

Office of Research

colorado school of public health

APR-JUN 2023

Publication Highlights



CANCER CENTER

High Impact Journal Recognition: Journal of Clinical Oncology (Impact Factor 50.717)

Working, Low Income, and Cancer Caregiving: Financial and Mental Health Impacts

Bradley, CJ; Kitchen, S; Owsley, KM
Journal of Clinical Oncology

Approximately 6 million people provide caregiving to people diagnosed with cancer. Many must remain employed to support their household and to have access to health insurance. It is unknown if caregiving for a spouse diagnosed with cancer is associated with greater financial and mental stress relative to providing care for a spouse with different conditions. Health and Retirement Study (2002-2020) data were used to compare employed caregivers, younger than age 65 years, caring for a spouse diagnosed with cancer and a matched control group caring for a spouse with other conditions. Around a third of cancer caregivers reported they stopped working and had an increase in household debt. Cancer caregivers in households below the median household income were more likely to report decreased income, increased household debt, and stopping work than similar noncancer caregivers. Policies such as paid sick leave and family leave are needed for this strained and important population who have financial and employment responsibilities in addition to caregiving.

Awareness of Age-Related Gains and Losses in a National Sample of Adults Aged 80 Years and Older: Cross-Sectional Associations With Health Correlates

Kaspar, R; Wahl, HW; Diehl, M
Innovation in Aging

Advanced old age is a life stage with a high likelihood of age-related loss experiences. However, little is known about remaining gain experiences and their relation with perceived losses and health correlates in community-dwelling very old adults. Moreover, virtually nothing is known in this regard about the experiences of individuals in long-term care settings. First, the researchers strived to establish the normative course of age-related gains and losses in advanced old age. Second, they examined whether such gain/loss perceptions in advanced aging moderated health correlates. Data came from the nationally representative survey Old Age in Germany D80+ conducted in 2020/2021. The multidimensional Awareness of Age-Related Change (AARC) questionnaire and moderated regression were used to analyze associations with late-life health and functioning correlates. Levels of AARC-Gains were higher than those of AARC-Losses across most of the age range. Long-term care residents showed more AARC-Losses and fewer AARC-Gains compared with community-dwelling adults and contributed significantly to an overall negative balance of more losses than gains in those aged 90 years or older. Regarding functional health and autonomy, negative age effects were amplified by AARC-Losses, but buffered by AARC-Gains. A more positive ratio of gains-to-losses predicted better health and functioning. Findings suggest that the loss aspect of development in very late life might have been overstated in the existing literature. Perceived gains and losses are of critical importance for the understanding of health correlates in very old age.

Virtual Reality Assessment of Walking in A Modifiable Urban Environment: A Feasibility and Acceptability Study

Oselinsky, K; Spitzer, AN; Yu, YQ; Ortega, FR; Malinin, LH; Curl, KA; Leach, H; Graham, DJ
Scientific Reports

Physical activity is known to be one of the most health-beneficial behaviors, and salutogenic design modifications to the built environment can facilitate increased physical activity. Unfortunately, it is not often clear in advance which environmental and urban design implementations will generate increases in activities such as walking, and which will have little impact or even reduce walking. The present study tested the feasibility and acceptability of a virtual reality (VR) model for pre-testing urban designs for their impact on walking. Using a wearable VR head-mounted display/computer, young adults walked freely through a large indoor gymnasium, simultaneously walking through a virtual model of an urban streetscape that was designed to be modifiable and allow for testing impacts on walking of various changes to the urban environment. The majority of participants found the experience to be acceptable: pleasant and nonaversive, and they walked freely through the VR model for approximately 20 min, on average. Using modifiable VR models to pre-test built-environment changes for their impacts on walking behavior appears to be a feasible and acceptable approach and worthy of continued research investigation.

BIostatistics & InformatIcs

Intersectionality and Adverse Childhood Experiences: Comparing Subgroups of Sex, Race/Ethnicity, and Sexual Orientation

Giano, Z; Schwab-Reese, L; Mishra, AA; Hubach, RD; Johnson, RL; Epperson, CN; Sammel, MD
American Journal of Preventive Medicine

This study investigated the intersectionality of adverse childhood experiences among subgroups of sex, race/ethnicity, and sexual orientation. Using data from the Behavioral Risk Factor Surveillance Survey across 34 states from 2009 to 2018, authors stratified subgroups of sex (male/female), race/ethnicity (White/Hispanic/Black/multiracial/other), and sexual orientation (heterosexual/bisexual/gay) to investigate the number of adverse childhood experiences across groups. Stratification resulted in 30 distinct subgroups (e.g., bisexual Black females, straight multi-racial males) with significant post hoc differences per group. Generally, those identifying as sexual minority individuals had the highest number of adverse childhood experiences (the top 14 of 30 subgroups), whereas seven of the top ten subgroups were female. Surprisingly, no clear patterns emerged by race/ethnicity, although the two largest groups (straight White females and straight White males) were 27th and 28th of 30, respectively. Although studies have examined adverse childhood experiences by individual demographic variables, less is known about the extent to which adverse childhood experiences are present in stratified subgroups. Sexual minority sub-groups (particularly female bisexual subgroups) trend toward a higher number of adverse childhood experiences, whereas heterosexual subgroups (regardless of sex) comprised the lowest 6 groups with respect to adverse childhood experiences. Implications include further examination of bisexual and female subgroups (including specific ACE domain investigations) to identify the vulnerable population.

EPIDEMIOLOGY

Prenatal Exposures to Per- and Polyfluoroalkyl Substances and Epigenetic Aging in Umbilical Cord Blood: The Healthy Start Study

Niemiec, SS; Kechris, K; Pattee, J; Yang, IV; Adgate, JL; Calafat, AM; Dabelea, D; Starling, AP
Environmental Research

Per- and polyfluoroalkyl substances are ubiquitous, environmentally persistent chemicals, and prenatal exposures have been associated with adverse child health outcomes. Prenatal PFAS exposure may lead to epigenetic age acceleration, defined as the discrepancy between an individual's chronologic and epigenetic or biological age. Researchers estimated associations of maternal serum PFAS concentrations with to epigenetic age acceleration in umbilical cord blood DNA methylation. Maternal mid-pregnancy serum concentrations of perfluorodecanoate were negatively associated with to epigenetic age acceleration in cord blood, suggesting a pathway by which prenatal per- and polyfluoroalkyl substances exposures may affect infant development. No significant associations were observed with other per- and polyfluoroalkyl substances. Mixture models suggested opposite directions of association between perfluoroalkyl sulfonates and carboxylates. Future studies are needed to determine the importance of neonatal epigenetic age acceleration for later child health outcomes.

Open-Source Environmental Data as An Alternative to Snail Surveys to Assess Schistosomiasis Risk in Areas Approaching Elimination

Grover, EN; Allshouse, WB; Lund, AJ; Liu, Y; Paull, SH; James, KA; Crooks, JL; Carlton, EJ
International Journal of Health Geographics

Although the presence of intermediate snails is a necessary condition for local schistosomiasis transmission to occur, using them as surveillance targets in areas approaching elimination is challenging because the patchy and dynamic quality of snail host habitats makes collecting and testing snails labor-intensive. Meanwhile, geospatial analyses that rely on remotely sensed data are becoming popular tools for identifying environmental conditions that contribute to pathogen emergence and persistence. In this study, researchers assessed whether open-source environmental data can be used to predict the presence of human *Schistosoma japonicum* infections among households with a similar or improved degree of accuracy compared to prediction models developed using data from comprehensive snail surveys. Infection data was collected from rural communities in Southwestern China in 2016 to develop and compare the predictive performance of two Random Forest machine learning models: one built using snail survey data, and one using open-source environmental data. Results suggest that in low-transmission environments, leveraging open-source environmental data can yield more accurate identification of pockets of human infection than using snail surveys. Furthermore, the variable importance measures from the models point to aspects of the local environment that may indicate increased risk of schistosomiasis. For example, households were more likely to have infected residents if they were further from roads or were surrounded by more surface water, highlighting areas to target in future surveillance and control efforts.

Multi-Omics Resources for Targeted Agronomic Improvement of Pigmented Rice

Sedek K; Zuccolo A; Fornasiero A; Weber AM; Sanikommu K; Sampathkumar S; Rivera LF; Butt H; Mussurova S; Alhabsi A; Nurmansyah N; Ryan EP; Wing RA; Mahfouz MM
Nature Food

Pigmented rice (*Oryza sativa* L.) is a rich source of nutrients, but pigmented lines typically have long life cycles and limited productivity. Here we generated genome assemblies of 5 pigmented rice varieties and evaluated the genetic variation among 51 pigmented rice varieties by resequencing an additional 46 varieties. Phylogenetic analyses divided the pigmented varieties into four varietal groups: Geng-japonica, Xian-indica, circum-Aus and circum-Basmati. Metabolomics and ionomics profiling revealed that black rice varieties are rich in aromatic secondary metabolites. We established a regeneration and transformation system and used CRISPR–Cas9 to knock out three flowering time repressors (Hd2, Hd4 and Hd5) in the black Indonesian rice Cempo Ireng, resulting in an early maturing variety with shorter stature. Our study thus provides a multi-omics resource for understanding and improving Asian pigmented rice.

COMMUNITY & BEHAVIORAL HEALTH

Blood Cannabinoid Molar Metabolite Ratios are Superior to Blood THC as An Indicator of Recent Cannabis Smoking

Kosnett, MJ; Ma, M; Dooley, G; Wang, GS; Friedman, K; Brown, T; Henthorn, TK; Brooks-Russell, A
Clinical Toxicology

Cannabis use is a growing concern in transportation and workplace incidents. Because Delta 9-tetrahydrocannabinol (THC) is detectable after acute psychoactive effects have resolved, it has limitations as an indicator of recent usage or potential impairment. In an observational study of driving and psychomotor performance, researchers measured whole blood Delta 9-THC plus its metabolites 11-hydroxy-Delta 9-THC and 11-nor-9carboxy-Delta 9-THC by liquid chromatography with tandem mass spectrometry at baseline and 30 min after starting a 15-minute interval of smoking cannabis in 24 occasional and 32 daily cannabis smokers. They calculated two blood cannabinoid molar metabolite ratios: 1) [Delta 9-THC] to [11-nor-9-carboxy-Delta 9-THC] and 2) ([Delta 9-THC] + [11-hydroxy-Delta 9-THC]) to [11-nor-9-carboxy-D9-THC]. They compared these to blood [D9-tetrahydrocannabinol] alone as indicators of recent cannabis smoking. In occasional and daily users, the blood cannabinoid molar metabolite ratios were superior to whole blood D9-tetrahydrocannabinol as indicators of recent cannabis smoking. The researchers recommend measurement and reporting of Delta 9-THC, 11-hydroxy-Delta 9-THC, and 11-nor-9-carboxy-Delta 9-THC, and their molar metabolite ratios in forensic and safety investigations.

HEALTH SYSTEMS, MANAGEMENT & POLICY

Medicaid Payment For Postpartum Long-Acting Reversible Contraception Prompts More Equitable Use

Quinlan, TAG; Lindrooth, RC; Guiahi, M; McManus, BM; Mays, GP
Health Affairs

To increase access to highly effective contraception and improve reproductive autonomy, a growing number of state Medicaid programs pay for the provision of immediate postpartum long-acting reversible contraception in addition to providing a global payment for maternity care. Using Pregnancy Risk Assessment Monitoring System data, researchers examined postpartum long-acting reversible contraception use both overall and by race and ethnicity among respondents with Medicaid-paid births during the period 2012-18 in eight states that implemented immediate postpartum long-acting reversible contraception payment and eight states without it. The study found that the policy resulted in an overall 2.1-percentage-point increase in postpartum long-acting reversible contraception use. They found no significant change among White mothers and a 3.7-percentage-point increase in use among Black mothers compared with White mothers. Additional research is needed to determine whether this increase was aligned with patients' preferences and whether hospitals' immediate postpartum long-acting reversible contraception policies and practices take a patient-centered approach that supports reproductive autonomy and equity.

CENTERS FOR AMERICAN INDIAN & ALASKA NATIVE HEALTH

Relationship Between Food Insecurity and A Gestational Diabetes Risk Reduction

Intervention: Outcomes Among American Indian and Alaska Native Adolescent and Young Adult Females

Stotz, SA; Hebert, LE; Charron-Prochownik, D; Scarton, L; Moore, KR; Sereika, SM; Stopping GDM Study Grp

Translational Behavioral Medicine

American Indian and Alaska Native (AI/AN) women are disproportionately impacted by gestational diabetes mellitus (GDM). GDM can cause severe perinatal complications for both mother and baby. Weight management through healthy diet and physical activity are key factors in decreasing risk for GDM. However, there are barriers to healthful eating in many AI/AN communities. Food insecurity, defined as the lack of consistent access to enough food for an active, healthy life, is a risk factor for unwanted weight gain. In this paper, researchers examined the relationship between food insecurity with healthy eating self-efficacy and behaviors among AI/AN adolescents and young adults (AYAs) through secondary analysis of an existing randomized controlled trial dataset. Methods included secondary analysis of healthy eating self-efficacy and behaviors, and household-level food insecurity measures from an randomized controlled trial that tested the effect of engagement in a GDM risk reduction educational intervention on knowledge, behavior, and self-efficacy for GDM risk reduction from baseline to 3-month follow-up. Participants were AI/AN daughters (12-24 years old) and their mothers. Researchers found that more than one-third reported food insecurity. The results of the study suggest food insecurity is an important factor regarding the efficacy of interventions designed to reduce GDM risk and offer unique insight on upstream causes of GDM health disparities among AI/AN communities.

CENTER FOR GLOBAL HEALTH

Differences in Parental Vaccine Confidence and Attitudes by Health System in Guatemala and Their Impact on Immunization Timeliness

Kuan-Mahecha, MA; Rahman, S; Martinez-Rivera, P; Lamb, MM; Asturias, EJ

Vaccine

The objectives of this study were to evaluate parental confidence and attitudes towards immunization in urban Guatemala between private versus public health systems and their impact on vaccination timeliness in their children. A cross-sectional survey was conducted in parents 6-18-month-old children who attended well-child outpatient clinics from two health systems (public employee-based insurance and private health care) in Guatemala City from November 2017 through August 2018. Parental demographics, household characteristics, food insecurity, vaccine hesitancy using the WHO SAGE Vaccine Hesitancy Scale, and information on parental use of social media platforms and vaccine information sources were collected. The study found that in Guatemala, children receiving immunizations at private clinics were significantly more likely than those attending public clinics to be delayed in their immunization schedule and to remain more days without the recommended protection, especially for third doses of the primary vaccine series.

Deep Learning on Graphs for Multi-Omics Classification of COPD

Zhuang, YH; Xing, FY; Ghosh, D; Hobbs, BD; Hersh, CP; Banaei-Kashani, F; Bowler, RP; Kechris, K
PLOS ONE

Network approaches have successfully been used to help reveal complex mechanisms of diseases including Chronic Obstructive Pulmonary Disease (COPD). However despite recent advances, we remain limited in our ability to incorporate protein-protein interaction (PPI) network information with omics data for disease prediction. New deep learning methods including convolution Graph Neural Network (ConvGNN) has shown great potential for disease classification using transcriptomics data and known PPI networks from existing databases. In this study, researchers first reconstructed the COPD-associated PPI network through the AhGlasso (Augmented High-Dimensional Graphical Lasso Method) algorithm based on one independent transcriptomics dataset including COPD cases and controls. Then they extended the existing ConvGNN methods to successfully integrate COPD-associated PPI, proteomics, and transcriptomics data and developed a prediction model for COPD classification. This approach improves accuracy over several conventional classification methods and neural networks that do not incorporate network information. They also demonstrated that the updated COPD-associated network developed using AhGlasso further improves prediction accuracy. Although deep neural networks often achieve superior statistical power in classification compared to other methods, it can be very difficult to explain how the model, especially graph neural network(s), makes decisions on the given features and identifies the features that contribute the most to prediction generally and individually. To better explain how the spectral-based Graph Neural Network model(s) works, they applied one unified explainable machine learning method, SHapley Additive exPlanations (SHAP), and identified CXCL11, IL-2, CD48, KIR3DL2, TLR2, BMP10 and several other relevant COPD genes in subnetworks of the ConvGNN model for COPD prediction. Finally, Gene Ontology (GO) enrichment analysis identified glycosaminoglycan, heparin signaling, and carbohydrate derivative signaling pathways significantly enriched in the top important gene/proteins for COPD classifications.

Pigmented rice (*Oryza sativa* L.) is a rich source of nutrients, but pigmented lines typically have long life cycles and limited productivity. Here we generated genome assemblies of 5 pigmented rice varieties and evaluated the genetic variation among 51 pigmented rice varieties by resequencing an additional 46 varieties. Phylogenetic analyses divided the pigmented varieties into four varietal groups: Geng-japonica, Xian-indica, circum-Aus and circum-Basmati. Metabolomics and ionomics profiling revealed that black rice varieties are rich in aromatic secondary metabolites. We established a regeneration and transformation system and used CRISPR–Cas9 to knock out three flowering time repressors (Hd2, Hd4 and Hd5) in the black Indonesian rice Cempo Ireng, resulting in an early maturing variety with shorter stature. Our study thus provides a multi-omics resource for understanding and improving Asian pigmented rice.