

Office of Research

colorado school of public health

APR - JUN 2025

Publication Highlights

DEPARTMENT OF EPIDEMIOLOGY



Long-Term Exposure to Uranium and Arsenic in Community Drinking Water and CKD Risk Among California Women

Danielle N. Medgyesi, Sumit Mohan, Komal Bangia, Emma S. Spielfogel, Maya Spaur, Anirban Basu, Jared A. Fisher, Jessica M. Madrigal, Arce Domingo-Relloso, Rena R. Jones, Mary H. Ward, James V. Lacey, and Tiffany R. Sanchez
American Journal of Kidney Diseases

ABSTRACT:

Rationale & Objective: Metals/metalloids in drinking water, including uranium and arsenic, may damage kidney function and increase chronic kidney disease (CKD) risk. We evaluated exposure to these contaminants in community water supplies (CWS) and CKD risk in the California Teachers Study.

Study Design: Prospective cohort study.

Setting & Participants: 88,185 women who were California teachers and school administrators enrolled 1995-1996.

Exposure: Time- and residence-weighted annual average uranium and arsenic concentrations from CWS serving participants' residential addresses from 1995 to 2005.

Outcome: 6,185 moderate to end-stage CKD cases from hospitalization records between 2005 and 2018.

Analytical Approach: Hazard ratios and 95% confidence intervals calculated using mixed-effects Cox models, adjusted for age as the time scale, body mass index, smoking status, race and ethnicity, neighborhood socioeconomic status, and census region as a random effect. Analyses were also stratified by risk factors and comorbidities.

Results: Most exposures in this population were below the current regulatory limits (uranium: 30µg/L; arsenic: 10µg/L), with median concentrations of 3.1µg/L (IQR, 0.9-5.6µg/L) for uranium and 1.0µg/L (IQR, 0.6-1.8µg/L) for arsenic. Uranium exposure was positively associated with CKD risk (continuous log, per IQR; HR, 1.11 [95% CI, 1.02-1.20]). Compared with uranium exposure <2µg/L (World Health Organization 1998 guideline), the risk was over 30% greater at 10 to <15µg/L (HR, 1.33 [95% CI, 1.15-1.54]) and similar at ≥15µg/L (HR, 1.32 [95% CI, 1.09-1.58]). There was no evidence of a significant association between arsenic and CKD overall (log, per IQR; HR, 1.02 [95% CI, 0.98-1.07]). However, the risk from arsenic was greater among younger individuals (≤55 years) and those who developed cardiovascular disease or diabetes.

Limitations: Individual tap water use and consumption; limited generalizability to men and non-White and less affluent populations.

Conclusions: Uranium below the current regulatory limit from community water may increase CKD risk.

LIFECOURSE EPIDEMIOLOGY OF ADIPOSITY AND DIABETES CENTER

GLP-1R Polymorphisms Modify the Relationship Between Exposure to Gestational Diabetes Mellitus and Offspring BMI Growth: The EPOCH Study

Kylie K. Harrall, Deborah H. Glueck, Leslie A. Lange, Elizabeth M. Litkowski, Lauren A. Vanderlinden, Iain R. Konigsberg, Melanie G. Cree, Wei Perng, and Dana Dabelea

Diabetes Care

Abstract

Objective: Exposure to maternal gestational diabetes mellitus (GDM) is associated with childhood BMI. Among youth, we explored whether three different glucagon-like peptide 1 receptor gene (GLP-1R) polymorphisms modified the associations between 1) GDM and BMI trajectories and 2) GDM and markers of glucose-insulin homeostasis.

Research Design and Methods: For 464 participants from the Exploring Perinatal Outcomes Among Children (EPOCH) study, microarray genotyping was performed during childhood (< 10 years). BMI trajectories across childhood and adolescence were characterized using repeated measurements from research visits and medical record abstraction. Markers of glucose-insulin homeostasis were derived from one oral glucose tolerance test in adolescence (< 16 years). Linear models assessed effect modification by GLP-1R polymorphisms.

Results: Among youth with at least one minor allele of rs10305420 (CT or TT) or rs1042044 (CA or AA), but not among major allele homozygotes, exposure to GDM was associated with higher average BMI. For rs6923761, participants who were exposed to GDM and were major allele homozygotes (i.e., genotype GG) had significantly higher average BMI than all other participants in the cohort. No polymorphisms modified the association between GDM and markers of glucose-insulin homeostasis during adolescence.

Conclusions: GLP-1R polymorphisms modify the association between GDM and BMI growth among youth. Further studies are needed to replicate these findings, and to better understand the mechanisms by which GLP-1R polymorphisms lead to heterogeneity in offspring BMI growth.

DEPARTMENT OF EPIDEMIOLOGY

Conflict and the Environment: The Tragic Example of Gaza

Jonathan M. Samet

American Journal of Public Health

Introductory Paragraph:

As I write this commentary in April 2025, the Global Conflict Tracker of the Council on Foreign Relations lists more than 25 conflicts, some armed and others not (<https://bit.ly/3ETkGaA>). We learn about them as they flare, human casualties rise, and notable destruction occurs. We infrequently hear about the environmental consequences of conflict, even though they may be devastating and leave uninhabitable lands. For general background on conflict and the environment, Meaza et al. review 193 publications on the topic between 1914 and 2023, and Levy's book, *From Horror to Hope*, provides a public health framing of the consequences of war.^{1,2} The evidence is clear: conflict does create public health crises.

DEPARTMENT OF EPIDEMIOLOGY

Foodborne Illness Acquired in the United States- Major Pathogens, 2019

Elaine J Scallan Walter, Zhaohui Cui, Reese Tierney, Patricia M Griffin, Robert M Hoekstra, Daniel C Payne, Erica B Rose, Carey Devine, Angella Sandra Namwase, Sara A Mirza, Anita K Kambhampati, Anne Straily, and Beau B Bruce

Emerging Infectious Diseases

Abstract

Estimating the number of illnesses caused by foodborne pathogens is critical for allocating resources and prioritizing interventions. We estimated the number of illnesses, hospitalizations, and deaths in the United States caused by 7 major foodborne pathogens by using surveillance data and other sources, adjusted for underreporting and underdiagnosis. *Campylobacter* spp., *Clostridium perfringens*, invasive *Listeria monocytogenes*, norovirus, nontyphoidal *Salmonella* serotypes, and Shiga toxin–producing *Escherichia coli* caused ≈9.9 million (90% credible interval [CrI] 5.9–15.4 million) domestically acquired foodborne illnesses in 2019. Together with *Toxoplasma gondii*, those pathogens caused 53,300 (90% CrI 35,700–74,500) hospitalizations and 931 (90% CrI 530–1,460) deaths. Norovirus caused most illnesses (≈5.5 million illnesses, 22,400 hospitalizations), followed by *Campylobacter* spp. (1.9 million illnesses, 13,000 hospitalizations) and nontyphoidal *Salmonella* serotypes (1.3 million illnesses, 12,500 hospitalizations). *Salmonella* infection was the leading cause of death ($n = 238$). Foodborne illness estimates can inform policy and direct food safety interventions that reduce those illnesses.

COLORADO STATE UNIVERSITY

Green Hospitals: Maximizing Health and Climate Benefits Globally

David Rojas-Rueda

Science of the Total Environment

Abstract

Climate change poses unprecedented challenges to global health, with the healthcare sector itself contributing significantly to greenhouse gas emissions. This perspective presents an innovative, adaptable framework for integrating sustainable and climate-friendly practices into healthcare settings across diverse economic contexts. We examine energy efficiency, waste management, water sustainability, supply chain optimization, telemedicine, and biophilic design in healthcare. The framework provides implementation strategies, cross-cutting climate innovations, and explores interconnections between climate-smart healthcare, health equity, and global sustainability. Our findings suggest that implementing climate-smart healthcare can lead to significant reductions in carbon emissions, enhanced resilience to climate-related health threats, and improved health outcomes globally. We conclude that the healthcare sector can transform from a significant contributor to climate change into a leader in climate mitigation and adaptation, creating a more sustainable, resilient, and equitable global health system.

DEPARTMENT OF EPIDEMIOLOGY & LIFECOURSE EPIDEMIOLOGY OF ADIPOSITY AND DIABETES CENTER

Prenatal and Perinatal Factors of Life's Essential 8 Cardiovascular Health Trajectories

Izzuddin M. Aris, Sheryl L. Rifas-Shiman, Sarah D. de Ferranti, Marie-France Hivert, and Wei Perng
JAMA Network Open

Abstract

Importance: The American Heart Association put forth the Life's Essential 8 construct to assess cardiovascular health (CVH) based on 8 biological and behavioral factors. Few studies have identified prenatal and perinatal factors of CVH trajectories across childhood and adolescence, life stages where disease precursors and health behaviors are established.

Objective: To examine associations of prenatal and perinatal factors with child CVH trajectory.

Design, Setting, and Participants: Data from the Project Viva prebirth cohort from April 1999 to August 2021 were used. Participant inclusion required 3 or more CVH metrics in early childhood (median [range] age, 3.2 [2.8-6.2] years) or 4 or more in midchildhood (median [range] age, 7.7 [6.6-10.9] years), early adolescence (median [range] age, 13.0 [11.9-16.6] years), or late adolescence (median [range] age, 17.5 [15.4-20.1] years). Data were analyzed from April 1 to September 30, 2024.

Exposures: Prenatal and perinatal factors.

Main Outcomes and Measures: CVH score (0-100 points), calculated as the unweighted average of all available CVH metrics at each life stage.

Results: Among 1333 children included, 680 (51.0%) were male, 78 (5.9%) Hispanic, 181 (13.6%) non-Hispanic Black, and 959 (71.9%) non-Hispanic White. The estimated mean (SD) age of inflection when CVH started to decline was 10.2 (0.7) years for male children and 10.0 (0.6) years for female children. Prepregnancy overweight or obesity (vs healthy or underweight), smoking during pregnancy (vs never), and formula-feeding (vs breastfeeding) in the first 6 months were each associated with lower CVH from childhood to adolescence, but gestational diabetes (vs normal glucose tolerance) was not associated with CVH. Prepregnancy obesity was associated with later inflection ($\beta = 0.1$; 95% CI, 0.0 to 0.2 years) and slower CVH decline after inflection ($\beta = 0.2$; 95% CI, 0.1 to 0.4 points per year). Gestational hypertension or preeclampsia (vs normal blood pressure) was associated with faster CVH gain before inflection ($\beta = 0.3$; 95% CI, 0.1 to 0.5 points per year), earlier inflection ($\beta = -0.1$; 95% CI, -0.2 to 0.0 years), and faster CVH decline after inflection ($\beta = -0.3$; 95% CI, -0.5 to -0.1 points per year), while smoking during pregnancy was associated with later inflection ($\beta = 0.2$; 95% CI, 0.1 to 0.3 years).

Conclusions and Relevance: In this cohort study, prepregnancy overweight or obesity, smoking during pregnancy, and formula-feeding in the first 6 months of life were each associated with adverse CVH trajectories early in life. Future work should examine whether interventions that address these factors would be effective in optimizing CVH in children.

DEPARTMENT OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH

Cumulative Human Health Risk Assessment of Regional Ozone and Volatile Organic Compounds from Unconventional Oil and Gas Sites in Colorado's Front Range

Meagan L Weisner, Paige M Varner, I-Ting Ku, Jeffrey L Collett Jr, Brent Buck, and Lisa M McKenzie
Environmental Health Perspectives

Abstract

Background: Most unconventional oil and gas (UOG) extraction in Colorado occurs within the Denver Metro/North Front Range (DMNFR) ozone Nonattainment Area (NAA). Previous UOG human health risk assessments do not consider cumulative risk from both volatile organic compounds (VOCs) and criteria air pollutants like ozone.

Methods: We conducted a cumulative human health risk assessment (CHHRA) using regulatory-grade 1- and 8-h ozone measurements from a DMNFR US Environmental Protection Agency (US EPA) monitoring station and weekly and short-term (15 s-1 min) VOC air quality monitoring data collected between 2018-2023 from 10 near-pad air monitoring sites, three community sites, and one background site. Acute and chronic noncancer hazard indices (HIs) for multiple health end points, as well as cancer risks, were calculated during well drilling, well completions, and production activity periods and compared between sites. VOC concentrations were compared between operations that used a petroleum-based drilling fluid vs. a synthetic drill fluid. Differences in weekly chemical concentrations between sites, UOG phases, and drill muds were analyzed using repeated measures analysis of variance with post hoc pairwise comparisons with Bonferroni adjustment.

Results: Acute HIs of VOCs and ozone ranged from 1.34×10^{-4} – 41.34×10^{-4} to 31.33 at the 95th percentile concentrations at all sites. One of the three community monitoring sites, Anthem, exceeded US EPA thresholds for respiratory, immunological, and developmental end points during production and for the immunological end point during well completions. At the near-pad sites, acute hazards exceeded US EPA thresholds during well completions for immunological, respiratory, reproductive, developmental, and neurological end points. Neurological and immunological HIs were above thresholds for the drilling phase at near-pad sites. Chronic HIs ranged from 8.43×10^{-4} – 48.43×10^{-4} to 0.47 at 95th percentile concentrations and, therefore, were below the HI threshold for all near-pad and community sites for all health end points. Cancer risks ranging from 209 to 335 in a million at 95th percentile concentrations were above US EPA thresholds for all sites, including the background site, which is more heavily influenced by Denver Metro traffic emissions.

Conclusions: Our results suggest that for communities located near UOG well pads in the DMNFR ozone NAA, acute health risks persist after the implementation of best management practices to reduce emissions. Greater protection to public health could be afforded by establishing policies that require drilling and well completions to be conducted outside the summer ozone season. Further research is needed to address potential health risks from the use of synthetic drilling fluid.

DEPARTMENT OF HEALTH SYSTEMS, MANAGEMENT, AND POLICY

Cost-Effectiveness of Universal Routine Depression Screening for Adolescents in Primary Care

Tran T. Doan, David W. Hutton, Davene R. Wright, and Lisa A. Prosser

JAMA Health Forum

Abstract

Importance: Approximately one-fifth of adolescents in the US experience a major depressive episode each year. Universal depression screening for adolescents is recommended as part of routine pediatric primary care, but its cost-effectiveness is unclear.

Objective: To evaluate the cost-effectiveness of universal routine depression screening in adolescent primary care compared with usual care.

Design, Setting, and Participants: This economic evaluation used a decision-analytic model with an embedded state-transition submodel and annual transitions. A hypothetical population of 1000 adolescents and young adults from ages 12 to 22 years, including 12 demographic groups of disaggregated combinations of sex (female and male) and race or ethnicity (American Indian or Alaska Native; Asian, Native Hawaiian, or Pacific Islander; Black or African American; Hispanic, Latino, or Spanish; White; and multiracial or other race or ethnicity) was simulated in pediatric primary care settings.

Exposures: Universal depression screening of varying frequencies, including annual, biennial, and single-time screening at age 12 years, compared with usual care, defined as 20% annual screening rate.

Main Outcomes and Measures: Costs, health effects as measured by quality-adjusted life-years (QALYs) and depression-free days, and incremental cost-effectiveness ratios (ICERs) from the health care sector and limited societal perspectives.

Results: A universal annual screening policy had an ICER of \$66,822 per QALY or \$84 per depression-free day gained compared with single-time screening from the limited societal perspective, including caregiver time costs. Universal single-time screening had an ICER of \$44,483 per QALY and \$62 per depression-free day gained compared with usual care. Targeted universal depression screening was more cost-effective for female individuals and those who identified as Hispanic, Latina, or Spanish, multiracial, or other race or ethnicity. Results were sensitive to treatment recovery rates, depression health state utility scores, treatment costs involving psychotherapy, suicide-related hospitalization costs, and initial depression prevalence at age 12 years. In approximately 99.8% of probabilistic simulations, universal annual screening had an ICER less than \$150,000 per QALY threshold.

Conclusions and Relevance: The study results suggest that universal annual depression screening for adolescents in primary care is cost-effective compared with a \$100 000 per QALY willingness-to-pay threshold. Universal annual screening may be more cost-effective if health systems invest in efforts to enhance family access to telemedicine behavioral health, decrease treatment costs, or improve treatment effectiveness. Future analyses could examine whether additional potentially associated demographic factors, such as gender orientation, sexual identity, rurality, or comorbidities, affect cost-effectiveness outcomes.

Temporal Association Between Maternal Depression and Paternal Postpartum Depression

Kris F. Wain, Matthew F. Daley, and Marcelo Coca Perraiillon

American Journal of Preventive Medicine

Abstract

Introduction: Paternal postpartum depression may affect 28% of fathers, but its temporal association with maternal postpartum depression is not well understood. This study aimed to quantify the temporal association between maternal postpartum depression and paternal postpartum depression, considering mother's depression history and other clinical factors.

Methods: Data for this retrospective cohort study were obtained from Kaiser Permanente Colorado health records between 2008 and 2019. The cohort included father–mother dyads having live-birth pregnancies. Diagnostic codes identified postpartum depression during the 12 months after childbirth. Complementary log–log models with inverse probability of treatment weighting estimated the relative risk of paternal postpartum depression by maternal postpartum depression, stratified by maternal depression history. Statistical analyses were performed between 2022 and 2024.

Results: The sample included 15,257 father–mother dyads contributing 19,352 pregnancies, in which neither parent had a history of postpartum depression. Among these pregnancies, 326 paternal postpartum depression diagnoses (1.7%) and 1,731 maternal postpartum depression diagnoses (8.9%) were identified. Paternal postpartum depression was more common in dyads with maternal postpartum depression (3.0%) than in dyads without (1.6%). Maternal postpartum depression was associated with an 81% increase in paternal postpartum depression (relative risk=1.81; 95% CI=1.14, 2.87) if the mother had no history of depression. However, no association was observed if the mother had a history of depression.

Conclusions: Among a cohort of father–mother dyads having live-birth pregnancies, maternal postpartum depression was associated with increased paternal postpartum depression but only if the mother had no history of depression. Study findings highlight the need to develop depression screening tools for fathers that consider risk factors for both parents.

Racial Differences in Psychosocial Resources and Mental and Physical Health Outcomes During Pregnancy: A Structural Equation Modeling Approach

Charlotte V. Farewell, Sarah J. Schmiede, and Jenn A. Leiferman
Maternal Health, Neonatology, and Perinatology

Abstract

Objectives: Poor prenatal health is of particular concern among minoritized individuals who may experience adverse social determinants of health contributing to the intergenerational transmission of health disparities. The purpose of this study was to investigate associations between psychosocial resources, and mental and physical health among a prenatal sample, and to explore if these relationships vary by race.

Methods: English-speaking pregnant individuals living in the United States were recruited using Centiment (n = 340). Participants completed a 121-item cross-sectional survey. We conducted a single- and multi-group structural equation model to test hypothesized relationships, and then investigated differences by pregnant White individuals versus Black, Indigenous, and People of Color (BIPOC).

Results: Our final single-group model exhibited good model fit ($\chi^2(43) = 99.07$, $p < .01$, CFI = 0.97, SRMR = 0.04, and RMSEA = 0.06 (0.05–0.08)). After controlling for demographic characteristics and social determinants of health, higher levels of mindfulness were statistically significantly related to lower anxiety and depression scores (both $p < .01$). Higher levels of social supports were statistically significantly related to lower anxiety scores. Scale measurement invariance was confirmed for the multi-group model and the structural model was statistically significantly different between pregnant White individuals and BIPOC in this sample ($\Delta \chi^2(27) = 116.71$, $p < .01$).

Conclusions: Identification of core components of psychosocial resource interventions, consideration of upstream structural determinants, mindfulness and valued-living (MVL)-based strategies, cultural adaptation, and an emphasis on resilience rather than psychopathology may result in improved prenatal health among pregnant individuals traditionally underrepresented in research.