. Kidney failure affects about 1% of persons with diabetes in the United States; a considerably higher proportion, about 40%, have less severe kidney disease. Based on data from the National Health and Nutrition Examination Surveys 2017–March 2020, 14% of adults age ≥20 years or an estimated 35.5 million individuals had chronic kidney disease (CKD), and 38.7% of adults with diabetes had CKD-defined single measurements of albuminuria and serum creatinine. Improvements in the management of persons with diabetes and CKD have extended the time course from onset of severe albuminuria to kidney failure and reduced the occurrence of cardiovascular events. Newer antihyperglycemic treatment strategies with sodium-glucose cotransporter-2 (SGLT2) inhibitors, glucagon-like peptide-1 (GLP-1) receptor agonists, and the newer mineralocorticoid receptor antagonists (MRAs) have shown efficacy in slowing kidney disease progression and reducing cardiovascular outcomes, without increasing the risk of hypoglycemia. In addition, landmark studies have shown that persons with kidney disease associated with diabetes require multidisciplinary management involving a combination of treatments and behavioral adjustments to delay progression of CKD and to prevent the associated complications.

Sunscreen Use Associated With Elevated Prevalence of Anti-Nuclear Antibodies in U.S. Adults

DLH researcher **Jesse Wilkerson** was among the authors of an article published in the *Journal of Autoimmunity* (Epub: November 2024; Online: December 2024). Antinuclear antibody (ANA) prevalence in the U.S. population increased from 1988 to 2012, especially in white and more educated individuals. In adults ages 20-39 years from the National Health and Nutrition Examination Survey (NHANES) 2003-2004 and 2011-2012, ANA prevalence was previously associated with urinary concentrations of a common sunscreen ingredient, benzophenone 3, measured in winter. Spot urines may not capture relevant chronic exposures, thus the authors examined whether ANA was related to sunscreen use. In a cross-sectional study of adults ages 20-59, the authors examined associations of ANA with reported sunscreen use when in the sun for 1 hour or more. Associations and joint effects with other sun protective behaviors and sunburn in the past 12 months were explored. The association of ANA with sunscreen differed by age: for ages 20-39, the authors saw an exposure response for using sunscreen always or most of the time, and for less frequent versus never-use. These associations were more apparent in females, non-Hispanic white and black participants (vs. other race/ethnicity), and those with sufficient serum vitamin D. ANA was not associated with other protective behaviors and not confounded or modified by these behaviors or recent sunburn. These cross-sectional findings showed frequent sunscreen was associated with ANA in younger adults, supporting the need for replication, and longitudinal studies with detailed exposure histories. *The other authors are researchers from the National Institute of Environmental Health Sciences, the University of Rochester School of Medicine and Dentistry, and the Institute for Social Research at the University of Michigan.*

Occupational and Hobby Exposures Associated with Myositis Phenotypes in a National Myositis Patient Registry

DLH researcher **Jesse Wilkerson** was among the authors of an article published in *Arthritis Care & Research* (Online Ahead of Print: November 2024; Print: January 2025). The authors' objective was to investigate occupational and hobby exposures to silica, solvents, and heavy metals and odds of idiopathic inflammatory myositis (IIM) phenotypes, dermatomyositis (DM) and polymyositis (PM) versus inclusion body myositis (IBM), lung disease plus fever or arthritis (LD+), and systemic autoimmune rheumatic disease-overlap myositis (OM). The sample included 1,390 patients (598 DM, 409 PM, and 383 IBM) ages ≥18 years from a national registry. Of these, 218 (16%) were identified with LD+, i.e., self-reported lung disease with fever and/or arthritis, and 166 (12%) with OM. Questionnaire data on jobs, hobbies, and exposures before diagnosis were evaluated using a rules-based protocol and expert assessment of silica dust, solvents, and heavy metals exposure. Adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated and joint effects with smoking were explored. High silica exposure was associated with an increased odds of having DM (compared to no exposure), LD+ (versus no LD), and OM. Moderate to high heavy metals exposure was associated with greater odds of having LD+ and OM. Greater odds of LD+ were seen among smokers with moderate to high silica exposure versus non-smokers with low or no exposure. These findings, based on a systematic exposure assessment, suggest that occupational and hobby exposures to silica and heavy metals contribute to adult IIM phenotypes, including DM, OM, and LD+, a possible marker for anti-synthetase or other autoantibody-associated lung disease. *The other authors are researchers from the National Institute of Environmental Health Sciences, the Cincinnati Children's Medical Center, and The Myositis Association.*

Postpartum Modern Family Planning Among Women Living With HIV Attending Care at Health Facilities in Busia County, Kenya

DLH researcher **Derrick Kimuli** was among the authors of an article published in *Contraception and Reproductive Medicine* (Online: November 2024). For women living with the human immunodeficiency virus (WLHIV), preventing untimed pregnancies during the postpartum period reduces vertical transmission and improves other maternal and child health outcomes. In Kenya, Busia County's HIV prevalence and mother-to-child transmission rate are higher than the national average yet uptake of postpartum family planning (PPFP) is generally low. This study examined health system factors influencing the consistent use of PP modern FP methods among WLHIV in Busia County. A retrospective study involving 314 WLHIV with children aged 12-24 months who were chosen using systematic random sampling was conducted from February to March 2024 from outpatient clinics in Busia County. Additionally, 14 health providers were purposively sampled as key informants. Quantitative data was collected using a pretested questionnaire, while qualitative data was gathered through key informant interview guides. The mean age of the participants was 32.06 with the majority aged between 25 and 34 years, married, and unemployed. Overall, 73.25% had used postpartum (PP) modern family planning (FP) methods, but only 52.55% reported consistent use throughout the first year postpartum. The only factors found to increase the odds of PPFP use were being married, being escorted by a preferred person during seeking maternal and child health services, and perceiving that they were provided information on all types of FP. Persistent stock-outs and inadequate counseling hindered consistent PPFP use. The study identified gaps in the consistent use of PP modern FP methods among WLHIV in Busia County, influenced by the availability of FP information and health system factors. Addressing stock-outs and improving counseling during clinic visits and pregnancy are crucial for improving FP service delivery and reducing maternal and child health risks in high HIV-incidence areas like Busia County. *The other authors include researchers from the Department of Public Health at Maseno University (Kisumu, Kenya).*

Active Tuberculosis Disease Among People Living With HIV on ART Who Completed Tuberculosis Preventive Therapy at Three Public Hospitals in Uganda

DLH researcher **Derrick Kimuli** was among the authors of an article published in *PLoS One* (Online: November 2024). Tuberculosis (TB) preventive therapy (TPT) reduces the incidence of TB among people living with the human immunodeficiency virus (PLHIV). However, despite an increase in TPT uptake, TB/HIV coinfection remains stagnant in Uganda especially in areas of increasing HIV incidence such as the Bunyoro sub-region. This study was a retrospective review records (antiretroviral therapy [ART] files) of PLHIV who were active on ART and completed TPT in 2019/2020 at three major hospitals in the Bunyoro sub-region, Uganda: Masindi General Hospital, Hoima Regional Referral Hospital, and Kiryandongo General Hospital. The sample size (987) for each facility was determined using a proportionate sampling method to ensure the study's power and precision. The participants' mean age was 38.23 and the majority were female. Overall, 9.63% developed active TB disease post TPT completion. In the adjusted analysis, factors associated with active TB disease were a history of an unsuppressed viral load after TPT, opportunistic infections after TPT completion, a history of TB active TB disease, and chronic illness during or after TPT. To reduce the development of TB disease post TPT thereby improving the effectiveness of TPT, ART adherence should be emphasized to resolve viral suppression and active management of chronic and opportunistic infections. Further clinical management consideration and research is needed for PLHIV who receive TPT but have a previous history of TB disease. *The other authors include researchers from*

the Cavendish University Uganda, Hoima Regional Referral Hospital (Uganda), Alliance for Community Health Initiative (Kampala, Uganda), and the Ministry of Health Uganda.

Neighborhood Social Cohesion and Sleep Health Among Sexual Minoritized US Adults and Intersections With Sex/Gender, Race/Ethnicity, and Age

DLH researchers **Christopher Payne** and **Braxton Jackson** were among the authors of an article published in *Sleep Health* (Online ahead of Print: November 2024). Neighborhood social cohesion or living in communities characterized by trust and social ties may mitigate sleep disparities among sexual minoritized vs. heterosexual persons; but its relation to sleep health is understudied among sexual minoritized groups. To investigate associations between perceived neighborhood social cohesion and sleep health among adult US men and women who identified as "lesbian or gay, bisexual, or something else," the authors used cross-sectional National Health Interview Survey data (2013-2018). Participants reported neighborhood social cohesion (categorized as low or medium vs. high) and sleep characteristics. Among 4666 sexual minoritized adults, 44% reported low, 32% medium, and 24% high neighborhood social cohesion. Women, minoritized racial/ethnic groups, and young adults disproportionately reported low neighborhood social cohesion. Overall, low vs. high neighborhood social cohesion was associated with a higher prevalence of short sleep and all sleep disturbances. Prevalence ratios were often higher as intersectionality or membership to multiple minoritized groups increased. Lower perceived neighborhood social cohesion was associated with poorer sleep. Fostering community cohesiveness may mitigate sleep disparities among sexual minoritized adults. *The other authors are researchers from the National Institute of Environmental Health Sciences, University of North Carolina at Charlotte, and the National Institute on Aging.*

Disability and Diabetes in Adults

DLH senior epidemiologist and researcher **Sarah Casagrande** served as an editor for an article published in *Diabetes in America*, a National Institute of Diabetes and Digestive and Kidney Diseases compilation and assessment of epidemiologic, public health, clinical research, and clinical trial data focused on diabetes, its complications and treatment, health care utilization, and diabetes prevention in the United States. (Online: December 2024). *Excerpt:* This article reviews findings from national studies of prevalence in diabetes-related disability, presents new data on contemporary trends in disability among people with diabetes across the United States, summarizes risk factors and mechanisms for the excess disability prevalence associated with diabetes, and reviews evidence that disability may be preventable or modifiable. Cross-sectional and prospective studies have consistently found that people with diabetes have 50%–90% increased risk of disability, including mobility loss, reduced instrumental activities of daily living (IADL) and activities of daily living (ADL), and work disability. The association of diabetes with increased disability risk is multifactorial, with age, longer diabetes duration, obesity, coronary heart disease, lower extremity complications, depression, and stroke among the most consistently observed factors explaining the difference in disability rates between people with and without diabetes. Additionally, several studies have suggested that specific physiological factors, including inflammation, insulin resistance, hyperglycemia, and their contribution to loss of muscle mass, may also mediate the higher diabetes-related disability risk. Nationally representative data from 2019-2022 show that 21% of adult women with diabetes (vs. 9% of women without diabetes) and 19% of adult men with diabetes (vs. 7% of men without diabetes) reported any disability. For both women and men with diabetes, the prevalence of any disability increased with age, ranging from ~15% for adults age 20–44 years to ~35%–40% for those age ≥75 years. The relative differences

in disability prevalence between persons with versus without diabetes decreased with age. In 2019–2022, one-third of adults with diabetes had mobility disability or some mobility difficulty. Among persons with diabetes, there were substantial differences in disability prevalence according to other sociodemographic factors. Notably, the prevalence of any disability among persons with diabetes living below the poverty threshold (poverty income ratio [PIR] <1.0) was double the prevalence among those living above the poverty threshold (PIR ≥1.0): 34% vs. 17%, respectively. The high prevalence of disability among people with diabetes poses substantial burden to people with diabetes, health care and public health systems, employers, and payors. Lifestyle interventions focused on achieving weight loss and increasing physical activity are effective for reducing disability and long-term functional decline in people with diabetes. However, further research is needed to determine the impact of preventive care and diabetes management practices, including diabetes treatment and the emergence of new diabetes therapies, on disability risk. Continued surveillance is needed to determine the impact of primary and secondary prevention approaches on disability risk in the coming decades.

HepB-CpG vs HepB-Alum Vaccine in People With HIV and Prior Vaccine Nonresponse: The BEe-HIVe Randomized Clinical Trial

DLH researcher **Parita Rathod** was among the authors of an article published in *JAMA* (Online Ahead of Print: December 2024; Print: January 2025). Nonresponse to hepatitis B vaccine is common among people with HIV, resulting in vulnerability to infection with hepatitis B virus (HBV). The study objective was to compare the seroprotection response achieved with a 2-dose (noninferiority, 10% margin) and a 3-dose hepatitis B vaccine with a cytosine phosphoguanine adjuvant (HepB-CpG vaccine) vs a conventional 3-dose hepatitis B vaccine with an aluminum hydroxide adjuvant (HepB-alum vaccine) in people with HIV and prior nonresponse to HepB-alum vaccine. This phase 3, open-label, randomized clinical trial included people with HIV receiving antiretroviral therapy (CD4 cell count ≥100 cells/μL and HIV RNA <1000 copies/mL) without past or present serological evidence of having HBV or a response to hepatitis B vaccine. From December 2020 to February 2023, 561 adults were enrolled in the study at 41 sites in 10 countries in Africa, Asia, North America, and South America with follow-up for the primary outcome analysis through September 4, 2023. Participants were randomly assigned to receive 2 doses of HepB-CpG vaccine administered intramuscularly at weeks 0 and 4; 3 doses of HepB-CpG vaccine administered intramuscularly at weeks 0, 4, and 24; or 3 doses of HepB-alum vaccine administered intramuscularly at weeks 0, 4, and 24. The primary outcome was a seroprotection response to hepatitis B vaccine (defined as level of antibody titer against hepatitis B surface antigen [HBsAg] ≥10 mIU/mL) at week 12 for the 2-dose regimen (8 weeks after dose 2) and at week 28 for 3-dose regimens (4 weeks after dose 3). Key secondary outcomes included seroprotection response at additional time points, antibody titer against HBsAg, and adverse events within 4 weeks of hepatitis B vaccination. Of 561 participants included in the analysis (median age, 46 years; 64% were male; 17% of participants were Asian, 42% were Black, and 35% were White), a seroprotection response was achieved in 93.1% who received 2 doses of HepB-CpG vaccine, in 99.4% who received 3 doses of HepB-CpG vaccine, and in 80.6% who received 3 doses of HepB-alum vaccine. The 3-dose HepB-CpG vaccine regimen was superior to the 3-dose HepB-alum vaccine regimen. By week 12, more than 90% of participants who received HepB-CpG vaccine achieved a seroprotection response. The 3-dose regimen of HepB-CpG vaccine achieved a higher proportion of participants with antibody titer against HBsAg greater than 1000 mIU/mL vs the other 2 regimen groups. No unexpected safety issues were observed. Among people with HIV and nonresponse to prior hepatitis B vaccination, both the 2-dose

and 3-dose regimens of HepB-CpG vaccine achieved a superior seroprotection response compared with 3 doses of HepB-alum vaccine. *The other authors include researchers from Weill Cornell Medicine, Massachusetts General Hospital, Harvard University T. H. Chan School of Public Health, Johns Hopkins University, and the National Institute of Allergy and Infectious Diseases, as well as researchers from Vietnam, Botswana, Zimbabwe, Kenya, Brazil, and Thailand.*

Associations Between Pesticide Use and Rheumatoid Arthritis Among Older Farmers in the Agricultural Health Study

DLH researchers **Darya Leyzarovich** and **Ghassan Hamra** were among the authors of an article published in *Scientific Reports* (Online: December 2024). Pesticides and farming have been associated with increased rheumatoid arthritis (RA) risk, but the role of specific pesticides remains unknown. The authors examined RA risk among licensed pesticide applicators (97% white male farmers), from North Carolina and Iowa, in the Agricultural Health Study, in relation to lifetime use of 45 pesticides reported at enrollment (1993-1997, updated 1999-2003). In 22,642 applicators ages ≥67 years with ≥24 months Fee for Service Medicare data (1999-2016), the authors identified 161 incident cases with ≥2 RA claims (including ≥1 by a rheumatologist), ≥30 days apart, after ≥12 months without RA claims. Risk was elevated for use of nine pesticides: four insecticides (malathion, phorate, carbaryl, carbofuran), four herbicides (alachlor, metolachlor, S-Ethyl dipropylthiocarbamate, metribuzin), and one fungicide (benomyl). Exposure-response was seen for greater intensity-weighted lifetime days use of malathion and carbofuran. Some specific pesticides, including several currently approved and commonly used in agricultural, public health, or residential settings may increase RA risk among older adults. *The other authors are researchers from the National Institute of Environmental Health Sciences, Brigham and Women's Hospital, and the National Cancer Institute.*

Sociodemographic Characteristics of Youth and Adults With Diabetes

DLH senior epidemiologist and researcher **Sarah Casagrande** was the lead author of an article published in *Diabetes in America*, a National Institute of Diabetes and Digestive and Kidney Diseases compilation and assessment of epidemiologic, public health, clinical research, and clinical trial data focused on diabetes, its complications and treatment, health care utilization, and diabetes prevention in the United States (Online: December 2024). *Excerpt:* This article describes the sociodemographic characteristics of youth and adults with diabetes in the United States, overall and by diabetes type when available, and compares their characteristics to persons without diagnosed diabetes based on national data from the National Health Interview Survey (NHIS). In the NHIS 2021–2022, the age distribution of all persons with diagnosed diabetes was older than persons without diagnosed diabetes (mean age 61.2 years vs. 37.6 years). Adults with type 1 diabetes were younger than adults with type 2 diabetes (mean age 47.1 years vs. 62.5 years). For the race and ethnicity distribution, a higher proportion of adults with diagnosed diabetes were non-Hispanic Black persons and a lower proportion were non-Hispanic White persons compared to those without diabetes (15.7% vs. 11.4% and 57.3% vs. 64.3%, respectively). The proportion of non-Hispanic White persons was highest for adults with type 1 diabetes compared to those with type 2 diabetes and those without diabetes (75.3% vs. 56.6% and 64.3%, respectively). Among adults with diagnosed diabetes, a higher proportion of non-Hispanic White persons and a lower proportion of non-Hispanic Black persons were men (54.3% vs. 45.7% women and 42.7% vs. 57.3% women, respectively). In the NHIS 2021–2022, the majority of adults with or without diagnosed diabetes lived in metropolitan counties (83.5% and 86.7%, respectively), but compared to those without diabetes, slightly more adults with diagnosed diabetes lived in nonmetropolitan counties (16.5% vs.

13.3%, respectively) and in the South (42.6% vs. 37.6%, respectively). The level of attained education was lower in adults with diagnosed diabetes compared to those without diabetes (21.2% vs. 38.4% graduated with bachelor's degree or higher), and this difference persisted when stratified by age group. Hispanic persons with diagnosed diabetes had the highest prevalence of having less than a high school education compared to persons with diabetes of all other race/ethnicity groups (40.5% vs. 10.4%–19.4%). Compared to adults without diabetes, persons with diagnosed diabetes were more often: living below the poverty threshold (poverty income ratio <1.00: 13.1% vs. 9.3%), food insecure (11.0% vs. 6.5%), receiving Supplemental Nutrition Assistance Program benefits (food stamps; 18.6% vs. 12.2%), and receiving rental assistance (20.5% vs. 8.5%); these differences persisted when stratified by age group. Among adults that reported not working in the past week, those with diagnosed diabetes more often reported being disabled as the main reason for not working compared to persons without diabetes (25.2% vs. 14.3%), and this difference persisted regardless of age. National data from the National Health and Nutrition Examination Surveys (NHANES) 2015–March 2020 were used to compare characteristics among adults with diagnosed diabetes, undiagnosed diabetes, prediabetes, and no diabetes and among youth with diagnosed diabetes, prediabetes, and no diabetes. Adults with prediabetes were younger (37.6% age 20–44 years) than those with undiagnosed diabetes or diagnosed diabetes (21.6% and 12.7% age 20–44 years, respectively), but the distributions of sex and race/ethnicity were similar for these diabetes status groups. Among youth with prediabetes, there were more males than females, and the majority were non-Hispanic White persons (52.0%), followed by Hispanic persons (27.2%). *The other author is a researcher from the University of Pittsburgh.*

Volatile Hydrocarbon Exposures and Immune-Related Illnesses Among Deepwater Horizon Oil Spill Workers

DLH researcher **Braxton Jackson** was among the authors of an article published in the *Journal of Exposure Science & Environmental Epidemiology* (Online Ahead of Print: December 2024). Despite evidence from experimental studies linking some petroleum hydrocarbons to markers of immune suppression, limited epidemiologic research exists on this topic. The aim of this cross-sectional study was to examine associations of oil spill-related chemicals (benzene, toluene, ethylbenzene, xylene, and n-hexane [BTEX-H]) and total hydrocarbons (THC) with immune-related illnesses as indicators of potential immune suppression. Subjects comprised 8601 Deepwater Horizon (DWH) oil spill clean-up and response workers who participated in a home visit (1-3 years after the DWH spill) in the Gulf Long-term Follow-up (GuLF) Study. Cumulative exposures to THC and individual BTEX-H constituents during the oil spill clean-up were estimated using a job-exposure matrix linking air measurement data to detailed participant work histories. Study outcomes included post-spill occurrence and/or frequency of illnesses ascertained at the home visit, including colds, flu, cold sores, pneumonia, and shingles. Frequent cold and frequent flu were defined as ≥4 colds and ≥2 episodes of flu since the spill, respectively. The authors examined an aggregate outcome of frequent colds, any flu, cold sores, or pneumonia since the spill. The authors observed positive associations of increasing quartiles of THC and BTEX-H with all outcomes except shingles, with evidence of an exposure-response for most outcomes. Strongest associations were observed for frequent flu. The BTEX-H mixture was associated with small to modest elevations in prevalence ratios for most outcomes. Impact statement: This study is the first to the authors' knowledge to demonstrate an association between oil spill BTEX-H exposures and multiple immune-related illnesses as measures of potential immune suppression. Increasing oil spill-related volatile hydrocarbon exposures may increase the risk of multiple

immune-related illnesses, especially frequent cold and frequent flu. Future research on this topic using more robust measures of immune function would advance existing evidence on this relationship. *The other authors include researchers from the National Institute of Environmental Health Sciences, UNC Gillings School of Public Health, West Virginia University School of Public Health, and the Bloomberg School of Public Health at Johns Hopkins University.*

The Use of HIV Prevention Strategies and Services Reported by Black Women With a Risk For and With HIV in the United States

DLH researchers **Priya Nair** and **Tamara Carree** were among the authors of an article published in *AIDS and Behavior* (Online Ahead of Print: December 2024). Black women are disproportionately affected by HIV. The authors analyzed data from two Centers for Disease Control and Prevention's HIV surveillance systems to better understand HIV prevention strategies used by Black women at risk for and with HIV to help inform efforts to end HIV. Among sexually active Black women, 2019 National HIV Behavioral Surveillance data were analyzed on women without HIV (n = 4,033) and 2018-2020 Medical Monitoring Project data on women with HIV (n = 967). The authors reported percentages of HIV prevention strategies and services used and assessed differences between groups using Rao-Scott chi-square tests. Among Black women without HIV, 39% were aware of pre-exposure prophylaxis (PrEP); of these, 7% discussed PrEP with a healthcare provider, and 1% used PrEP in the past 12 months. Approximately 16% used a condom with their last sex partner; 36% reported that their last sex partner did not have HIV. Among Black women with HIV, 58% had condom-protected sex, 56% reported having sex while having sustained viral suppression, 3% had condomless sex with a partner on PrEP, and 24% had sex with a partner with HIV; 12% engaged in sex without using any HIV prevention strategy. HIV prevention strategies and services differed by selected demographic characteristics and social determinants of health. Although many sexually active Black women reported using HIV prevention strategies, there is room for improvement among those at risk for or with HIV. Tailoring prevention efforts based on individual needs and circumstances is essential for ending the HIV epidemic. *The other authors are researchers from the Division of HIV Prevention at the Centers for Disease Control and Prevention.*

Burden of Digestive Diseases in the United States Population: Rates and Trends

DLH researcher **Constance Ruhl** was a coauthor of an article published in *The American Journal of Gastroenterology* (Online Ahead of Print: December 2024). Digestive diseases are common in the United States and lead to significant morbidity, mortality, and health care utilization. The authors used national survey and claims databases to expand on earlier findings and investigate rates and trends in the digestive disease burden in the United States. The Nationwide Emergency Department Sample, National Inpatient Sample, Vital Statistics of the United States: Multiple Cause-of-Death Data, Optum Clinformatics Data Mart, and Centers for Medicare and Medicaid Services Medicare 5% Sample and Medicaid files were used to estimate claims-based prevalence, medical care, and mortality with a digestive disease diagnosis. Digestive disease prevalence (claims-based, 2019) was 24.2% among Medicaid beneficiaries, 33.2% among private insurance enrollees, and 51.5% among Medicare beneficiaries and rose over the previous decade. Digestive diseases contributed to 42 million emergency department visits, 17 million hospital stays, and 472,000 deaths in 2019. Women had higher medical care rates with a digestive disease diagnosis, but mortality rates were higher among men. Blacks had higher medical care use and mortality rates compared with Whites, and Hispanics had lower rates. During the study period, ambulatory care and emergency department visit rates with a digestive disease diagnosis rose, while hospitalization and mortality rates declined. Among private

insurance enrollees, rates were higher compared with national data for hospitalizations, but lower for emergency department visits. The digestive disease burden in the United States is substantial, particularly among Blacks and older adults. Further research is needed to better understand reasons for disparities and trends in health care use and mortality reported in this paper. *The other author is a researcher at the National Institute of Diabetes and Digestive and Kidney Diseases.*

Prevalence of Metabolic Dysfunction-Associated Steatotic Liver Disease and Fibrosis Defined by Liver Elastography in the United States Using National Health and Nutrition Examination Survey 2017-March 2020 and August 2021-August 2023 Data

DLH researcher **Constance Ruhl** was a coauthor of an article published in *Hepatology* (Online Ahead of Print: December 2024). Steatotic liver disease (SLD) is a significant public health burden. Previously, the authors estimated prepandemic SLD prevalence determined by transient elastography assessed hepatic steatosis and fibrosis in the United States. The authors now estimate prevalence of metabolic dysfunction-associated steatotic liver disease (MASLD) and examine associations with lifestyle, socioeconomic, and other factors. Liver stiffness and controlled attenuation parameter (CAP) were assessed on 13,538 non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Hispanic men and women aged 20 years and over in the National Health and Nutrition Examination Survey (NHANES) 2017-March 2020 and August 2021-August 2023. The prevalence of SLD was 28.7%, of fibrosis was 11.3%, and of MASLD was 25.6%. Between the two survey cycles the age standardized SLD prevalence was not significantly different, MASLD prevalence decreased, and fibrosis prevalence increased. In multivariable-adjusted analysis, both MASLD and fibrosis were associated with diabetes, higher body mass index and waist-to-hip ratio, elevated blood pressure, and inversely associated with non-Hispanic Black race-ethnicity. MASLD was also associated with male sex, non-Hispanic Asian race-ethnicity, pre-diabetes, higher total cholesterol, lower HDL cholesterol, and greater sedentary lifestyle. Fibrosis was also associated with SLD, lower total cholesterol, and less education. In the U.S. population, MASLD and fibrosis prevalence are high along with obesity and diabetes. Findings suggest that early detection of chronic liver disease and targeting lifestyle and other modifiable risk factors may slow disease progression toward advanced fibrosis and cirrhosis. *The other author is a researcher at the National Institute of Diabetes and Digestive and Kidney Diseases.*

Usability Enhancements to a Prototype Clinical Decision Support System for Combat Medics

DLH Human Factors Engineer **Jimmy Gaudaen** was a coauthor of an article published in *Military Medicine* (Online: November 2023). A Clinical Decision Support System that provides just-in-time medical guidance at the point of injury is being developed. To develop a user interface, a user-centered design approach was taken. To evaluate the system, personas of the users were created, a comparative analysis of the system against the Tactical Combat Casualty Care Card and Battlefield Assisted Trauma Distributed Observation Kit was completed, and user testing was performed. Many design recommendations were gathered from the user-centered design approach including replacing buttons with a homunculus, replacing prompts with a tree and node system, and allowing more user freedom in working with the system. Through multiple different evaluations, design recommendations for a clinical decision support system were implemented in an iterative process. More iterations and more formalized user testing are planned to maximize the usability of the system. *The other authors include researchers from the Telemedicine & Advanced Technology Research Center (TATRC), Fort Detrick, Frederick, Maryland.*

Vision-Based Human Identification with Face and Nametape Recognition in Aerial Casualty Monitoring System

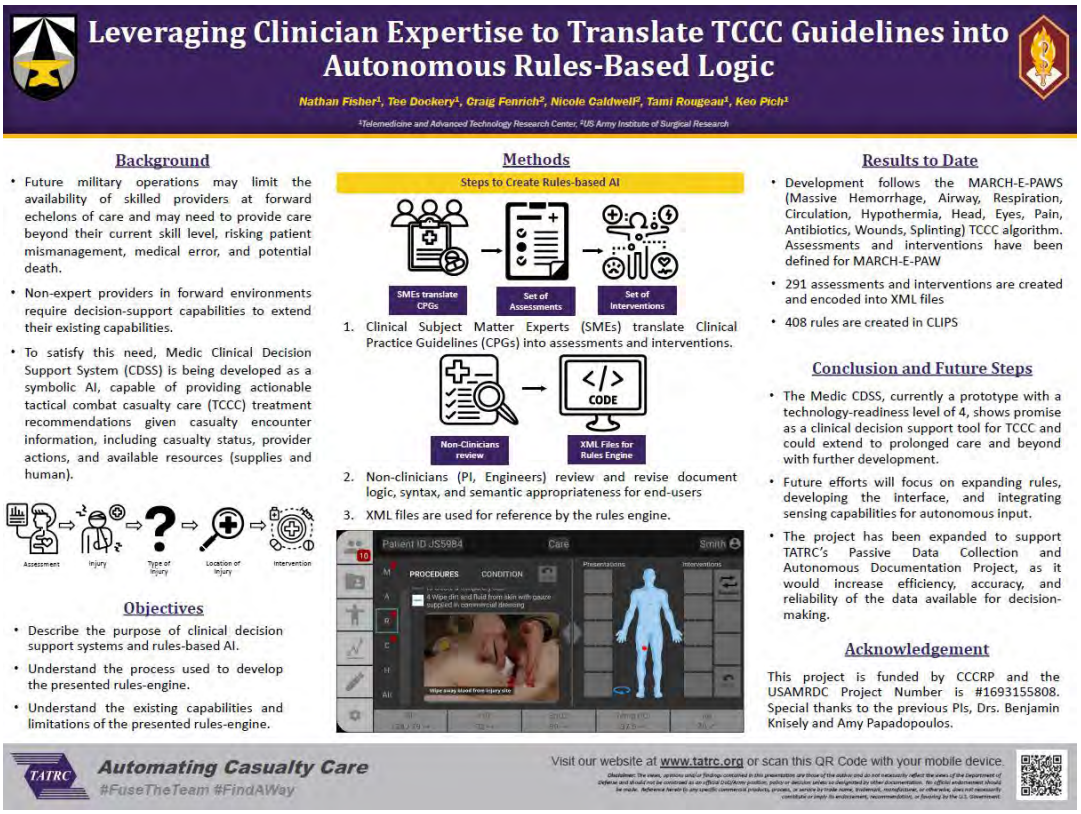
DLH Robotics Engineer **Jaeyeon Lee** was a coauthor of an article published in the *2023 32nd IEEE International Conference on Robot and Human Interactive Communication* (Online: November 2023). In emergency rescue scenarios, rapid identification of human casualties is a critical first step in enhancing emergency medical response. This task can be limited by the physical and cognitive capacity of rescue personnel, who are exposed to significant risk. The use of small unmanned aerial systems (sUAS) equipped with autonomous casualty assessment abilities can reduce these limitations and risks by enabling remote casualty detection, identification, and vitals assessment, providing standoff protection, and eliminating the need for human personnel to access the potentially hazardous scene. This paper presents a vision-based casualty assessment framework and specifically discusses our casualty identification software, which is designed to recognize the faces of casualties and identify their nametapes in images captured by sUAS under realistic conditions. Our approach addresses the limitations of the sUAS-captured long-distance images to enable accurate identification in challenging casualty monitoring situations. The face and nametape recognition algorithms will be integrated into the larger casualty perception framework and embedded into sUAS platforms to assist with emergency rescue operations. The total casualty perception system will detect, identify, and evaluate the condition of casualties from a remote location, providing standoff protection to first responders and rapid information to inform a suitable medical treatment plan. *The other authors include researchers from the Telemedicine & Advanced Technology Research Center (TATRC), Fort Detrick.*

Contactless Weight Estimation of Human Body and Body Parts for Safe Robotics-Assisted Casualty Extraction

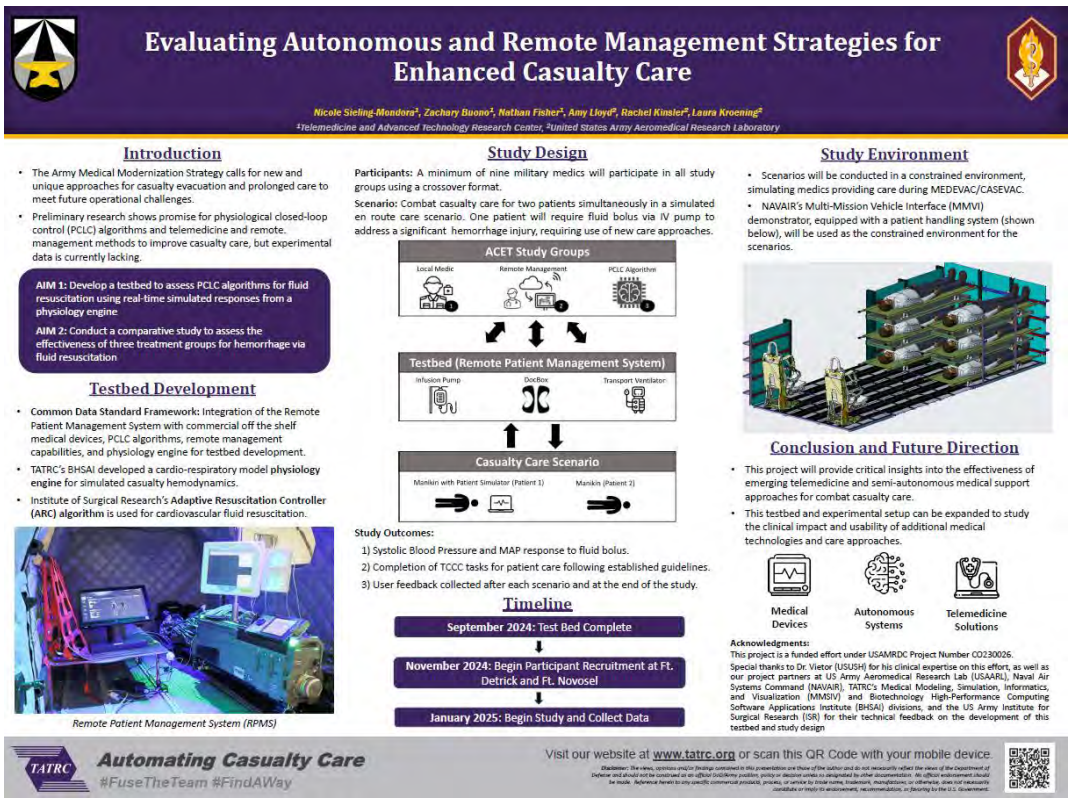
DLH Robotics Engineer **Jaeyeon Lee** was a coauthor of an article published in the *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems* (Online: December 2023). Deploying humans in a high-risk environment to extract casualties in order to provide medical attention is an inherently dangerous endeavor. To minimize this risk, Robotics and Autonomous Systems can be deployed in hazardous areas in place of human personnel to limit the exposure of first responders to various life-threatening conditions. The success of robotic extraction of injured persons depends heavily on how safely the human subject is handled. Therefore, the integration of intelligent technologies for secure control and motion planning is crucial in overcoming the dynamic and complex challenges of robotic grasping and manipulation. In this regard, the measurement of the target human subject's weight is an essential factor for safe grasping and maneuvering during robotic interactions with humans. This paper presents a contactless vision-based approach for estimating the weight of the human body. This approach employs visual body perception, 3D body point cloud representation, and a deep learning network for body segmentation to measure specific body parameters. Next, the body parameters are fed into a neural network model to predict the total body weight. This prediction then enables an approximation of the weight of individual body segments to be obtained. *The other authors include researchers from the Telemedicine & Advanced Technology Research Center (TATRC), Fort Detrick.*

DLH Research Posters and Presentations

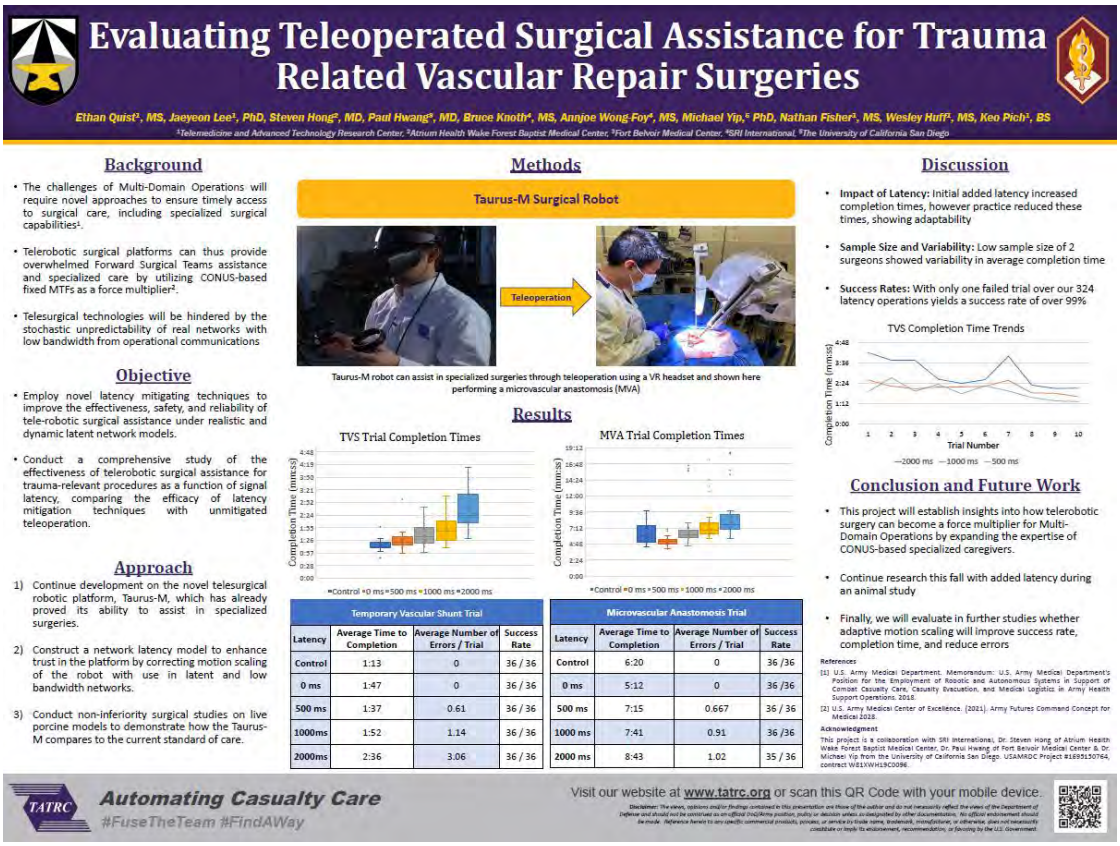
• **Keo Pich** presented a poster, "Leveraging Clinician Expertise to Translate TCCC Guidelines into Autonomous Rules-Based Logic," at the 2024 Military Health System Research Symposium.



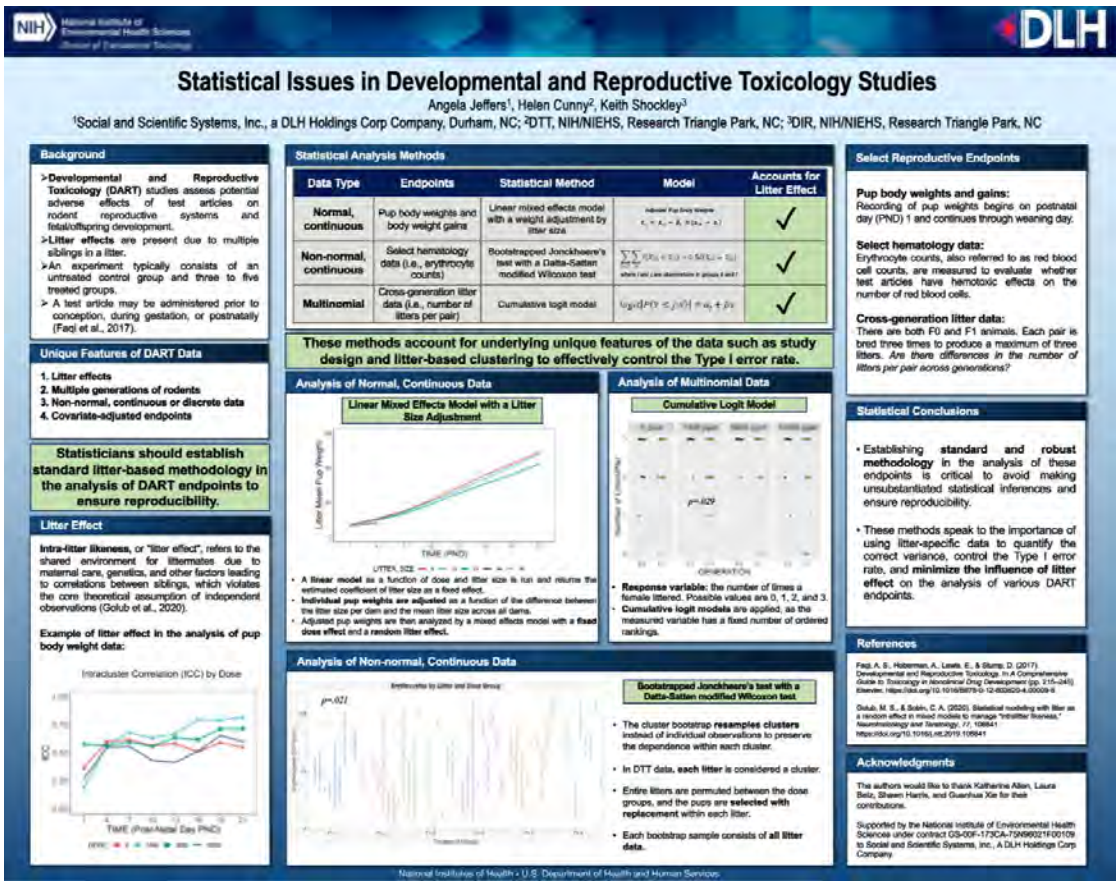
• **Nicole Sieling-Mondora** presented a poster, "Evaluating Autonomous and Remote Management Strategies for Enhanced Casualty Care," at the 2024 Military Health System Research Symposium.



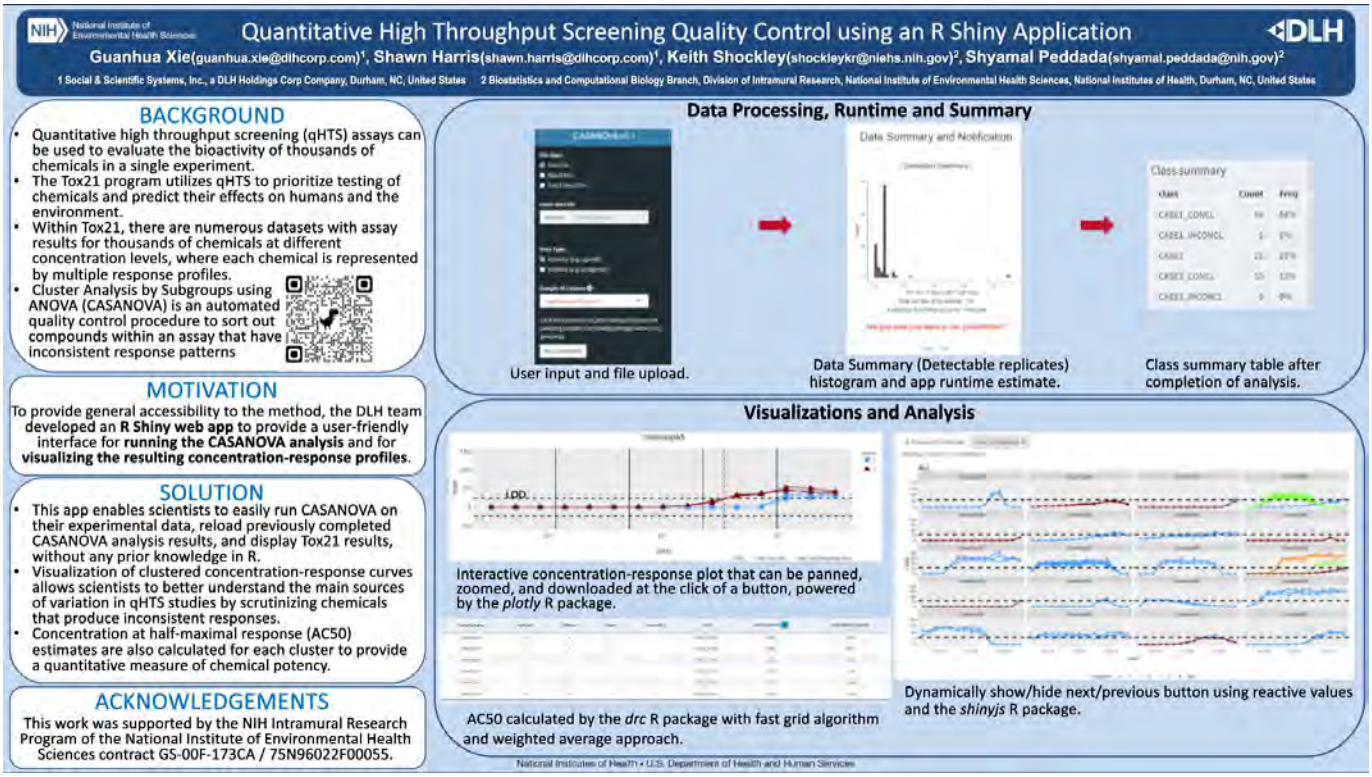
• **Jaeyeon Lee** presented a poster, "Evaluating Teleoperated Surgical Assistance for Trauma Related Vascular Repair Surgeries," at the 2024 Military Health System Research Symposium.



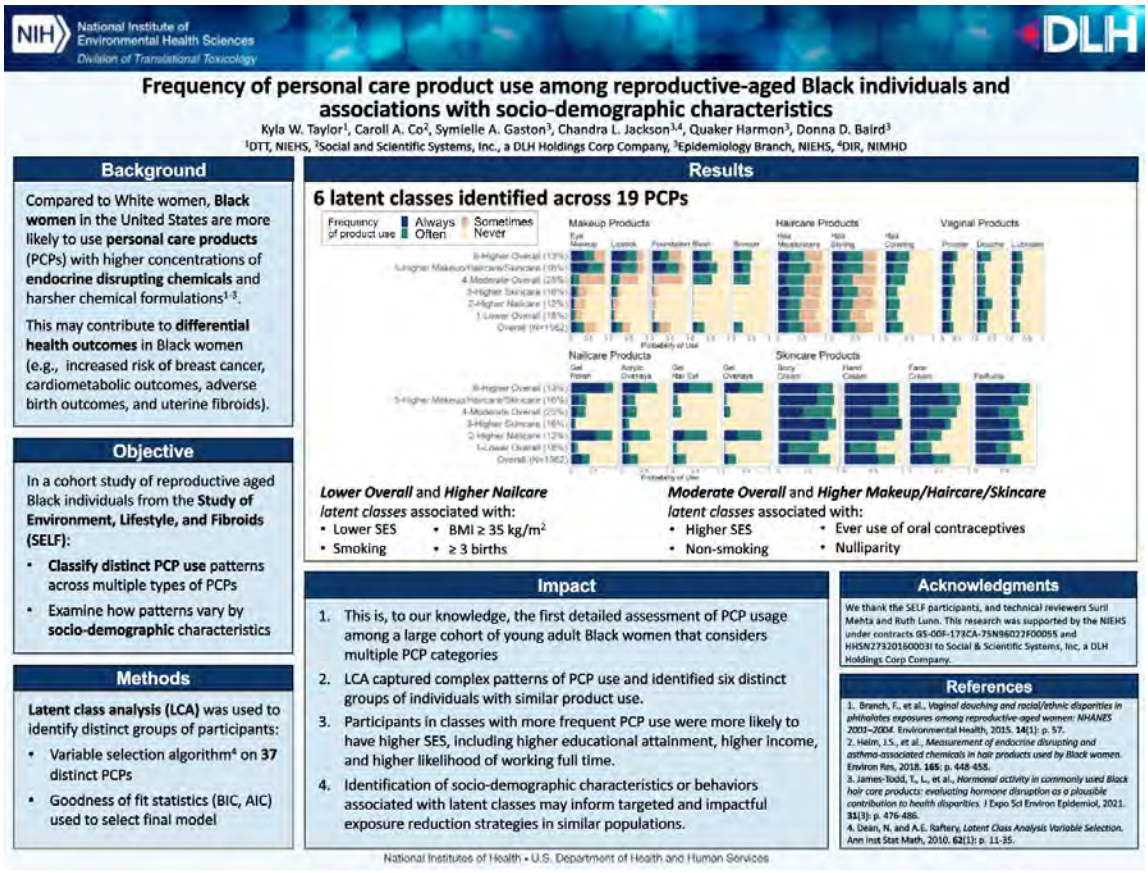
• **Angela Jeffers** presented a poster, "Statistical Issues in Developmental and Reproductive Toxicology Studies," at the Division of Translational Toxicology Poster Showcase.



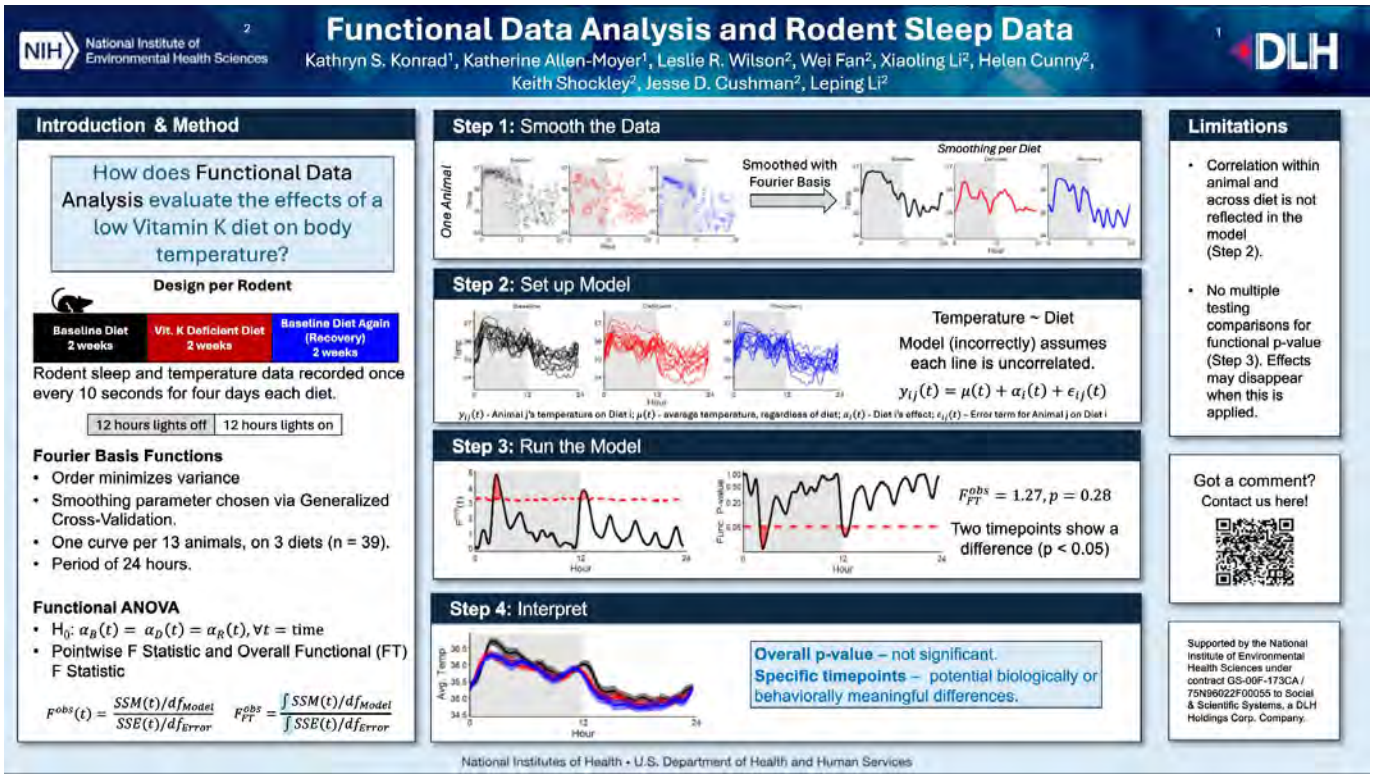
• **Guan Xie** presented a poster, "Quantitative High Throughput Screening Data Quality Control Analysis R Shiny Application," at the Division of Translational Toxicology Poster Showcase.



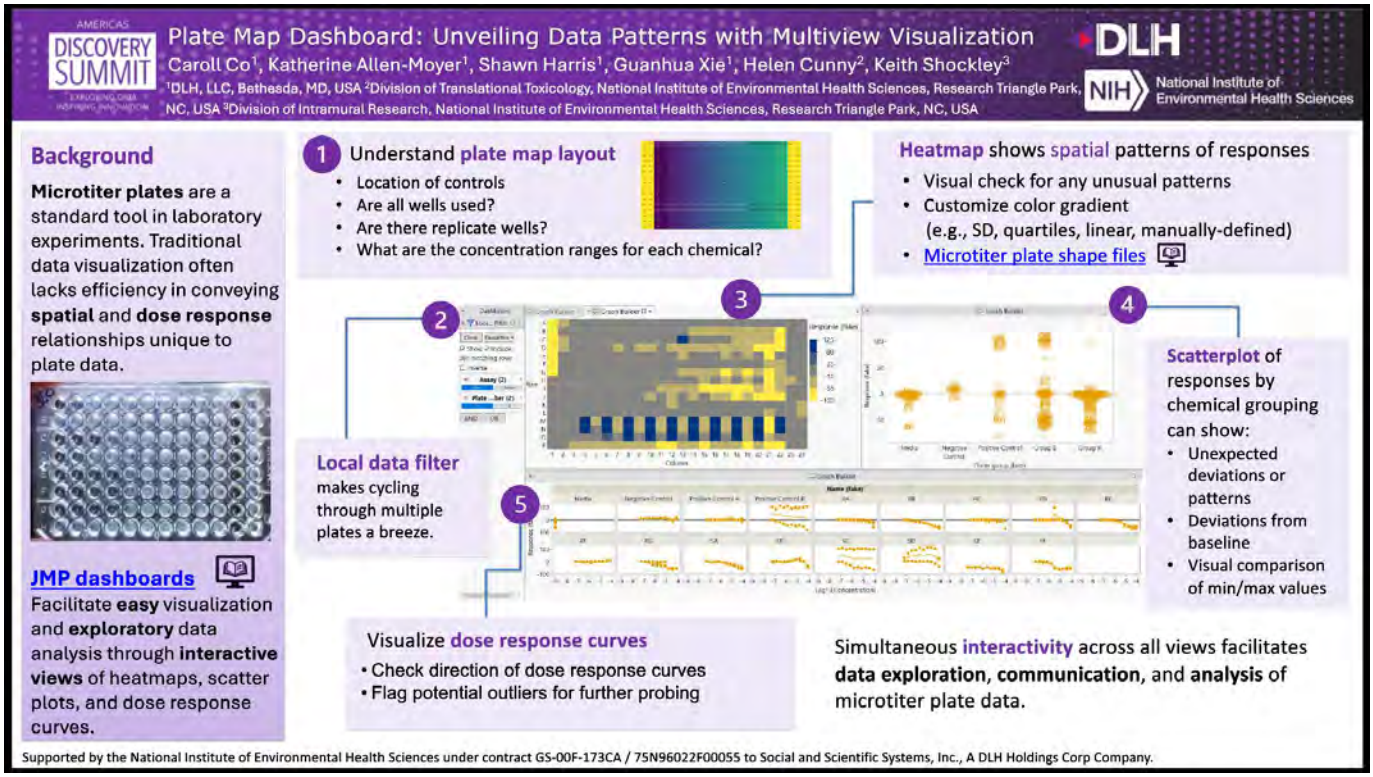
• **Caroll Co** presented a poster, "Frequency of Personal Care Product Use Among Reproductive-Aged Black Individuals and Associations with Socio-Demographic Characteristics," at the Division of Translational Toxicology Poster Showcase.



• **Kate Konrad** presented a poster, "Functional Data Analysis and Rodent Sleep Data," at Joint Statistical Meetings.



• **Caroll Co** presented a poster, "Plate Map Dashboard: Unveiling Data Patterns with Multiview Visualizations," at JMP Discovery Americas.



• **Kate Konrad** presented a poster, "Using JMP Graph Builder for Improving Data Quality in Longitudinal Fiber Photometry Datasets," at JMP Discovery Americas.