

# Office of Research

## colorado school of public health

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# Publication Highlights

## DEPARTMENT OF EPIDEMIOLOGY



**High Impact Journal Recognition: American Journal of Clinical Nutrition  
(Impact Factor: 8.472)**

### Associations of Infant Feeding Practices With Abdominal and Hepatic Fat Measures in Childhood in the Longitudinal Healthy Start Study

Cohen, Catherine C.; Harrall, Kylie K.; Hu, Houchun; Glueck, Deborah H.; Perng, Wei; Shankar, Kartik; Dabelea, Dana

**Background:** Infant feeding patterns have been linked with obesity risk in childhood, but associations with precise measures of body fat distribution are unclear.

**Objective:** We examined associations of infant feeding practices with abdominal fat and hepatic fat trajectories in childhood.

**Methods:** This study included 356 children in the Healthy Start Study, a prospective prebirth cohort in Colorado. Infant feeding practices were assessed by postnatal interviews and categorized as any human milk <6 mo compared with ≥6 mo; complementary foods introduced ≤4 mo compared with >4 mo; soda introduced ≤18 mo compared with >18 mo. Abdominal subcutaneous (SAT) and visceral adipose tissue (VAT) areas and hepatic fat (%) were assessed by magnetic resonance imaging in early and middle childhood (median 5 and 9 y old, respectively). We examined associations of infant feeding with adiposity trajectories across childhood using linear mixed models.

**Results:** In the sample of children, 67% consumed human milk ≥6 mo, 75% were introduced to complementary foods at >4 mo, and 81% were introduced to soda at >18 mo. We did not find any associations between duration of any human milk consumption and childhood adiposity trajectories. Early introduction to complementary foods (≤4 mo) was associated with faster rates of change for SAT and VAT during childhood (Slope [95% CI]: 15.1 [10.7,19.4] cm<sup>2</sup>/y for SAT; 2.5 [1.9,2.9] cm<sup>2</sup>/y for VAT), compared with introduction at >4 mo (5.5 [3.0,8.0] cm<sup>2</sup>/y and 1.6 [1.3,1.9] cm<sup>2</sup>/y, respectively). Similarly, early introduction to soda (≤18 mo) was associated with faster rates of change for all 3 outcomes during childhood (Slope [95% CI]: 20.6 [15.0,26.1] cm<sup>2</sup>/y for SAT, 2.7 [2.0,3.3] cm<sup>2</sup>/y for VAT, 0.3 [0.1,0.5] %/year for hepatic fat) compared with delayed introduction (5.4 [2.8,8.0] cm<sup>2</sup>/y, 1.7 [1.3, 2.0] cm<sup>2</sup>/y, -0.1 [-0.2,0.0] %/y, respectively).

**Conclusions:** The timing of introduction and quality of complementary foods in infancy was associated with rates of abdominal and hepatic fat accrual during childhood. Experimental studies are needed to assess underlying mechanisms.

# LIFECOURSE EPIDEMIOLOGY OF ADIPOSITY & DIABETES CENTER

## Maternal Prenatal Social Experiences and Offspring Epigenetic Age Acceleration From Birth to Mid-Childhood

Laubach, Zachary M.; Bozack, Anne; Aris, Izzuddin M.; Slopen, Natalie; Tiemeier, Henning; Hivert, Marie - France; Cardenas, Andres; Perng, Wei  
ANNALS of Epidemiology

**Purpose:** Investigate associations of maternal social experiences with offspring epigenetic age acceleration (EAA) from birth through mid-childhood among 205 mother-offspring dyads of minoritized racial and ethnic groups. **Methods:** We used linear regression to examine associations of maternal experiences of racial bias or discrimination (0 = none, 1–2 = intermediate, or 3+ = high), social support (tertile 1 = low, 2 = intermediate, 3 = high), and socioeconomic status index (tertile 1 = low, 2 = intermediate, 3 = high) during the prenatal period with offspring EAA according to Horvath's Pan-Tissue, Horvath's Skin and Blood, and Intrinsic EAA clocks at birth, 3 years, and 7 years. **Results:** In comparison to children of women who did not experience any racial bias or discrimination, those whose mothers reported highest levels of racial bias or discrimination had lower Pan-Tissue clock EAA in early (0.50 years; 90% CI: 0.91, 0.09) and mid-childhood (0.75 years; 1.41, 0.08). We observed similar associations for the Skin and Blood clock and Intrinsic EAA. Maternal experiences of discrimination were not associated with Pan-Tissue EAA at birth. Neither maternal social support nor socioeconomic status predicted offspring EAA. **Conclusions:** Children whose mothers experienced higher racial bias or discrimination exhibited slower EAA. Future studies are warranted to confirm these findings and establish associations of early-life EAA with long-term health outcomes.

## COLORADO STATE UNIVERSITY

## Pilot Study of Heat-Stabilized Rice Bran Acceptability in Households of Rural Southwest Guatemala and Estimates of Fiber, Protein, and Micro-Nutrient Intakes among Mothers and Children

Pfluger, Brigitte A.; Giunta, Alexis; Calvimontes, Diva M.; Lamb, Molly M.; Delgado-Zapata, Roberto; Ramakrishnan, Usha; Ryan, Elizabeth P.  
Nutrients

Nutrient-dense, acceptable foods are needed in low-resource settings. Rice bran, a global staple byproduct of white rice processing, is rich in amino acids, fibers, and vitamins, when compared to other cereal brans. This pilot study examines the nutritional contribution of rice bran to the daily diets of mother-child pairs in rural southwest Guatemala. Thirty households were screened. Mothers ( $\geq 18$  years) and children (6 to 24 months) completed 24 h dietary recalls at baseline and after 12 weeks (endline) for diet intake and diversity analyses. During biweekly visits for 12 weeks, households with  $< 5$  members received 14 packets containing 60 g of heat-stabilized rice bran, and those with  $\geq 5$  members received 28 packets. The macro- and micro-nutrient contributions of rice bran and whole, cooked black beans were included in dietary simulation models with average intakes established between the recalls and for comparison with dietary reference intakes (DRIs). A baseline child food frequency questionnaire was administered. The 27 mothers and 23 children with complete recalls were included in analyses. Daily maternal consumption of 10 g/d of rice bran plus 100 g/d of black beans resulted in all achieving at least 50% of the fiber, protein, magnesium, niacin, potassium, and thiamin DRIs. Daily child consumption of 3 g/d of rice bran plus 10 g/d of black beans resulted in all achieving at least 50% of the magnesium, niacin, phosphorous, and thiamine DRIs. For 15/17 food categories, male children had a higher intake frequency, notably for animal-source foods and coffee. Dietary rice bran coupled with black beans could improve nutritional adequacy, especially for fiber and key micro-nutrients, with broader implications for addressing maternal and child malnutrition in low-resource settings.

## **Assessing Vulnerability For Future Zika Virus Outbreaks Using Seroprevalence Data and Environmental Suitability Maps**

Roell, Yannik; Pezzi, Laura; Lozano-Parra, Anyela; Olson, Daniel; Messina, Jane; Quandelacy, Talia; Drexler, Jan Felix; Brady, Oliver; Karimzadeh, Morteza; Jaenisch, Thomas  
PLOS Neglected Tropical Diseases

The 2015-17 Zika virus (ZIKV) epidemic in the Americas subsided faster than expected and evolving population immunity was postulated to be the main reason. Herd immunization is suggested to occur around 60-70% seroprevalence, depending on demographic density and climate suitability. However, herd immunity was only documented for a few cities in South America, meaning a substantial portion of the population might still be vulnerable to a future Zika virus outbreak. The aim of the study was to determine the vulnerability of populations to ZIKV by comparing the environmental suitability of ZIKV transmission to the observed seroprevalence, based on published studies. Using a systematic search, we collected seroprevalence and geospatial data for 119 unique locations from 37 studies. Extracting the environmental suitability at each location and converting to a hypothetical expected seroprevalence, we were able to determine the discrepancy between observed and expected. This discrepancy is an indicator of vulnerability and divided into three categories: high risk, low risk, and very low risk. The vulnerability was used to evaluate the level of risk that each location still has for a ZIKV outbreak to occur. Of the 119 unique locations, 69 locations (58%) fell within the high risk category, 47 locations (39%) fell within the low risk category, and 3 locations (3%) fell within the very low risk category. The considerable heterogeneity between environmental suitability and seroprevalence potentially leaves a large population vulnerable to future infection. Vulnerability seems to be especially pronounced at the fringes of the environmental suitability for ZIKV (e.g. Sao Paulo, Brazil). The discrepancies between observed and expected seroprevalence raise the question: "why did the ZIKV epidemic stop with large populations unaffected?". This lack of understanding also highlights that future ZIKV outbreaks currently cannot be predicted with confidence.

## **Location-Aware Encoding for Lesion Detection in 68Ga-DOTATATE Positron Emission Tomography Images**

Xing, Fuyong; Silosky, Michael; Ghosh, Debashis; Chin, Bennett B.

IEEE Transactions On Biomedical Engineering

**Objective:** Lesion detection with positron emission tomography (PET) imaging is critical for tumor staging, treatment planning, and advancing novel therapies to improve patient outcomes, especially for neuroendocrine tumors (NETs). Current lesion detection methods often require manual cropping of regions/volumes of interest (ROIs/VOIs) a priori, or rely on multi-stage, cascaded models, or use multi-modality imaging to detect lesions in PET images. This leads to significant inefficiency, high variability and/or potential accumulative errors in lesion quantification. To tackle this issue, we propose a novel single-stage lesion detection method using only PET images.

**Methods:** We design and incorporate a new, plug-and-play codebook learning module into a U-Net-like neural network and promote lesion location-specific feature learning at multiple scales. We explicitly regularize the codebook learning with direct supervision at the network's multi-level hidden layers and enforce the network to learn multi-scale discriminative features with respect to predicting lesion positions. The network automatically combines the predictions from the codebook learning module and other layers via a learnable fusion layer.

**Results:** We evaluate the proposed method on a real-world clinical 68Ga-DOTATATE PET image dataset, and our method produces significantly better lesion detection performance than recent state-of-the-art approaches.

**Conclusion:** We present a novel deep learning method for single-stage lesion detection in PET imaging data, with no ROI/VOI cropping in advance, no multi-stage modeling and no multi-modality data.

**Significance:** This study provides a new perspective for effective and efficient lesion identification in PET, potentially accelerating novel therapeutic regimen development for NETs and ultimately improving patient outcomes including survival.

## A Sexual Empowerment Process Predicting Heterosexual Women's Sexual Pleasure

Grose, Rose Grace  
Psychology & Sexuality

Gender-based inequities within patriarchy create barriers to women's sexual well-being. This study integrated empowerment theory with research on heterosexual women's sexuality to examine multiple factors related to sexual pleasure. An empowerment process is one mechanism through which less powerful individuals gain influence and power that results in increased opportunities to control decisions that affect their lives. Although psychologists have been studying empowerment for decades, sexual empowerment has been under-explored. In this study, 253 heterosexual undergraduate women completed a questionnaire assessing sexual empowerment dimensions, including critical consciousness about gender and sexuality, sexual subjectivity, sexual assertiveness, and sexual pleasure. Data were analyzed with structural equation modelling. A mediated sexual empowerment process in which critical consciousness was indirectly related to sexual pleasure through two mediators, sexual subjectivity and sexual assertiveness, was supported. To the extent that women can reject heteronormative beliefs and conform less to patriarchal norms of sexual fidelity, they may be able to realize more sexual subjectivity, assertiveness, and pleasure. This study has implications for rights-based sexual education and pleasure-inclusive clinical practice.

## DEPARTMENT OF HEALTH SYSTEMS, MANAGEMENT & POLICY

## Examining Characteristics of Local Public Health Systems With Exceptional Tribal Organization Participation

Bauer, Kyla L.; Mitchell, Amelia L.; Mays, Glen P.  
Journal of Public Health Management and Practice

**Objective:** To learn feasible ways to increase multisector community partnership with tribal organizations, meaning tribal health authorities or American Indian and Alaska Native (AI/AN)-serving organizations, by examining characteristics of local public health systems with exceptional tribal organization participation.

**Design, setting, and participants:** In total, 728 local public health departments were surveyed in 2018 to generate a nationally representative sample of local public health systems in the United States. A positive deviance approach using logistic regression helped identify local public health systems that had tribal organization participation despite characteristics that make such participation statistically unlikely. Local public health systems with exceptional tribal organization participation were compared with systems with conventional participation, examining measures known to impact the formation of public health partnerships.

**Main outcome measure:** This study used an exploratory logistic regression approach to identify unique characteristics of local public health systems with exceptional tribal organization participation.

**Results:** Of 728 health systems surveyed, 21 were identified as having exceptional tribal organization participation. Across varying thresholds to identify exceptional participation, having a higher network density and prioritizing equity in public health activities were found to consistently distinguish exceptional tribal organization participation in both nonrural and rural areas.

**Conclusions:** Public health partnerships with tribal organizations are possible even in circumstances that make them unlikely. Efforts to build denser networks of collaborating organizations and prioritize equity may help public health systems achieve success with tribal organization partnerships.

# COLORADO INTEGRATED FOOD SAFETY CENTER OF EXCELLENCE & CENTER FOR PUBLIC HEALTH PRACTICE & ROCKY MOUNTAIN PUBLIC HEALTH TRAINING CENTER

## **Improving Occupational Health Surveillance for Enteric Infections**

White, Alice E.; Jervis, Rachel H.; Wilson, Elisha; Walter, Elaine Scallan  
Zoonoses and Public Health

**Aims:** Enteric pathogens with a livestock reservoir pose a unique risk to people in occupations with regular contact with animals. However, public health surveillance of occupational exposures is inadequate, with surveillance for occupation typically focusing on the risk of transmission and the need for worker exclusion, rather than workplace exposures. To improve surveillance for occupational zoonoses, the Colorado Integrated Food Safety Center of Excellence convened a group of subject matter experts who developed a set of variables on occupation, industry, and exposures, which were integrated into Colorado's surveillance system in 2017. We evaluated the quality and completeness of these new occupational fields for interviewed cases with laboratory-confirmed zoonotic infections and compared occupations to cases with a non-zoonotic infection (*Shigella*) and to employment data from the Bureau of Labor Statistics.

**Methods and Results:** From March 2017 through December 2019, 3668 domestically acquired, laboratory-confirmed sporadic infections of *Campylobacter*, *Cryptosporidium*, Shiga toxin-producing *Escherichia coli*, and non-typhoidal *Salmonella* among individuals  $\geq 14$  years of age were interviewed by public health. We found asking explicitly about occupational exposure risks and focusing on animal exposures, improved data quality and accuracy. Of the cases who stated that they were employed, 262 (13%) reported working in an occupation with regular animal exposure, and 254 (14%) reported an industry with regular animal exposure. Cases with an animal exposure occupation were more likely to be male and live in a rural or frontier county compared to other occupations. All occupations with regular animal contact were reported at a higher frequency than among *Shigella* cases or the general population.

**Conclusions:** Public health efforts, both in occupational health and communicable disease sectors, should be made to improve surveillance for enteric zoonoses and identify opportunities for prevention strategies.

### **Impacts:**

- Specific questions about occupations and industries with regular animal exposure improve data quality and accuracy of public health surveillance for occupational exposure to enteric zoonoses. National efforts to improve surveillance for occupational zoonoses would allow public health to evaluate and recommend policies and procedures and target future control strategies to improve worker health.
- Cases with an enteric zoonosis infection were more likely to work in occupations with animal contact compared to those with other infections and to the general population. More research is needed to understand the impact of underreporting by occupation.
- Public health efforts should be made to improve surveillance for enteric zoonoses and identify prevention strategies.

**The NIOSH Worker Well-Being Questionnaire (WellBQ): A Psychometric Assessment with the Early Childhood Education Workforce**

Powers, Jamie N.; Farewell, Charlotte V.; Mauirro, Emily; Brogden, Diane; Puma, Jini E.  
Early Childhood Education Journal

The well-being of the early childhood education (ECE) workforce is of great importance to the field, yet existing measures to capture well-being are varied in conceptual and contextual constructs. There is a need to measure well-being among ECE employees holistically and to be able to compare to other industries. The National Institute for Occupational Safety and Health Worker Well-being Questionnaire (NIOSH WellBQ) is an assessment of workforce well-being through 5 domains that measure the quality of work life, physical and mental health, and conditions outside of work. In this psychometric analysis, we administered the NIOSH WellBQ to 332 ECE staff. We used confirmatory factor analysis to assess the validity of the five NIOSH domains: (1) Work Evaluation and Experience; (2) Workplace Policies and Culture; (3) Workplace Physical Environment and Safety Climate; (4) Health Status; and (5) Home, Community, and Society. Thirteen items were removed from the original survey due to low variability and poor factor loadings to create our final instrument. Model fit of our final model resulted in an AIC of 30780.44, a RMSEA of 0.06, a CFI of 0.78, and an SRMR of 0.07, indicating adequate model fit. Findings indicate that an adapted version of the NIOSH WellBQ has high construct validity and, therefore, can serve as a holistic framework and measurement tool for assessing worker well-being and informing well-being promotion programs among the ECE workforce.

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**Factors Associated With Postpartum Depression Among High-Risk Women During the COVID-19 Pandemic**

Farewell, Charlotte; Tong, Suhong; Sehart, Madeleine; Siegart, Jamie; Nicklas, Jacinda  
Women & Health

The purpose of this study was to investigate the impacts of the COVID-19 pandemic on multi-level factors associated with depression among a high-risk sample of postpartum women using longitudinal data collected at two timepoints. High-risk postpartum participants in the United States were recruited to participate in a parent study focused on mitigating risk of cardiometabolic disease in postpartum women. Individuals completed a baseline survey which included the Edinburgh Postpartum Depression Scale (EPDS) at 6-weeks postpartum between 2017 through 2019. A modified survey with the inclusion of selected questions from the Coronavirus Health Impact Survey (CRISIS) questionnaire was administered again during the first 6-months of the COVID-19 pandemic and individuals who completed both the baseline assessment and the COVID-19 assessment were included for analyses ( $n = 46$ ). Multivariate models were run to investigate the impacts of individual-, interpersonal-, and structural-level factors on change in EPDS scores across the postpartum period. Findings suggest that losing contact with social supports ( $\beta = 4.5$ ,  $SE = 1.9$ ,  $p = .02$ ) and individuals who reported a total household income of less than \$75,000 ( $\beta = 3.4$ ,  $SE = 1.7$ ,  $p = .05$ ) were more likely to report significantly worsening postpartum depression scores compared to others. Recommendations to mitigate the stressors that have been amplified by the COVID-19 pandemic and resulting mental health disparities include screening all high-risk postpartum women for depression and anxiety during both postpartum and pediatric healthcare visits, providing informational flyers with tips related to healthy coping behaviors and free/affordable community resources, and linking individuals to peer-led support groups.