

## Indigenous U.S. coal miners face increased odds of lung function impairment

Author: Jeremy Hua

**Rationale:** Occupational lung disease among Indigenous (AI) coal miners is poorly understood. We examined clinical surveillance data to compare adjusted odds of abnormal spirometry and pneumoconiosis among AI/non-AI western U.S. coal miners.

**Methods:** Coal miners were screened in CO/WY/AZ clinics from 2002-2022. AI was considered self-reported “American Indian/Alaskan Native” race. Outcomes were abnormal spirometry (obstructive or restrictive pattern) based on Department of Labor (DOL)-required Knudson (1976) standards and pneumoconiosis (International Labour Office B-read profusion  $\geq 1/0$  on chest radiograph). Co-variables included age, gender, height/weight, smoking status/pack-years, and mining characteristics (cumulative, coal/non-coal, and surface/underground tenures). We used multivariable logistic regression to measure interaction of AI race with coal mining tenure for both outcomes (Rv4.1.1). We then applied spirometry standards developed from an AI-specific population (Marion 2001) to assess potential differences in using Knudson standards to allocate DOL disability compensation benefits.

**Results:** Table 1 shows data from 752 coal miners (326 AI, 426 non-AI). AI miners had greater odds of abnormal spirometry for every decade of coal mining worked (OR 1.41, 95%CI [1.04, 1.95]), after adjusting for confounders. AI miners had similar pneumoconiosis adjusted odds per decade of coal mining (OR 1.09, 95%CI [-0.66, 1.85]). 4/19 (21%) AI miners were disabled using AI-specific spirometry standards, but not Knudson standards.

**Conclusions:** AI coal miners face increased odds of impaired lung function for each decade of coal mining worked, despite less smoking and underground mining. DOL/Knudson spirometry standards (developed using non-Hispanic White subjects only) unjustly excludes ~20% of AI miners from receiving federal compensation for work-related pulmonary impairment. This study highlights structural inequity and guides future investigation into workplace hazards, disability compensation, and inter-disciplinary collaboration for exposure prevention with Indigenous tribal groups.

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# Neutron Spectroscopy and Dosimetry Using Electron Paramagnetic Resonance and Alanine Filters

Author: Paige Witter

**Abstract:** Neutron dosimetry is the measurement and analysis of the ionizing radiation dose received by an individual or material as a result of exposure to neutron radiation. Neutron exposure can occur in a variety of environments, including in a criticality accident, in space, in medicine and in research and industrial settings where neutron sources are used. The energy of a neutron is an important factor in its ability to penetrate materials and cause damage to living tissue, so the neutron energy spectrum must be considered when assessing neutron dose. Common neutron dosimetry techniques involve activity measurements of activation products chosen for the energy ranges of interest. Less commonly, electron paramagnetic resonance (EPR) dosimetry of L-a-alanine mixed with 10-20% paraffin into a pellet is a validated technique for reference and transfer dosimetry of gamma radiation. It has been used as a neutron + gamma dosimeter in nuclear accident dosimetry blind intercomparison exercises. This study investigates the use of alanine EPR dosimetry with neutron sensitive filters to evaluate the neutron spectrum and neutron dose of a Adelphi Technology, Inc. DT-110NS27-003 Generator.

**Funding:** This project is supported by NASA TRISH and Lawrence Livermore National Laboratory.

## Occupational Noise Exposure and Hearing Assessment of Hydraulic Fracturing Workers: Conventional Versus Quiet Fleets

Authors: Melissa Blevens and William Brazile, PhD

**Abstract:** Oil and gas extraction companies are exempt from implementing hearing conservation programs for their workers according to the Occupational Safety and Health Administration's noise standard. These workers' occupational noise exposure and hearing status were unknown before the current study as these companies are exempt from noise monitoring and providing employees annual audiograms. We partnered with an oil and gas extraction operator and one hydraulic fracturing subcontractor to assess worker occupational noise exposure of both conventional and quiet fleets and determine if temporary hearing loss occurred after one work shift, as repeated temporary threshold shifts (TTS) can lead to permanent hearing loss. We conducted personal noise dosimetry, equipment measurement in decibels in the A- and C-weighted scales, and pure tone audiometry pre- and post-work shift to assess for temporary hearing loss. Based on the noise dosimetry results, 42/50 (84%) of the quiet fleet and 34/34 (100%) of the conventional fleet workers sampled were overexposed according to the ACGIH noise threshold limit value. Upon further data analysis, we will also be reporting the percentage of workers that suffered temporary hearing loss and the equipment noise levels. In conclusion, while this hydraulic fracturing company has engineered the pumps to attenuate noise in the quiet fleet, these workers are still at risk of hearing loss and further controls are needed for both fleets. The authors recommend the implementation of a hearing conservation program despite exemption to protect worker health.

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## Museum Poisons Test Kit: Analytical Testing for All Museums

Authors: Paulette Reading, Charlie Koch, CIH, MPH, and Brandy Howard, PE, CIH, CSP

**Abstract:** People view museums, libraries, and other cultural institutions as benign repositories offering educational, historical, and artistic enrichment. However, collections often contain hazardous substances, either by way of applied pesticides or as part of the objects' construction. This long-standing problem presents significant health risks to museum workers as well as students, interns, volunteers, researchers, consulting Native American tribal members, and visitors.

The only way to know with any certainty if hazardous materials are present is through chemical analysis. Direct sampling of museum objects can cause permanent damage to fragile artifacts. Elemental analysis using handheld x-ray fluorescence spectroscopy has become the go-to technique to identify the presence of inorganic metals/pesticides by the art conservation community. However, access to this technology remains largely inaccessible to the wider cultural heritage population. Many staff do not know that their collections may contain hazards, let alone know how to address it.

This project represents a collaboration between the professions of art conservation and industrial hygiene. "Museum Poisons Test Kit" aims to spread awareness about possible contaminations of cultural collections and provide low-cost access to analytical testing. Utilizing validated analytical methods common to industrial hygienists, wipe samples will be taken and submitted for laboratory analysis. Testing of adjacent surfaces eliminates the need for direct sampling of collections. Outsourcing analysis provides a low-cost option to in-house testing.

The researchers will present available results from several of the participating museums including obstacles encountered, adjustments made during the study, and conclusions to date.

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## Optimizing Hospitalist Staffing Models with Evidence-based Practices for Improved Patient, Clinician, and Institutional Outcomes

Authors: Marisha Burden, MD, Lauren McBeth, BA, Angela Keniston MSPH

**Abstract: Background:** The current clinician staffing model in hospitals is based on financial considerations, leading to inadequate staffing levels and suboptimal patient care. There is no standard way to measure hospitalist workload or determine optimal workload levels. We aim to develop an evidence-based approach to building hospitalist staffing models that incorporates clinician data and electronic clinical data to develop a workforce application and safety management platform that drives improved hospitalist, patient, and institutional outcomes.

**Methods:** We developed the GrittyWork mobile application (GW App) to measure hospitalist work using a multiple methods approach. We conducted a Delphi panel and are in the process of a scoping review. These have informed the GW App. The Chokshi and Mann Process Model were used to guide the GW App development. User experience data will be collected using the System Usability Scale and usage data.

**Results:** The Delphi panel, conducted from April to June 2022 with 17 participants from 14 organizations, reached consensus on 31 highly relevant measures and 120 moderately relevant measures, including patient complexity scores, the Maslach Burnout inventory, and patient encounters. The GW app, currently in development, collects hospitalist perception of work through targeted surveys and physical activity data (Figure 1). The tool will be further optimized and tested, with the goal of integrating data inputs from clinicians and electronic clinical data to provide a safety management platform with decision (Figure 2).

**Conclusion:** GrittyWork connects workload and work environment to clinician and patient outcomes, informing evidence-based staffing practices.

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# The Role of Authenticity in Confronting Interpersonal Mistreatment at Work

Author: Brittany Lynner

**Abstract:** Interpersonal mistreatment refers to a broad range of negative interactions between people, ranging from mild disrespect or rudeness, to more serious acts such as consistent harassment, social exclusion, or verbal abuse. In the workplace, interpersonal mistreatment predicts negative mental and physical health outcomes for employees. To gain insight into interpersonal mistreatment as an ongoing workplace phenomenon, researchers designed a mixed-methods study. 227 participants recruited from Amazon's Mechanical Turk were asked to complete an online self-report survey. First, participants described an instance of interpersonal mistreatment that they personally observed at work and that occurred on the basis of one or more social identities (e.g., race, gender). Thereafter, participants responded to measures that evaluated the conditions surrounding the incident. The conditions under investigation include the power and status of the third-party witness as well as the held values and felt authenticity of that individual. With data collection and data cleaning complete, researchers will thematically code qualitative data and employ structural equation modeling (SEM) to examine relationships among variables. Researchers anticipate that those with authority (i.e., power and status) will experience perceived responsibility to intervene, which will predict their subsequent intervention. Moreover, we expect that those with authority perceive less risk with presenting as their authentic selves, and that authenticity will mediate the relationship between authority and intervention. We also anticipate that values will moderate the relationship between authenticity and intervention such that those with stronger social justice values will be more likely to intervene. Findings may inform the conditions under which coworkers intervene in instances of workplace interpersonal mistreatment.

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## Stooped Postures in Agricultural Workers: Characterizing the Task

Author: Denali Sanders

**Abstract:** Agricultural workers throughout the world are often exposed to stooped postures during their working tasks. Stooped postures are a significant risk factor for the development of musculoskeletal disorders, specifically low back pain. Unfortunately, there are few studies that have quantified stooped postures among agricultural workers. The purpose of this study was to quantify the stooped postures of workers that perform agricultural tasks.

Agricultural workers (N=72) were recruited from Colorado farms, which represented a variety of agricultural products and work tasks. Participants wore a physiologic sensor (Zephyr BioHarness) on their chest, which recorded and logged trunk motion and heart rate for two hours during each work task. Data from the sensor module was downloaded and processed in a customized MathLab program to determine the percentage of time spent in different posture categories, cycle time, cycle frequency, average and maximum trunk flexion, and cardiovascular load.

Each specific harvesting task was characterized to assess the percent time spent in the four posture categories. Stooped postures were defined as a trunk flexion greater than 60 degrees. We hypothesize that there will be significant differences in the magnitude and percent time spent in stooped postures (as well as cardiovascular loads) when comparing agricultural tasks. The results of this study can provide quantitative data to develop targeted interventions that reduce stooped postures among agricultural workers. Additionally, the methods developed in this study may assist the Colorado Department of Agriculture and farm owners with policies established in Colorado Senate Bill (SB 21-087), which limits stooped postures during agricultural tasks that involve thinning and weeding during crop production.

**Funding:** I am funded through a MAP ERC research grant. I have no conflicts of interest.

# Recommendations for Incorporation of Cumulative Impact Analysis (CIAs) in Colorado Air Quality Policy

Author: Stephanie Pease

Abstract: Federal and state air quality regulations based on single-pollutant studies, self-reported data, and single facility emissions thresholds fail to provide equitable access to clean air. Environmental justice advocates and health researchers have been calling for a shift in regulatory focus towards cumulative impacts that would account for surrounding pollution levels in various media (air, water, and soil) and community vulnerabilities (demographics, chronic disease rates, housing vulnerability, etc.). The objective of this Capstone project is to make recommendations for what next steps are needed for Colorado policymakers to successfully incorporate cumulative impact analysis into Colorado air quality policy to advance environmental justice and more equitably protect public health. Semi-structured interviews will be conducted with regulatory groups within and outside of Colorado, with special focus on states in which legislation has passed mandating incorporation of cumulative impact analysis in air quality policy (New Jersey, Massachusetts). Interview results will inform a comparative policy analysis.



## Employee Health and Wellbeing: The impact of staff supportive physical work environments.

Author: Cedra Goldman AIA, WELL AP, MPH

**Abstract:** We will characterize the impact that specific types of spaces in workplaces (e.g., offices, break rooms, lactation rooms) and their design attributes (e.g., daylight, biophilic design, controllability of environment) have on the health and wellbeing of employees.

Recent studies that assess workplace factors that contribute to employee resilience highlight the need to address worker dissatisfaction and burn-out by promoting worker wellbeing using a Total Worker Health (TWH) approach that includes providing physical work environments that contribute to the physical and mental health of employees. Supportive workspaces not only have the potential to provide areas of refuge from high-stress work environments, but they can also foster stronger employee relationships, contribute to employees engaging in self-care practices and mindful eating, and they demonstrate to employees that their health and well-being is a priority to their employers.

The presentation will focus on the implications these findings have on un-desked (no dedicated office space/personal desk space) employee populations as employment sectors with large percentages of un-desked employees (e.g., healthcare, manufacturing, big-box retail) face some of the highest levels of occupational illness and injury and are currently experiencing high labor shortages due, in part, to employee burnout and attrition. The findings presented will be developed through the completion of a literature review that is cross-disciplinary and will include sources from the fields of architecture/design, occupational health, medical science, and psychology. The review will include academic studies, industry studies, expert commentaries, and established healthy-building rating standards.

# Measuring Moral Injury Amongst Clinical Social Workers in Healthcare: A Mixed Methods Scale Development Study

Author: Pari Thibodeau MSW, LCSW

**Abstract:** Clinical social workers (CSW) on healthcare teams are critical to the implementation of patient treatment. CSWs, while vulnerable to many of the same burnout-producing factors as other healthcare professionals, face moral and ethical challenges due to training that emphasizes patient psychosocial needs. Given the large exit from the healthcare workforce amid the COVID-19 pandemic, there is a need to measure how CSWs experience moral injury. Moral injury is the moral boundary breaking, by oneself or someone in a position of power, in high stakes situations, and the adverse outcomes of those experiences (Litz & Kerig, 2019, Shay, 2014).

This is a mixed methods scale development study with two aims:

Aim 1 explores the experience of moral injury amongst CSWs in healthcare settings to provide a holistic understanding on how social workers in healthcare experience moral injury in their work. Phenomenological qualitative interviews were conducted in August of 2022. Hybrid (thematic and rapid) analysis was used, and findings were used to create a moral injury scale for CSWs.

Aim 2 will study the psychometric properties of the new moral injury scale and the associations of moral injury and mental health using a national cross-sectional survey. A minimum sample of 100 participants will be recruited. This survey launches in January 2023.

Qualitatively, 24 CSWs participated in conversations averaging 80-minutes. Rapid analysis is complete, and the MISS-CSW was created. I am in the process of thematic analysis. The findings from the thematic analysis and the survey will be analyzed by March 2023.

This work provides a holistic way of how CSWs in healthcare are impacted by their work. The field of occupational and public health can benefit from narrative based research to improve the ways we capture how the healthcare workforce is doing. Future healthcare occupational health research should include service workers (i.e. CNAs and housekeeping).

**Funding:** This project was funded by the University of Denver Office of Graduate Education (Outstanding Dissertation Award) and the Graduate School of Social Work (Dissertation Fund). There are no conflicts of interest to report.

# Investigating the Association of the Environmental Health Risk of Density of Alcohol Vendors and Survival in Younger vs Older Patients with Colorectal Cancer

Author: Stacey Bagby

**Abstract:** Background: Unfortunately, there is an increasing incidence of Colorectal Cancer (CRC) in younger patients. Alcohol consumption is a known risk factor for CRC incidence; however, it remains unknown if alcohol vendor density (AVD) could play a role in survival. Our objective was to evaluate the association of AVD and survival time of CRC patients and to determine if it differs by age.

**Methods:** A retrospective cohort study utilized patient data from the University of Colorado Cancer Center registry and alcohol vendor locations. AVD was calculated that used an inverse distance between each patient's address and alcohol vendors within their respective ZIP code. AVD was divided into low ( $<0.1$ ) and high ( $\geq 0.1$ ) groups. A Cox proportional hazard regression model and Kaplan Meier survival graphs was applied to determine if survival time differed by AVD category.

**Results:** Survival analysis determined that there was not a significant difference in the survival experience between AVD groups ( $p = 0.97$ ) or between groups defined by AVD and age ( $p = 0.66$ ), when tested using a log rank test. A Cox model was performed adjusting for age, sex, ethnicity/race, cancer stage, insurance, family history of cancer, alcohol use, and tobacco use. A hazard ratio which was protective but not statistically significant (0.84, CI 0.61-1.15,  $p = 0.27$ ) in the regression model was observed when comparing mortality in low/high AVD.

**Conclusions:** The density of alcohol vendors did not significantly affect the survival times in the CU Cancer Center CRC population. For every 0.1 increase in AVD the risk for death decreased by 16 percent. Moreover, there was no differences seen in younger or older patients. These results conveyed that further research should be focused on other potential environmental risks.

## Risk Factors for Kidney Injury Among Male and Female Sugarcane Workers in Central America

Author: Sara Hull

**Abstract:** Background: Sugarcane workers in Central America are at an increased risk of developing kidney injury and chronic kidney disease of unknown origin. The objective of this cross-sectional study is to evaluate the association between biomarkers, demographics, and risk factors such as hypokalemia, hyponatremia, sex, occupation, location, rhabdomyolysis, dehydration and change in creatinine—a marker of kidney function and injury.

**Methods:** Previously collected data on male (N=370) and female (N=47) workers from Guatemala, Nicaragua, and Mexico during the 2018-2019 harvest will be used to examine the association between potential risk factors and change in creatinine. Univariate linear regression will be performed for all predictors. Univariate coefficients with a p-value <0.10 and potential confounders will be included in the final multivariable linear regression model.

# Spatial & Demographic Patterns of Residential Proximity to Injection & Abandoned Oil & Gas Wells in Colorado

Author: Hannah Walters, MPH

**Abstract:** In the last ten years, oil and gas (OG) production in Colorado has quadrupled due to innovations in extractive technology, namely horizontal drilling, and hydraulic fracturing. While much scholarly and press attention has been justifiably focused on these newer, more intense forms of extraction, research on aging oil and gas infrastructure will become increasingly important as the U.S. transitions away from fossil fuels and the enormous cohort of wells that were drilled in the last ten years age into disuse. Understanding patterns of inactive wells now and which communities may be disproportionately burdened by aging infrastructure, would help illuminate the full lifecycle of risk that communities face while OG companies are continuing to seek new well construction. Using COGCC well data and The Attitudes and Behaviors Survey (TABS) 2018 data, this analysis will combine geospatial analytic methods and statistical modelling to examine spatial patterns of abandoned and injection oil and gas wells across Colorado and whether there are statistically significant relationships between select socio-economic factors and residential proximity to these OG structures. This analysis will provide a formative picture of the landscape of abandoned/repurposed oil and gas infrastructure in the state, while setting up future research questions related to the environmental justice, potential exposures, and health risks associated with abandoned oil and gas wells in Colorado.

## Changes in lung function after deployment to Southwest Asia among military personnel with respiratory symptoms

Authors: Lauren Zell-Baran, Silpa Krefft, Matthew Strand & Cecile Rose

**Abstract:** Introduction: Exposure to burnpit smoke, desert/combat dust, and diesel exhaust during post-9/11 deployment to Southwest Asia (SWA) can cause deployment-related respiratory diseases (DRRDs) and may confer risk for worsening lung function after return.

**Methods:** Study subjects were SWA-deployed veterans who underwent occupational lung disease evaluation (n=230). We analyzed all available spirometry tests and assessed differences in percent predicted forced expiratory volume (FEV1pp) between subjects with different cumulative exposures (grouped by tertile) and DRRDs. We used a mixed model in SAS.v.9.4 with a random intercept for each subject, group by time interactions, and a spatial power covariance structure. **Results:** Most symptomatic deployers reported frequent exposure to burn pits and diesel exhaust but had normal post-deployment spirometry (Table 1). The most common DRRDs were deployment-related distal lung disease (DDLDD, 40%), deployment-related asthma (DRA, 13%), or both DRA/DDLD (23%). Adjusting for smoking, mean FEV1pp was significantly lower among those with both DDLDD/DRA compared to other diagnosis groups five years after deployment (82.1% DDLDD/DRA; 93.8% DDLDD; 95.2% DRA; 96.2% symptoms;  $p < 0.0001$ ). Among those with DDLDD or symptoms alone FEV1pp remained stable, while it significantly increased among those with DRA or DDLDD/DRA combined (mean change/year 0.60% DDLDD/DRA  $p = 0.03$ ; -0.04% DDLDD  $p = 0.80$ ; 0.91% DRA  $p = 0.02$ ; 0.20% symptoms  $p = 0.53$ ). Those reporting more intense inhalational exposure during deployment had significantly lower mean FEV1pp (88.0% in highest tertile vs 95.0% in lowest tertile,  $p = 0.02$ ). **Conclusions:** We found no accelerated decline in FEV1pp following deployment. More intense deployment inhalational exposures are linked with worse post-deployment lung function. Future analyses will assess longitudinal changes in symptoms and other lung function parameters to inform both exposure prevention and clinical follow-up/treatment for these workers.

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## Vertebral Compression Fractures & Clinical Imaging of Spinal Trauma

Author: Judith Brutus-Lestin

**Abstract:** Vertebral compression fracture is a distinguishing feature of osteoporosis and by far the most prevalent fragility fracture. Vertebral fractures can be caused by both direct or indirect trauma and are more likely to occur in patients with decreased bone density or bone metastases. Fractures may be classified a stable or unstable if there is a risk of damage to the spinal cord. Diagnosis involves a detailed neurological exam, imaging and laboratory tests. The imaging of osteoporosis and unstable fractures includes conventional radiology to evaluate spinal fractures by x-ray of the cervical spine, bone mineral density (BMD) testing by dual energy x-ray densitometry, quantitative computerized tomography on suspicion of changes in the spinal canal and neurologic deficits, magnetic resonance imaging, bone scintigraphy (if necessary), and doppler ultrasound if injury to vessels in the neck is suspected. Approximately two-thirds of the Vertebral compression fractures that occur each year are not accurately diagnosed and, therefore, not treated. This review outlines the epidemiology, clinical and radiological assessment of vertebral compression fractures, and key decisions that needs to be made in their management. It also discusses the reasoning for vertebroplasty, kyphoplasty and spinal stabilization, and looks at outcomes in this vulnerable patient population.

**Funding:** The University of Colorado, CU Anschutz Medical Campus.

## Animal Bites and The Worker

Author: Rachel Ain

Abstract: Animal bites are a common occurrence in multiple workplace settings including fire fighters, police and animal control. These workers are at risk for multiple infections depending on the animal, location of bite, and penetration of the wound. Appropriate treatment and follow-up is important, and providers should be familiar with and understand which protocols to follow in which setting, as well as which bites are reportable to the local government.



Developing a Survey to Assess Adverse Childhood Experiences as a Risk Factor for  
Suicidal Ideation and Behavior in Public Safety Professional

Author: Elizabeth Esty, MD

Abstract: TBD

# The Separation of Americium from Curium Using New Sodium Bismuthate-based Systems for Used Nuclear Fuel Recycling

Author: Samantha Labb

**Abstract:** The absence of an approved long-term disposal plan for the large inventory of used radioactive nuclear fuel in the US raises concerns for worker, environmental, and public exposure in the event of a release. The implementation of Partitioning and Transmutation (P&T) is a logical approach towards recycling used nuclear fuel to address these concerns by reducing its volume, radiotoxicity, and lifetime while also generating clean energy. P&T aims to recover energy-dense radionuclides present in used nuclear fuel (partitioning) and using them as fuel in a nuclear reactor (transmutation). By eliminating these radionuclides, radiation dose rates to waste-handling workers will be reduced and exposure to the environment, and the public will be mitigated.

Of the radionuclides present, americium (Am) and curium (Cm) are the greatest contributors to the long lifetime and radiotoxicity making them top candidates for P&T processes. To achieve the partitioning of Am and Cm, the development of a successful and efficient separation method for these radionuclides is integral, but has been a long-standing scientific challenge due to their nearly identical chemistry. However, redox chemistry can be exploited based on the fact that Am can be oxidized while Cm cannot. Recently, studies have highlighted sodium bismuthate ( $\text{NaBiO}_3$ ) as a reagent capable of oxidizing Am while also having the ion exchange behavior favorable for separations. This work has developed, evaluated, and compared several materials that incorporate  $\text{NaBiO}_3$  with the goal of combining both the oxidation and ion exchange mechanisms into one material for a continuous separation process. This presentation will highlight the batch studies describing the adsorption behavior of Am and Cm in different  $\text{NaBiO}_3$ -based systems geared towards identifying the optimal separation conditions. In addition, the chromatographic separations achieved with these materials and suggestions for future research projects will be discussed.

**Funding:** Mountains and Plains Education and Research Center, U.S. Nuclear Regulatory Commission

## The Effect of Asphalt Debris on Radiochemical Analysis of Plutonium

Author: Raissa Chunko

**Abstract:** Radiochemical analysis of samples in standard matrices of soil, water, and air are very well characterized; however, some limited research has been conducted on the effect of unusual matrices such as steel, concrete, glass, and asphalt. In the event of nuclear incident, standard radioanalytical techniques need to be available to analyze radionuclide in unusual matrices. Currently, the Environmental Protection Agency (EPA) has one technique researched on plutonium separations from asphalt under a single acid concentration and one type of resin. The EPA also has one method published for asphalt dissolution using sodium hydroxide fusion which could be studied in greater detail for more efficient techniques.

Since plutonium is used very commonly as the core of most nuclear weapons due to the relative ease of synthesizing enough weapons grade material in comparison to weapons grade uranium, plutonium is the radionuclide of interest in this study. In addition, successful plutonium separations could lead to further study of isotopic composition as well as daughter nuclides of the material. This is important for determining the age of the material in question and the isotopic composition as it relates directly to determining where the material was sourced and processed. Rigorously tested radiochemical techniques on unusual Asphalt is commonly used in road pavements and shingles which are significant components of urban debris following a catastrophic event. One of the unique challenges of asphalt is the organic material used as a binder in this matrix. The organic material found in asphalt is a very viscous bitumen called asphaltenes. These asphaltene typically contain approximately twenty carbons and multiple aromatic rings. This study aims to characterize the interference effects of asphaltene on the columns typically used to conduct plutonium separations.

## An Investigative Study of Actinide and Non-Actinide Bearing Fuel Salts

Author: Michaella Swinhart

**Abstract:** Molten salt reactors (MSR) are inherently safer, more proliferation resistant, and have better compatibility with mixed and used fuels than the current operating nuclear reactors in the United States. The MSR design proposes a solution to nuclear waste disposal, while improving worker health in the process. Though the concept is not new, the most important developmental studies conducted before the reactor can become a reality, are centered around the thermophysical properties of the fuel and coolant salt loops. This study focuses on the sodium and potassium-chloride (CINaK) series and the lithium and thorium-fluoride (FLiTh). Determination of heat capacity, enthalpy, volatilization, and viscosity have been well established as experimental methods. Many of these properties need to be understood to optimize models and prepare for successful reactor operations. Heat capacity experiments performed with differential scanning calorimetry and drop calorimetry have shown good alignment with literature values and compare well to systems used in applied solar. Leaching in containment vessels through experimental parameters suggests high corrosion and volatility. The volatility will need to be a primary focus in case of extra headspace requirements in the reactor core or subsequent systems, such as the heat exchangers. The fission products are often in ionic form that can cause a runaway reaction if there is sufficient mass loss. Thus, studying the fundamentals of these initial fuel salts is crucial to reactor function and design

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## Evaluation of Nanodiamonds for the Adsorption of Radioactivity from Ocean Waters

Author: Megan Zaiger

**Abstract:** The determination of low levels of radioactivity in the environment is challenging, because the sample amount required to meet low minimum detection limits can be difficult to manage and can give rise to self-shielding which may lead to inaccurate measurements. In this work, the use of a hexacyanoferrate(II) nanodiamond adsorbent is investigated to preconcentrate dissolved radiocesium in contaminated waters in order to improve the counting efficiency and accuracy for low activity samples. The adsorption of various radioisotopes on nanocarbon materials from aqueous solutions has been studied previously; however, low adsorption rates together with a strong dependence on pH and temperature have limited their use. Detonation Nanodiamonds (ND) are a new technological approach to the use of carbon-based nanomaterials for adsorption-based separations. They have a much higher adsorption rate of 98% and are not strongly affected by changes in pH or temperature. NDs were originally created by detonating explosives in a closed chamber under reduced conditions; however, can now be synthesized in a lab. They have a high biocompatibility, high surface area, radiation resistance, low weight, and are less toxic than other nanocarbon based materials; therefore, have attracted great interest for radiochemical research. Past studies saw a smaller absorption rate for very low levels of radiocesium, such as 0.01 Bq/L. However, this may be caused by the radioactive cesium adhering to the container. To address this issue, future research will be conducted by adding stable cesium to the solution as well as radioactive cesium. The non-radioactive cesium should adhere to the container and allow the radioactive cesium to bind to the nanodiamonds and increase the absorption rate. Finally, the uptake of radiocesium on coated nanodiamonds from a variety of water samples, including synthetic and real ocean waters will be studied to determine absorption rates in the presence of other competing ions.

**Funding:** MAP ERC funding which does not create a conflict of interest.

## Development of a Predictive Model to Quantify Exposure to Amorphous Silica Among Sugarcane Workers

Authors: Colton Castro, John Adgate, Jamie Butler-Dawson., Erlandson, G., Seidel, J., Lee Newman, and Joshua Schaeffer

**Abstract:** Recent scientific evidence indicates that exposure to amorphous silica may play a role in the development of chronic kidney disease of unknown etiology (CKDu). Epidemics of CKDu have been identified in Central America, Sri Lanka, and beyond. Moreover, sugarcane workers have been predominantly affected by this disease. The health impacts of amorphous silica, especially in the context of kidney injury and disease, remain largely understudied. Further, the quantitation of amorphous silica, due to its non-crystalline structure, requires both cost and time intensive techniques that are inherently destructive (e.g., X-ray diffraction; XRD). This study aims to use Fourier-Transformed-Infrared-Spectroscopy (FTIR) to develop a predictive model to rapidly quantify amorphous silica in a cost-effective manner while maintaining a level of accuracy and precision that is comparable to XRD. We hypothesize that the model is feasible to construct and will quantify various concentrations of amorphous silica present in samples. This model will be built from a subset of personal air samples collected from sugarcane workers in Guatemala. Samples will be analyzed using FTIR and XRD to identify and quantitate silica, respectively. Subsequently, the area of the FTIR absorbance peak at 800  $\text{cm}^{-1}$  (indicative of silica) and the mass of amorphous silica will be used to create an equation to quantitate amorphous silica. This model will allow researchers to quickly and reliably gain insight into the amount of amorphous silica present in air samples. Since FTIR is a non-destructive technique, air samples will be analyzed using additional methods to identify if other nephrotoxic contaminants are present. The model may allow other operations and industries to measure amorphous silica in their respective workplaces.

**Funding:** This research was funded by support from the CDC/NIOSH MAP ERC and the National Institute of Environmental Health Sciences (NIEHS; 1R01ES031585).

Pantaleon provided on-site support for our field research team in the form of local office and lab space, transportation to field sites, and local lodging in Guatemala; Perkin Elmer provided on-site support for laboratory analyses using the Spectrum Two FTIR

# Evaluating Noise Exposure and Temporary Threshold Shifts in a Manufacturing Setting

Author: Darren Gieseck

## Abstract:

This research aims to evaluate noise exposure and subsequent temporary threshold shifts of workers in a metal and aerospace manufacturing facility. Personal noise dosimetry devices will be worn by each participant and a sound level meter will be used to create a noise map of the facility. Additionally, audiograms will be conducted before and after each shift to determine whether a threshold shift has occurred. The results of the study will be compared to the exposure levels recommended by OSHA and ACGIH. The goal of this research is to better understand the noise exposure experienced by workers in this type of manufacturing setting and to identify potential opportunities and strategies for reducing noise related health risks. By furthering our understanding of the noise patterns in this environment and objective impacts to worker hearing, this study can contribute to the development of effective noise control measures for this industry

Funding: CSU MAP ERC. No known conflict of interest.

## Community Noise Exposure from Nearby Oil and Gas Extraction Sites

Author: Phillip Stepherson

**Abstract:** Due to an increase in oil drilling and hydraulic fracturing (fracking) sites in Colorado near residential areas, many community residents may be at a higher risk of harmful noise exposure. The Colorado Oil and Gas Conservation Commission (COGCC) has identified multiple sources of high-volume sound associated with oil and gas site preparation, drilling and fracking including engines, mud pumps, rig top drives, and ancillary equipment. There is currently very limited data on the extent of community noise exposure as a result of proximity to oil and gas extraction operations and no published research directly comparing community noise exposure data to the COGCC regulatory standards. However, it is suggested in current literature that there is a substantially higher risk of exposure to low-frequency sound which is characteristic of the equipment used at oil and gas sites and also extremely difficult to control. Exposure to low-frequency sound has been found to cause adverse health effects such as sleep disturbance, discomfort, and irritability. To assess community noise exposure, a comprehensive noise survey will be performed including both A-weighted (primary human hearing range) and C-weighted (low frequency) frequency scales at various distances from drilling and fracking sites. Sound monitoring equipment will include noise dosimeters and sound level meters/octave band analyzers that will be stationed to collect 24-hour exposures. Estimated community noise exposures levels will be calculated from the noise survey data and will be compared against the COGCC noise limits to determine if community members are at increased risk of suffering adverse health outcomes.

**Funding:**



## Same Picture or Different? Examining Mechanisms of Belongingness across Work Settings

Author: Kinjal Chheda

**Abstract:** Belongingness is a central construct in human health and well-being, behavior, and experience. Although studied from different perspectives, recent events, primarily, Covid-19 made the topic of belongingness at work more prevalent and may have reshaped the traditional conceptualization of belongingness as it resulted in a long-lasting transformation of work, for example, from in-person to virtual settings. Hence, the study will first examine the difference in the sense of belongingness between in-person working employees and virtual working employees. Then the study will investigate different mechanisms of belongingness amongst two work environments: in-person and virtual, by analyzing opportunities to connect and place attachment as two potential mediators. The study will utilize Amazon Mechanical Turk (MTurk) data collection platform to collect data from full-time employees (i.e., 40 hours/week), working either fully in-person or fully virtually. Through my analyses, I anticipate that employees working fully virtually will have a lower sense of belongingness compared to employees working fully in-person. Additionally, I expect that opportunities to connect and place attachment will be significant mediators for an in-person work setting, contrary to opportunities to connect being the sole significant mediator for the virtual work setting. The results of these studies may signify that although previous research has laid a strong foundation on belongingness, new research is much needed to study it in virtual environments to further our knowledge of antecedents and mechanisms of belongingness. These would then help to curate belongingness interventions in organizations accordingly and improve research measurement and practitioner tools.

## Red, White, and Who?: An investigation on how political identities impact safety behaviors in the workplace

Author: Hannah Finch

**Abstract:** Over the last 30 years, we have seen the United States become more politically involved and polarized, reaching record numbers of voting behaviors (Pew Research Center, 2014; Pew Research Center, 2020). Unfortunately, research has also found that individuals are becoming less understanding of each other and over 25% of each party believe that the opponents' beliefs and policies are detrimental to the well-being of the country (Pew Research Center, 2014). With politics becoming more of a hot topic in today's society, the goal of this research study is to investigate the impacts that diverse political ideology has on the workplace. Specifically, I hope to evaluate workplace incivility, psychological well-being, and safety voice behaviors for individuals whose beliefs differ from the perceived organizational political ideology. I plan to recruit 300 participants via Amazon's Mechanical Turk to reach a diverse range of individuals around the country and industries. This work will add to the literature by increasing the understanding of how diverse identities, specifically political identities, may impact psychological and physical safety and behaviors in the workplace.

## Item Generation and Validation to Assess the Science/Practice Gap within Occupational Health Psychology

Authors: James Kunz, Gwen Fisher, Richard Boustred

**Abstract:** Though the science/practice gap has been recognized and studied in some areas of Industrial/Organizational (IO) psychology, the purpose of this overall study is to investigate the extent to which HR managers and safety professionals are knowledgeable about important findings in occupational health psychology (OHP). Identifying and minimizing gaps between science and practice within the context of OHP is essential to improve worker health and wellbeing by ensuring that organizations use empirically supported practices. For example, some organizations provide bonuses to employees for not having (reporting) workplace injuries, likely unaware that doing so inadvertently incentivizes underreporting of actual injuries. Therefore, an example item based on previous research that will be sent to SMEs for quantitative ratings and qualitative feedback is, "Organizations should offer employees bonuses for not having workplace accidents." (False).

A key step in this research project is to validate the 12 total items with feedback from subject matter experts (SME). These items will be distributed to SMEs in February, 2023. The Research Day presentation will present the items, descriptive statistics about SME ratings, interrater reliability, and a summary of SME feedback. Following utilizing feedback from SMEs, validated items will be sent to human resource practitioners and safety professionals in a subsequent study to assess the science/practice gap within OHP.

We anticipate the findings of this study will provide validity evidence to guide the subsequent study. Results of the overall study will clarify where science/practice gaps exist among HR managers and safety professionals. This research will further assist occupational health psychologists working to ensure the most empirically supported practices are being utilized to support and improve worker health & well-being.

## The Development and Validation of a Code-Switching Scale

Author: Shelby Davis

**Abstract:** According to Mcluney et al. (2021), code-switching is when people temporarily “switch on” or adjust their behaviors to manage the impressions they make on others, typically in exchange for a desired outcome (i.e., perceived professionalism). In many cases, Black employees feel it necessary to manage how their non-black employees perceive them (avoiding stereotypes and stigmas) and this is often done with racial code-switching. Code-switching literature has continued to grow over time, however, a code-switching scale has yet to be developed that specifically assesses code-switching behaviors with Black employees. The current study aims to address this gap by developing and validating a self-reported scale that measures the behaviors Black employees perform to manage their professional identity. This scale will draw on past literature on racial identity, code-switching, identity management, and identity shifting. Additionally, qualitative information regarding code-switching will be collected by conducting semi-structured interview questions with Black employees. The proposed procedure and analysis of this project will follow the scale development best practices recommended by Hinkin (1998). Proper scale development and validation will help ensure future research can accurately assess the relationship between code-switching and potential occupational health hazards such as stress, burnout, and overall well-being. This knowledge can lead to the development and/or enhancement of organizational policies and procedures that aim to reduce bias and promote inclusion. These policies and procedures can be used to reshape organizational norms that help to reduce the need to code-switch in Black employees.

**Funding:** My funding is through CSU's Occupational Health Psychology (OHP) program which is apart of the National Institute for Occupational Safety and Health Mountains and Plains Educational Research Center (MAP-ERC). There are no conflicts of interest.

# Perceptions of Supportive Organizational Practices and Well-being Among LGBTQ+ Employees

Author: Rachel Perpich

**Abstract:** Recent societal attitude changes have paved the way for more individuals to feel comfortable expressing themselves authentically, particularly in terms of their sexual orientation identity. As the number of people who identify as lesbian, gay, bisexual, queer, etc. (LGBTQ+) continues to increase, more research is needed to better understand and support the experiences of LGBTQ+ individuals in the work context. The purpose of the current study was to examine the relationships between perceptions of supportive organizational practices, perceived organizational support, and worker well-being indicators among LGBTQ+ employees. A final sample of 338 LGBTQ+ participants were recruited and anonymously surveyed at two time points via Prolific. It was hypothesized that sexual minority employees who report their organization having supportive organizational practices will perceive more support from their organization, and thus have more favorable reports of well-being (e.g., higher job satisfaction, higher work/life balance, and fewer symptoms of poor mental health). Additionally, it was expected that sexual orientation identity centrality will serve as a moderator between perceptions of organizational support and well-being. Data analyses are currently in progress and will be completed before Research Day 2023. The results of the current study will provide insight about the perceptions of LGBTQ+ workers to help organizations make well-informed decisions to better support and retain these employees, facilitate worker well-being for this important and often understudied population of workers, and help to answer the call of incorporating more diverse perspectives in occupational health research.

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# I Get By With A Little Help From My Friends: Addressing Newcomer Adjustment through Social Support and Self-Determination Theory

Author: Rosalyn Stoa

**Abstract:** Newcomer socialization is associated with many positive work outcomes. Although social support is related to newcomer adjustment and reduced stress, more research is needed to understand how social support moderates the relationship between socialization tactics and need satisfaction. Using self-determination theory and social support, this study investigates the mediating role of autonomy, competence, and relatedness on newcomer outcomes, as well as the moderating role of social support. Participants will be asked to complete an online survey with measures of socialization tactics, need satisfaction, workplace social support, stress, turnover intention, organizational commitment, job satisfaction, social integration, and work engagement, and then complete the measures again six months later. Multiple regressions will be used to test hypotheses. This study could advance research by exploring self-determination theory as a theoretical framework to understand newcomer adjustment.

**Funding:** This research was supported by the National Institute for Occupational Safety and Health (NIOSH) Mountain and Plains Education and Research Center (T42OH009229)

## Promoting Safety through Diversity Management: Diversity Climate & Racial-Ethnic Differences in Safety Voice

Author: Julia Beckel, M.S

**Abstract:** I propose the current study to empirically examine and assess racial-ethnic differences in the relationship between diversity climate and safety voice – the extent to which workers speak up on safety hazards in the workplace. I consider four research questions: 1) How do employee perceptions of their organization's diversity climate relate to worker safety voice, 2) Do workers' perceptions of psychological safety and organizational commitment mediate the relationship between perceived diversity climate and worker safety voice, 3) What racial-ethnic differences exist in the indirect effects of diversity climate on worker safety voice via psychological safety and organizational identification?, and 4) If racial-ethnic difference in safety voice exist, are they also associated with differences in self-reported occurrences of accidents, injuries, or work-related illnesses across racial-ethnic groups? Given sustained increase in, and undue burden of, work-related injury and illness among racial-ethnic minorities in the United States, the proposed study is needed to provide a preliminary understanding into mechanisms which might lend to occupational health disparities. I propose a three-wave survey approach using Prolific, a web-based survey platform to gather perceptions from workers in high-risk industries (e.g., construction, manufacturing, healthcare, etc.) relating to their organization's diversity climate, perceived psychological safety and organizational commitment, and safety voice behaviors. I expect the work from this study to provide preliminary support for promoting diversity management to bolster employee safety communication among racial-ethnic minorities as it relates to accident, injury, and illness prevention.

**Funding:** This research was supported by the Mountains and Plains Education and Research Center, T42OH009229, funded by the Centers for Disease Control and Prevention National Institute for Occupational Safety and Health. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

## Active breaks in prolonged sitting versus continuous physical activity on behavioral and health-related outcomes in office workers with prediabetes: A pilot study

Authors: Ana Pinto, Carmen Ortega-Santos, Melissa Mamele, Patricia Smith, Sheila Steinke, Zhaoxing Pan, Kevin Masters, Daniel Bessesen, and Audrey Bergouignan

**Abstract:** Sedentary behavior (SB) is associated with several chronic diseases and all-cause mortality. The workplace has been identified as a key setting for accumulating SB with office workers being one of the most vulnerable occupational groups. Though 30-60-min bouts of physical activity (PA) are typically advocated, people may find it impractical to perform it during a workday. Brief, active breaks in sitting emerge as an alternative that may be more feasible to reduce SB during work hours. We will explore the behavioral and health-related effects of active breaks in sitting versus a continuous bout of PA, as well as barriers/facilitators to implement interventions in the workplace and free-living settings. This will be a 3-month, parallel-group, randomized controlled trial. Twenty-eight (50%F) sedentary, adult office workers with prediabetes and overweight/obesity will be randomized to ONE (45-min/d bout of brisk walking, 5 d/wk) or BREAK (9 hourly 5-min bouts of brisk walking, 45 min/d total, 5 d/wk). Objectively-measured daily patterns of SB/PA, physical (fasting glucose, insulin and lipids, HbA1c, glucose control, body composition, waist circumference, and blood pressure) and mental health outcomes (mood, vigor, fatigue, and well-being), and barriers/facilitators to SB/PA will be assessed before and after 3 months of intervention. This pilot study will provide novel data on the distinct effects of breaking up SB with brief PA bouts on behavioral and health-related outcomes in office workers. Findings on barriers and facilitators will help to improve implementation of PA interventions for future large-scale trials conducted.

**Funding:** This pilot study is supported by Grant Number U19OH011227 from CDC NIOSH Center for Health, Work, and Environment (CHWE), a NIOSH Center of Excellence for Total Worker Health. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the CDC NIOSH and CHWE. This study is also supported by the NIDDK (R01DK123334). The NIDDK does not have any role in the study design, data collection, analysis, interpretation, and dissemination.



## Evaluation of Goals Setting to Enhance TWH Consultation

Author: John Wortman

Abstract: Health Links™ (HL) assess and consults with organizations to improve Total Worker Health through goal setting. Assessments are divided into 6 areas (benchmarks) and include a total aggregate score based scores from each of the benchmarks. The purpose of this research is to investigate the impact HL consultation and goal setting on the health, safety and wellbeing of participating organizations. A better understanding of the impacts of consultation and goal setting will likely help to focus future HL consultation efforts. HL conducted previous research examining the impact of consultation on organizations' overall score with business stratified by the number of employees in the organization. I'll expand on this research by examining the change in total aggregate scores of based on number of consultation sessions. After examining the impact of the number of counseling sessions, I'll examine impact of goals assigned during those sessions. I'll examine the impact of the 5 most frequently assigned goals regardless of their achievement. Since each of these goals was created to improve a specific benchmark of the HL assessment, I'll compare the proportion of organizations that were assigned a goal and showed an improvement in that benchmark to the proportion of businesses that showed an improvement without the same goal assigned. I intend to begin my examination of each goal by making comparisons between changes in benchmark scores between all organizations that did and did not have the goal assigned, regardless of the number of consultation sessions they had. I then intend to further investigate by comparing the effect of each of the goals on its benchmark based on the number advising sessions. Since study has not been conducted, there are no results to report. I intend to have results by the symposium date.

## 5 Pillars of Wellness

Author: Stephanie Jones

Abstract: In employee wellness, it is a challenge to incorporate the five pillars of total wellbeing (physical, social/emotional, financial, career and community) into the company culture. Arkansas Blue Cross is taking a new approach in employee wellness by being intentional with the promotion of programs across the enterprise and within the community. Arkansas Blue Cross views the five pillars of wellbeing as a part of a total rewards system with the goal to attract, develop and retain exceptional employees. Our wellness department is able to deliver the quality support in the areas of physical and even financial wellbeing; we also realize that we are not the experts across all five. As a result, we have been developing strategic partnerships with internal and external SMEs to act as a conduit to promote these services. We believe this helps achieve two goals: 1) fostering trust and promoting a safe work environment and 2) ensuring our employees get the tools and education they need to feel supported in all areas of life. The mission of Arkansas Blue Cross is to ensure the health, wellbeing and financial security of our members. Shifting our wellness program to encompass the five pillars is our homegrown approach to touching more than 3,000 of our members either directly or indirectly. By meeting our employees varied health needs and creating a safe work environment we hope to limit the ongoing violence prevalent in downtown Little Rock and ensure that Arkansas Blue Cross plays a part in the local community to create a safe and healthy place to live and play.

## A Network Analysis to Establish a Total Worker Health behavioral Health Intervention for the Agriculture Workforce of the San Luis Valley, Colorado

Author: Nick Stoll

**Abstract: Introduction:** Workers in the American agriculture industry are experiencing a behavioral health crisis in response to extreme stressors involving weather and climate events, chronic illness, high demand occupations, barriers to accessing health services, and economic volatility. The San Luis Valley (SLV), Colorado relies heavily on agriculture for its economy, with a third of the population working in the industry. With a notable Hispanic/Latino population and counties with some of Colorado's lowest median household income, community members are calling for assessment and intervention to address health disparities and inequities.

**Methods:** Stratified-random sampling is being used to recruit a target sample of 512 SLV agriculture workers. Social network analysis will be utilized to identify connections between agriculture workers and local organizations that support their needs. Portions of the NIOSH WellBQ, CES-D, and GAD 7 will also be completed to assess worker wellbeing, depression, and anxiety. These measures will be contextualized to the participants occupation, immediate needs, support from social networks and organizations; and used to identify areas of concern and potential intervention.

**Results:** Approximately 233 survey responses have been collected and remain to be analyzed. Anticipated results include descriptive information on mode of participation, worker types, job types, residential status, ethnicity, race, age, education, and income.

**Conclusion:** This work will aid in addressing a behavioral health deficit within the agriculture workforce – a disproportionately impacted and underserved population. A significant portion of survey responses have low completion rates, potentially due to low literacy, language barriers, and the reactive development of physical survey packets. Additional representation is sought from non-Hispanic white farm/ranch owner/operators, as well as migrant workers temporarily residing in the SLV. These limitations highlight the importance of addressing these public health concerns for this hard-to-reach population.

**Funding Source:** Dept. of Health & Human Services, Center for Disease Control & Prevention (Award # 6 U19OH011227-05-02)

## Individual and household determinants of renal insufficiency among agricultural workers: A Total Worker Health® approach

Authors: Lyndsay Krisher, Karely Villarreal Hernandez, Diana Jaramillo, Miranda Dally, Jaime Butler-Dawson, Nicholas Smith, and Lee Newman

### Abstract:

**Background:** A global epidemic of chronic kidney disease of unknown cause (CKDu) is affecting agricultural workers. We hypothesize that there are household & individual determinants that contribute to the risk of kidney injury among sugarcane workers, and that there are protective factors related to post-work recovery that moderate the effect of heavy labor in the heat on the incidence of kidney injury.

**Methods:** During the 2022 sugarcane harvest in Guatemala, we collected personal ambient heat & humidity exposure data, as well as continuous core body temperature, individual recovery practices, and household characteristics during both the work shift and off-work hours. Urine and blood biomarkers were collected pre- and post-shift on two consecutive days (N=64). Individual and household-level factors will be related to kidney function.

**Results:** Preliminary results will be presented, including data on personal heat exposure and effect during the workday and overnight recovery periods. Results will identify practices and exposures related to post-work recovery that contribute to or reduce risk for kidney insufficiency among sugarcane workers.

**Conclusions:** This research will: a) investigate unexplored exposures and protective factors during the post-work recovery period, b) evaluate the relationship between non-occupational exposure(s) and kidney health, including potential moderators of risk and c) examine heat stress among workers through continuous, individual monitoring of core body temperature during the workday and overnight.

**Funding:** This research is funded in part by the Center for Health, Work, & Environment, a NIOSH Center of Excellence for Total Worker Health and by NIEHS R01 ES03158. The authors declare no conflicts of interest.

## Ionizing Radiation and Cognitive Mortality Among Department of Energy Cohorts: Potential Risk and Role of Work Design Interventions

Authors: Tony Zbysinski, Sarah Howard, Ashley Golden, Andreas Neophytou

**Abstract:** Background: Previous studies investigating ionizing radiation and health outcomes predominantly study acute high dose ionizing radiation (IR) exposure and cancer outcomes. Low-dose IR exposure is of growing concern due to increased prevalence and risks of non-cancer health outcomes, especially cognitive ones, are poorly understood potentially clouding the need for workplace interventions to reduce exposure. Our aim is to analyze the potential relationship between low-dose IR and cognitive-related mortality in an interdisciplinary approach that will consider human factors and design of work as key points for potential interventions.

**Methods:** A pooled analysis will be conducted using de-identified data from cohorts through the Comprehensive Epidemiologic Data Resource (CEDR) founded by the U.S. Department of Energy (DOE). The appropriate IRB approval will be obtained through a reliance agreement with the DOE. Cohorts ranging between the years of 1940 and 2017 with similar dosimetry, mortality, and sociodemographic data will be pooled together. Standardized Mortality Ratios (SMRs), and other approaches will be used to assess a potential relationship.

**Results:** Similar studies have shown inconsistent results for cognitive outcomes; however, such studies are based on dated dosimetry modeling and are likely underpowered. Other research, especially that of high-dose acute exposure, finds associations between IR and a variety of cognitive outcomes. Addressing limitations of prior research is anticipated to better elucidate these relationships, and the role of interventions on exposure. **Conclusion:** The completed research will be a critical step in guiding workplace interventions that focus on changing work design. Such interventions can reduce IR exposure and negative cognitive and other health outcomes, so that workers can lead longer and healthier lives.

**Funding:** Tony J Zbysinski III is a trainee in the Mountain and Plains Education and Research Center, Occupational Ergonomics & Safety Program. **Conflict of Interest Statement:** We have no conflicts of interest to disclose.

# Analysis of 3D Facial Anthropometric Measurements for Respirator Fit Outcomes

Author: Kayna Hobbs-Murphy

**Abstract:** Anthropometry is central to the development of efficacious products and environments (i.e., personal protective equipment, clothing, sunglasses, chairs, interior spaces, etc.) used by humans. Three-dimensional (3D) scanning is increasingly common for collecting anthropometric data, as it offers a faster and less intrusive than traditional manual methods. Additionally, 3D anthropometric methods used to derive facial dimensions provide greater contextual application in the development of respirators and facemasks. More than 2,000 3D facial scans were analyzed to assess measurement reliability and the dimensions of 27 facial features. This research represents the largest sample of 3D facial anthropometrics assessed to date.

The three specific aims of the research included: 1) to assess the intra- and inter-rater reliability of 3D facial measurement methods, 2) to compare the 3D facial anthropometric summary statistics from the present study to relevant summary statistics from manual facial measurements found in the literature, and 3) to assess the presence of differences in 3D facial anthropometrics related to respirator fit, based on demographic factors of gender, race/ethnicity, and age. Post hoc analyses were completed to quantify 3D facial measurement differences between demographic groups (within the larger demographic categories of gender, race/ethnicity, and age group). The most notable results of this research include a) high reliability in 3D measurement data collection methods, b) differences in measurement data summary statistics between 3D and manual methods, and c) significant differences in facial measurements between demographic categories of gender (Male and Female/Other), race/ethnicity (white, Black, LatinX, Asian, and Other), and age (18-34, 35-54, and 55-72).

**Funding:** This work was funded by the High Plains Intermountain Center for Agricultural Health and Safety. There are no other conflicts of interest to report.