Rocky Mountain Center for RMCoEh

Occupational and Environmental Health
Dedicated to protecting workers and their environment through interdisciplinary education, research, and service.
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We want to hear from you!
“Protecting workers and their environment through interdisciplinary education, research, and service.”

A Message from the Center

During a normal April, faculty, staff, and students at the RMCOEH would be gathering into our classrooms to hold defenses, meeting to celebrate the end of another successful year, and readying for a summer of grant submissions, research, manuscript preparation, and preparing for next year’s classes. However, as we are all aware, times are anything but normal. The ongoing COVID-19 pandemic has challenged each one of us—not only to work from home and practice social distancing, but to support and protect the health of a multitude of essential workers.

All of the RMCOEH has united behind this call, whether it be by devoting their time to fit-testing respirators for healthcare workers and helping obtain more Personal Protective Equipment (PPE) (see pgs. 5-6), creating Continuing Education material for employers (see pg. 6), helping prepare to re-open the economy (see pg. 7), educating the community through interviews and other press (see pg. 8) or responding with innovative research that will help slow the spread and protect our essential workers (see pg. 9). This pandemic offers us all a chance to join together in a global initiative for research to preserve our lives and way of living.

Of course, in spite of all this, we have managed to preserve aspects of normalcy for our students and residents. We have continued to hold our weekly Journal Clubs, which have the added benefit of allowing faculty to share updates with students on research and on the epidemic itself. Our sense of community remains as strong as ever, and we are pleased that faculty like Drs. Andrew Merryweather and Rachael Jones have offered students presentations on research relevant to the times. We have continued the regular pace of learning with online courses, student forums held on Zoom, and regular meetings that now take place online instead of in the Center itself.

I could not be prouder of how the Center has conducted itself during this time. Each member has responded to this challenge with innovation, research, and persistence. Our Occupational Medicine (OM) faculty and residents have spent long hours helping to contain the spread through testing, directing healthcare personnel to resources, or corresponding with the businesses and workers that we serve (among many other tasks!) Other OM faculty have worked to ensure that our frontline healthcare personnel have adequate protection, while our Ergonomics & Safety faculty and students have created 3-D printed PPE. Faculty from our other programs have sought funding to investigate transmission, test novel respirators, and more (see pg. 9). In addition, faculty have been working to bolster to economy and preparing for the country to re-open, while our Continuing Education program is working to conduct essential courses online while offering a free COVID-19 course to employers. Our support staff have helped make all these efforts possible, from our research team to those who work to support grants, programs, research, and education.

All these events have made clear that the Center is more than a building that contains so many diverse programs—we are a community dedicated to our three tenets of education, research, and service. Regardless of what the future holds, we know that the Center will hold true to our mission of protecting workers and their environment.

Kurt T. Hegmann, MD, MPH
RMCOEH Director
Dr. Paul S. Richards Endowed Chair in Occupational Safety and Health
SCIENCE, SANITATION, AND SOCIAL DISTANCE

THE RMCOEH’S RESPONSE TO COVID-19
December 31, 2019
Chinese authorities alert the World Health Organization (WHO) to pneumonia cases with an unknown cause

January 21, 2020
First COVID-19 case confirmed in the United States

January 30, 2020
Dr. Kurt Hegmann, RMCOEH Director, creates first “Corona Virus 2020: Info for Employers.” Recommended stopping travel to certain countries. RMCOEH develops action plan in case of spread

February 26, 2020
Continuing Education releases the COVID-19 Course: Free Information for Employers

March 6, 2020
First COVID-19 course confirmed in Utah

March 9, 2020
RMCOEH implements action plans for COVID-19, including moving to distance-based learning and preparing for most employees to telecommute

March 9, 2020
COVID-19 characterized a pandemic by the WHO

March 12, 2020
University of Utah moves all courses distance-based. The RMCOEH authors a community-based plan to blunt the curve, treat early, and prevent hospitalizations and ICU stays

March 13, 2020
Dr. Hegmann appears at a press conference in support of Governor Gary Herbert’s decision to enact “soft closure” of all Utah public schools

March 20, 2020
The RMCOEH releases a series of short educational videos on COVID-19 preparation and safety. Personal Protective Equipment (PPE) extended use and re-use plans developed

March 30, 2020
Due to new findings regarding asymptomatic transmission, the RMCOEH recommends that all healthcare personnel, regardless of position, wear N95 respirators

April and onwards
The RMCOEH continues to work in support of blunting the curve by protecting workers, conducting research, offering education, and advising local businesses
Center Director Dr. Kurt Hegmann spoke in support of Utah Governor Gary Herbert’s decision to close all public schools on March 13, 2020, two days before community spread was identified in Utah. This decision faced considerable opposition, but likely spared Utah the same surge of cases that have been experienced in other cities and states like New York. Data suggest that children do not typically experience severe symptoms of COVID-19, but they are more likely therefore to be asymptomatic carriers and transmitters of the disease to those around them. Closing of the schools has proven to be a critically important decision.

Another promising way to blunt the curve is research into new treatments for COVID-19 (see pg. 7) RMCOEH researchers, particularly Dr. Kurt Hegmann, have urged public officials to ready for possible distribution of medication. In particular, hydroxychloroquine, which Dr. Hegmann offered details on in another press conference with the Utah Governor and other officials, including Senator Karen Mayne, has shown promise in small studies. One such study is one by Dr. Didier Raoult, a researcher at Aix-Marseille who found that the drug may reduce viral load and symptoms of COVID-19. Another randomize trial showed marked efficacy. Clinical trials to examine hydroxychloroquine are ongoing globally.

Even as faculty and staff prepared to shift their work to home to help reduce transmission of the virus in the community, researchers and our Continuing Education team began offering resources to help others ease their transition. Dr. Joseph Allen, whose expertise in meeting science has improved many in-person meetings, created educational content and offered interviews to help companies learn best practices for holding virtual meetings (one hint: get over vanity and turn the camera on! Seeing people on camera helps reduce multitasking and distraction).
From the early days of the COVID-19 pandemic, faculty, staff, and students at the RMCOEH heard an urgent call to fulfill their mission statement. Nowhere has that been more apparent than how faculty across programs have worked to support frontline healthcare personnel from infection transmission. COVID-19, like fellow coronaviruses SARS and MERS, requires infection control measures like respiratory protection, hand hygiene, isolation precautions, and, perhaps most critically, access to Personal Protective Equipment, or PPE. Researchers across the world have increasingly focused on asymptomatic transmission of SARS co-V2 (the virus responsible for COVID-19). Recent studies, including one forthcoming from Emerging Infectious Diseases, have identified how those without symptoms may pass the disease to others. Another recent study suggests that asymptomatic spreading is responsible for 44% of cases.

As newscasters repeated the acronym PPE, the nation learned what occupational health professionals have long known—that sometimes protective equipment is the best defense to preserve worker health. But as people around the world have also learned in the past two months, safe and effective use of PPE can be complicated by challenges in fit, testing, and protocols.

On March 30th, the RMCOEH tweeted a recommendation that all healthcare personnel use N95 respirators, regardless of symptoms. N95 respirators are disposable respirators approved by the National Institute of Occupational Safety and Health (NIOSH) to block 95% of particles of all sizes, including virus-sized particles. N95s are used across a number of industries—carpenters, painters, farm workers (and more!)—but in times of an epidemic, they are invaluable for healthcare personnel. However, a N95 respirator can work correctly only when it is fitted to a worker’s face. There are other, more effective respirators, like the PAPR that Dr. Cheng wears above. However, issues of cost, availability, and best practices require experts to come to a consensus about how to distribute which types of PPE within their institutions.
Dr. Jeremy Biggs has stepped into a critical role for the Health Sciences Center, acting as their “PPE czar” responsible for tracking the use of PPE. He is working with Drs. Phillips and Wood from Occupational Medicine (OM) and Drs. Sleeth, Jones, and Pahler from Industrial Hygiene (IH) in order to develop protocols of extended use and re-use of PPE. Extended use/re-use is only recommended in periods of shortages like now. Dr. Eric Wood, in conjunction with Continuing Education, developed two short videos outlining protocols for how to safely extend the use of N95s and best practices for sterilization. Work continues to prevent shortages and ensure healthcare personnel safety.

RMCOEH Occupational Medicine faculty have also been critical to the work of the University of Utah Work Wellness Center, which works to protect U of U employee wellness. At that center, Dr. Matt Hughes has been focused on respiratory fit-testing and PAPR training alongside resident Dr. Wibisono. Fellow residents Drs. Merris and Schwertz have been working in the Command Center directing employees to Work Wellness if they report COVID-19 symptoms in addition to coordinating tests and communicating results. The OM Redwood clinic has remained open, and clinical faculty spend considerable time monitoring first responders, ordering tests, and ensuring the safety of employees in the public domain.

Our Continuing Education program has, with the help of Center Director Dr. Kurt Hegmann, developed a continually updated “COVID-19: Course for Employers” that can be taken for free online (538 participants to date). Dr. Schaefer, the Senior Technical Writer, collaborated with faculty Drs. Cheng, Allen, and Wood to develop a series of short educational videos for the course. The video topics range from sanitation procedures to how to hold meetings from home to a demonstration of how the virus can spread. These videos have been shared throughout social media to help educate the general public.
While there is currently no proven treatment for COVID-19, considerable promising preliminary research has pointed towards chloroquine compounds (hydroxychloroquine in particular) as drugs that may reduce severity of the disease, prevent hospitalizations, and lessen the viral load. Clinical trials globally have begun to investigate the promises that this drug offers, including a trial held by a consortium of Utah physicians from the University of Utah and Intermountain Healthcare. Dr. Kurt Hegmann has been an early advocate for these studies and has worked with local business Meds in Motion pharmacy to ensure additional inventory of these potentially life-saving drugs. He and other researchers are working to develop a detailed protocol for community-based medicine distribution and population-based data collection in partnership with other local businesses. Dr. Hegmann adds that in an epidemic, it is important to “take our best shot each moment, each hour, and each day” in order to prevent the loss of lives and promote a return to normalcy.

After science and social distancing has worked to slow the spread of COVID-19, a nationwide return to work will be vital to reconstituting the economy. Federal projections place unemployment at 20-32%, an astonishing and troubling range. Faculty at the RMCOEH are working to soften the blow that will pose. They have offered guidance in discussion with Utah state government, including Senate President Adams and Senators Mayne and Bramble. Local businesses involved include WCF Insurance, Nomi Health, Qualtrics, and those at Silicon Slopes. We are next engaging with the Chamber of Commerce regarding reconstitution.

RMCOEH faculty have begun to help develop these plans. These plans will require many stakeholders to work together to create a consensus as to when schools will resume, businesses will reopen, and life can return to as we once knew it. We have also begun to reach out to neighboring and distant states as we apparently have the only model addressing all of the following: blunting the surge, population-based data, prevention of hospitalization, and economic reconstitution. Iowa has already signed on.
As the general public struggles to understand PPE, infection transmission, and treatments, a number of reporters have turned to faculty from the RMCOEH to explain these concepts clearly and concisely. Below are a few examples of how faculty expertise has been helped illuminate the rush of news regarding COVID-19.


IN THE NEWS

Dr. Rachael Jones outlines the masks most typically used in healthcare (surgical masks and N95 respirators) and how each of them works: surgical masks prevent contact with fluids and N95 respirators block particles. She cautions against too much reliance on cloth masks and gloves, noting that they can create a false feeling of security and do not replace social distancing measures.

Dr. Joseph Allen offers an explanation of why many people’s feelings about non-essential shopping, including pleasure shopping (e.g., fashion, leisure, and entertainment) have become increasingly complex in the face of two forces: concern over straining systems that are used to deliver essential goods and services, and encouragement to help bolster the economy through spending.

Dr. Kurt Hegmann explains the reasoning behind viewing hydroxychloroquine as a potential life-saving drug for COVID-19, and what the state has been doing to prepare for a possible surge in prescriptions. He notes that the public and private sectors have joined together to form a team that will assess the need for the medication and work to allow for a large number of prescriptions in the face of global supply issues.
Faculty across the RMCOEH have responded to the call for research on COVID-19 transmission, protection, and treatment. One particular area that has drawn considerable attention is alternative PPE, especially PPE created through 3D printing. Dr. Andrew Merryweather (head of the Ergonomics & Safety program and faculty in the Department of Mechanical engineering) has been involved in Engineering’s efforts to 3D print face shield brackets in order to get healthcare personnel the necessary PPE they need. They are experimenting with a flexible material to widen usability and increase comfort.

Drs. Leon Pahler and Rachael Jones have partnered with the Center for Medical Innovation at the University of Utah to test alternative respirator and respirator gear. They are offering their expertise with respiratory protection to test how well these alternatives fit and function, as well as providing key commentary on usability and performance. Their experience with how respirators are certified and perform in the field have proven key to the success of this initiative.

Drs. Darrah Sleeth and Jones have been awarded seed funding from the Vice President for Research. Dr. Sleeth will test 3D respirators in the RMCOEH wind tunnel laboratory in order to examine these respirators against standards comparable to NIOSH’s. Dr. Jones will examine infection transmission among healthcare personnel using air and swab sampling.

Research funding for COVID is coming quickly and unpredictably. Other faculty have begun work on grants, including Dr. Matt Hughes, who is expanding our Hazardous Worker Training grant with an application to train workers on protection against COVID-19, and Dr. Sarang Yoon, who is responding to a CDC request to test and monitor healthcare personnel and first responders. More funding requests and projects will come swiftly, and RMCOEH faculty are sure to follow.
Although early leadership initiatives and anticipation of the spread of COVID-19 meant that RMCOEH faculty (who were warned by mid-February), staff, and students were better prepared to shift online, the transition was not always easy. However, thanks to the close-knit and collaborative atmosphere at the Center, we quickly rallied and found ways to share our community online.

**Journal Club:**
Journal Club at the RMCOEH is a time-honored tradition in which the entire Center gathers to hear residents, doctoral candidates, and master’s students present on research from their fields. In an effort to maintain normalcy, our Journal Club continued on Zoom. This weekly hour became not only an invaluable opportunity for students and residents to hear and see each other, but to hear updates from their instructors, discuss their concerns regarding the epidemic, and share strategies for coping with work from home. One Journal Club was lucky enough to have Dr. Andrew Merryweather (head of Ergonomics & Safety) present on how to increase movement at work. His Q&A transformed into a brainstorming session of ways to work from home in ways that are both healthy and productive (see right infographic for a compilation of all suggestions!).

**Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium:**
We were disappointed to lose our in-person NORA symposium, but technology came through to allow the proceedings to be held virtually. On April 17th between 8:00 a.m. and 12:00 p.m., students and other new/young investigators shared their projects and findings, including students from RMCOEH’s cross-disciplinary seminar, Occupational Solutions. Students shared their findings from working with local businesses to solve an occupational problem they found.

**Final Defenses:**
In spite of the confusion caused by a rapid movement to online classes, graduating students rallied to present a series of successful pre-defenses and final defenses to their committee and peers. Students worked closely with their committee and the technical writer to create publishable, polished manuscripts that reflected their dedication to their graduate studies (for more information on students graduating this spring, see pg. 16).
Dr. Rachael Jones, Associate Professor of Industrial Hygiene and Director of OEH Graduate programs, has long pursued research on the transmission of viruses among healthcare workers (HCW), but never have a pair of her publications been so timely as two that appeared in *Infection Control & Hospital Epidemiology* in December 2019 and March 2020. The first paper, *Respiratory viruses on personal protective equipment (PPE) and bodies of healthcare workers*, described a project where 59 HCWs had their PPE, clothing, and skin swabbed to determine if a virus was present. While PPE like gloves, face masks/respirators, gowns, and head coverings are vital to protecting HCW, these items have a critical complication that can lead to the transfer of pathogens from patients to provider: they have to be removed.

Many previous studies have found that when HCWs remove their PPE, they often inadvertently self-contaminate by incorrectly removing gloves or touching a mask with a contaminated glove. This study followed HCWs who provided care to patients under isolation precautions due to a respiratory virus (influenzas and others). After they interacted with a patient, each HCW had their PPE, clothes, and skin swabbed to check for the virus. 21% of HCWs had the virus present on their bare hands in spite of wearing gloves, which could easily lead to infection transmission if proper hand hygiene and frequent changing of PPE were not practiced. Stethoscopes were also observed to have the virus present on their surface (29% of all measured).

The second paper, *Respiratory viruses in the patient environment*, describes the research team’s testing of the areas in which care for patients with respiratory viruses took place. This included the air within those rooms and surfaces like IV poles, telephones, tray tables, computers, and bed rails. These surfaces were chosen because they were touched by HCWs and could be contaminated with viruses. Results from this study found that 43% of the air samples taken had a virus present, but these percentages varied depending on which virus (influenza or rhinovirus) was measured. 67% of keyboards were contaminated with the virus, compared with 52% of bedrails. Surfaces that HCWs touched (like IV poles and telephones) were more likely to be contaminated with the virus than those they did not. The presence of the virus in these areas puts HCWs at greater risk of contracting and disseminating respiratory illnesses.

Lessons from research such as this from Dr. Jones and others are key to helping protect both HCWs and patients during the COVID-19 epidemic. It is important for HCWs to understand that PPE is only as good as how it is used and removed, and that viral contamination can take place across surfaces.

To learn more, read Dr. Jones’ articles in *Infection Control and Hospital Epidemiology* (see citations below).


The RMCOEH’s Community Emergency Response Team (CERT), developed as part of our ongoing collaboration within the Prevention, Preparedness, and Response (P2R) Consortium, offers a unique and comprehensive emergency preparedness and disaster response training program. Designed for non-professional community-based volunteers, workers from small and medium-sized companies, faith-based groups, civic leadership, schools and day care centers, and interested and vulnerable worker groups such as elementary teachers, CERT targets interested laypersons who are likely to provide support in various capacities during emergency preparedness/response activities or who may be called upon or wish to volunteer in other impacted areas across the country at short notice.

CERT provides Federal Emergency Management Agency (FEMA) standardized curriculum to ensure that all participants receive consistent messaging. During CERT courses, participants learn basic and realistic training that will help them cope with any emergency or disaster situation where government aid may be slow in coming. Among other key strategies, CERT teaches citizens to provide basic medical aid, to manage utilities, and to conduct light search and rescue. CERT also prioritizes community among its participants by teaching them to organize fellow volunteers and collect intelligence that will help inform the rescue effort when it comes.

Dr. Matthew Hughes and Ms. Rachel Brown of the RMCOEH have worked hand in hand with consultants to proudly develop online training modules and materials specifically targeted to the potential responders to increase the preparedness and response capabilities of the people living and working in Region 8 and eventually across the United States and Territories. They are now at the cusp of major success in establishing the national training program for CERT and plan to continue advancing this agenda in the coming 5 years and beyond. They created the first National CERT training program in the U.S., which is rapidly being adopted across various states throughout the U.S. By replacing classroom didactics with innovative online learning, this program has resulted in in greater opportunity for training more people in CERT across the country.

In the past 6 months with the CERT program rollout, their training has been adopted by multiple states, including Utah, California, and others, with enrollments of 20-30 persons per day. They anticipate training up to 50,000 people or more per year with this program across the United States in the next grant cycle.

To take advantage of CERT’s online program, visit https://medicine.utah.edu/rmcoeh/about-us/outreach/cert.php. Once completed, you just follow up with your local CERT Coordinator to complete the hands-on practical portion and receive your full CERT credentials.

CERT is funded by the National Institute of Environmental Health Sciences (NIEHS) under grant #U45ES019360.
**Selected Recent Publications**


A special mention goes to our former Center Director, Dr. Royce Moser, who recently published this fascinating article on how occupational medicine helped America reach the moon.


And finally, congratulations to Dr. Joseph Allen, whose book on managing meetings in organizations recently was published!

Head of Ergonomics & Safety program Dr. Andrew Merryweather has received this year’s Bennion Center Distinguished Faculty Service Award, which is given to a U faculty member who “has demonstrated a commitment to the campus-community connection through a life of active, unpaid community service and the integration of service with research and teaching.”

Dr. Merryweather was chosen for his focus on biomechanics research and community-based projects to improve the health and mobility of people with disabilities. His Ergonomics & Safety Laboratory has co-developed assistive devices for people with physical disabilities including a paraglider, skiing system, and sailboat for paraplegics. The lab also analyzes the stress related to human movement and occupational tasks.

Dr. Joseph A. Allen has been selected as a Fellow by the Society of Industrial and Organizational Psychology (SIOP). Dr. Allen is a Professor of Industrial/Organizational Psychology within the Rocky Mountain Center for Occupational and Environmental Health, where he contributes to occupational health via research, teaching, and service to organizations across the nation. His fellowship within SIOP recognizes the profound impact of his career and work in Industrial/Organizational Psychology.

SIOP Fellowship is a highly selective award, and only approximately 500 I/O psychologists have been recognized as Fellows since the mid-1960s. Nomination and selection to SIOP fellowship is reflective of a career that has excelled in research, service, instruction, collaboration, and overall dedication to the field of I/O psychology.

Congratulations to the winners of our annual RMCOEH Faculty and Student Awards!

MOH Student of the Year: Dr. Hyrum Bronson
Dr. Hyrum Bronson is an occupational medicine resident and physician in the United States Air Force. He is a devoted husband and father, a good friend to all who know him, and an excellent, supportive colleague.

MSOH Student of the Year: Angela Ho
Although Angela Ho officially graduated last December, she has not been forgotten. Angela is a dedicated worker, an innovative thinker, and a joy to be near at all times. She currently works at Texas Instruments.

MOH Faculty Instructor of the Year: Dr. Andrew Phillips
Dr. Phillips offers his students invaluable support for their research and sound advice for their clinical practice. His research serves as an inspiration to the MOH students who hope to follow in his path.

MSOH Faculty Instructor of the Year: Dr. Leon Pahler
Dr. Pahler is a dedicated and thoughtful instructor, an advocate for students, and a source of knowledge and support for all those who come to his office or his classroom. His teaching combines practical application with the science of industrial hygiene.

OEHS Research Mentor of the Year: Dr. Rachael Jones
Dr. Jones is well known to her students as an enthusiastic, generous, and thoughtful mentor. Although she has been at the University of Utah for just a year, she has already become essential to the many students who seek her support in their research.
ALUMNI SPOTLIGHT & SCHOLARSHIP DETAILS

Catch up with one of the RMCOEH’s alumni and former faculty Dr. Ed Holmes in his own words:

I practiced as a GP in an OM clinic for 9 years (1990-1999) seeing industrial injury patients and doing medical surveillance. In 1999 I was accepted into the OM residency at the U and graduated in 2001 after already having nearly 10 years experience in clinical OM. I then joined the RMCOEH faculty in 2001 upon graduation, became the OM clinic director, and organized the opening of the Redwood OM clinic to serve community OM clients and injured workers. I taught at RMCOEH and then became the OM residency program director for several years. After being asked for many years to consult on more complex toxicological and industrial chemical exposure related issues, I saw a paucity of competent toxicology consultants and decided to seek further training and expertise in toxicology. As a result I obtained a Masters degree in Medical Toxicology (MSc). In approximately 2009, I left RMCOEH and continued my private consulting business working on complex impairment, causation, and toxicology cases mainly for government agencies as a neutral party. I have been working as the Chief Medical consultant for the Utah Disability determination services for Social Security for many years and have consulted extensively for the VA on compensation and pension disability claims and causation analysis for over a decade. I continue to consult as a neutral party on workers compensation medical panels for the Labor Commission and for other government agencies on occasion. I miss teaching at RMCOEH! I have cut back my practice and am now heavily involved in volunteer activities in the community, mainly in the incarcerated and addicted populations to help them recover and find a substance-free life path. My work now mainly consists of finding as much time as possible to spend with my grandchildren!

Don’t forget that you can join the RMCOEH faculty and staff in supporting more students and residents like Dr. Holmes! To make a donation, contact Toni Chambers at toni.chambers@hsc.utah.edu.

Jessica Hanford Scholarship (Staff donating: Toni Chambers)

Richard E. Johns Scholarship

Moser Endowed Scholarship (Faculty donating: Dr. Kurt Hegmann)

Jeff Burton Scholarship

Dallas Bradford Scholarship (Faculty donating: Dr. Ken d’Entremont)

Work Wellness Resident Scholarship (Established by Dr. Sarang Yoon)

Rod Larson Endowed Scholarship
Joemy Ramsay received her PhD in Occupational and Environmental Health for her dissertation titled *Measurement of Exposure to Particulate Matter in the Nasal Airway*. Dr. Ramsay’s work focused on how particulate matter, or small particles in the air, deposited within a wind tunnel and within the nasal cavity of an anatomically correct physical model of the nasal cavity. Most research on particle deposition has focused on the respiratory system, which limits our full understanding of how particles can enter the body. Lastly, Dr. Ramsay examined the efficacy of nasal swabs, which provide a more comfortable alternative to nasopharyngeal swabs.

Madison Ellis’s research on temperature profiles in commercial kitchens began when a friend complained of high heat during his work as a line cook. Her interest piqued, Madison began work on *A Pilot Observational Study Comparing WBGT Parameter Measurements as a Result of Kitchen Configurations*, which examined three types of kitchens: zone, island, and assembly. Each of these place their heat-generating appliances in different positions. Her research found promising preliminary evidence that different kitchens experience different temperatures, and that line cooks do indeed experience temperatures that can possibly lead to heat stress.

Bruce Niebergall knew that surgical smoke produced by use of lasers in the operating room posed occupational hazards to those around, but he also knew that another medical procedure used lasers—and that population had not yet been studied extensively. His project, *Plume Analysis from Laser Hair Removal: A Pilot Study*, sought to do just that. Bruce worked with an industrial hygienist at Intermountain Health Care to monitor laser hair removal procedures using two air quality monitors, and found that laser hair removal produced high counts and concentrations of ultrafine particles that could pose a risk to provider and patient health both.

Kaylin Lake’s project *A Pilot Study to Investigate Heavy Metal Soil Contamination in a Frontier Tribal Population* was a culmination of her work sampling and analyzing soil from a frontier (i.e., extremely rural) Native American reservation. Kaylin’s work is part of several projects spearheaded by Industrial Hygiene faculty who are working in close partnership with Native American tribes within the Rocky Mountain West. One of Kaylin’s findings of dramatically high lead levels in the soil near a former community center and current preschool helped the tribal authorities initiate remediation to protect their community.

Angela Ho’s research project, *An Investigation of Aerosol Measurement Degradation in Low-Cost Particle Sensors Using Laboratory Calibration and Field Validation*, examined the University of Utah’s low-cost, integrated air quality sensor, the AirU (visit https://airu.coe.utah.edu to learn more) both in deployment in a field study and in her own home. Angela tracked pre- and post-deployment calibration equation changes and compared AirU data to those obtained from a reference-grade instrument, the GRIMM 1.109. Angela’s manuscript has been submitted to the journal of Aerosol and Air Quality Research (AAQR).
Derek Sandberg found himself intrigued by the rising prevalence of silicosis and coal worker pneumoconiosis in the 2000s, particularly among coal workers in West Virginia. His project examined the impact of a new respirable coal dust standard meant to combat those rates of disease, which began implementation in August 2014 and was finalized in August 2016. In his project, *Is the New Coal Dust Standard Protective for Respirable Quartz?*, Derek analyzed data from two databases from the Mining Health and Safety Administration (MSHA) to investigate the recorded coal dust and estimated quartz before and after the change.

Logan Webb worked to analyze and compare indoor air quality on two Native American reservations. Native American reservations experience high levels of environmental injustice and consequent health disparities, and Logan’s research focused on inadequate housing and consequent indoor air pollution from sources such as wood-burning stoves, poor ventilation, and other sources in *A Comparison of Indoor PM2.5 and Radon Concentrations for Two Rocky Mountain West Tribes*. His work intersects with several other students, including Angela Ho (analysis of AirUs) and previous graduate Jared Stenberg (indoor air quality analysis).

Raquel Robello’s project, *A quantitative comparison of heavy metal concentrations in the soils on two Rocky Mountain West tribal reservations*, incorporated data from Kaylin Lake’s study to compare heavy metal contaminations were for two reservations that had experienced histories of hard rock mining. Raquel hypothesized that there would be significant differences, as heavy metal contamination can be affected by type of mining, naturally-occurring levels, and other sources of contaminants. Her findings indicate a need for more individualized assessments to take place on reservations to determine specific patterns of contamination.

PhD candidate Andria Thatcher examined an occupational population that has been of considerable interest to researchers at the RMCOEH—long-haul truck drivers, who experience high rates of certain injuries and illnesses, and who are vulnerable due to the particular isolating challenges of their occupation. Her dissertation, *Manual Materials Handling and Musculoskeletal Disorders in Occupational Drivers: A Cross-Sectional Study*, examines where and how drivers encounter risky tasks in their days (pulling the 5th wheel pin, helping load and unload cargo, and even entering into the truck cab) and rates of musculoskeletal disorders among drivers.