Annual Meeting Abstract Book

2018

Baltimore, Maryland

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Plenary Session 1

EFFECT OF A HOME PREGNANCY TEST INTERVENTION ON COHORT RETENTION AND DETECTION OF PREGNANCY LOSS Lauren Wise, Kenneth Rothman, Amelia Wesselink, Ellen Mikkelsen, Sydney Willis, Elizabeth Hatch (Boston University School of Public Health)

Objective: We conducted a pilot study to assess the extent to which randomization of cohort study participants to receive home pregnancy tests (HPT) improves retention, increases detection of spontaneous abortion (SAB), and advances the timing of SAB detection. Methods: The study population comprised female participants from Pregnancy Study Online (PRESTO), a North American web-based preconception cohort study. Eligible women were aged 21-45 years, trying to conceive, and not using fertility treatment. Women completed a baseline questionnaire and follow-up questionnaires every 2 months for up to 12 months or until pregnancy, whichever came first. After enrollment, 401 U.S. participants with ≤6 cycles of attempt time at entry were randomized to receive either 12 Clearblue visual HPTs with guidance to test the day after a missed menstrual period (N=198) or the standard protocol (N=203). On follow-up questionnaires, women reported their pregnancy status, if they had experienced a SAB since their last questionnaire and, if so, the gestational weeks at SAB. We performed an intent-to-treat analysis to compare randomized groups. We defined cohort retention as completion of ≥1 follow-ups. Results: After a median of 32 weeks of follow-up, cohort retention was higher among women randomized to receive HPTs (N=166; 83.8%) relative to the standard protocol (N=139; 68.5%) (mean difference=15.4%, 95%CI=7.1%-23.6%). Conception was reported by 62.7% in the HPT arm and 53.3% in the standard protocol arm. Among women who conceived, SAB was reported by 22 (21.2%) in the HPT arm (gestational weeks at SAB: median=5.0, range: 4-10) and 13 (17.8%) in the standard protocol arm (gestational weeks at SAB: median=5.0, range=4-9). The number of SABs reported at <8 weeks' gestation was higher in the HPT arm (N=18) than in the standard protocol arm (N=11). Conclusions: Randomization of HPTs to participants in a web-based preconception cohort study may increase cohort retention and SAB detection.

NEITHER LOW (<7) NOR VERY LOW (<4) 5-MINUTE APGAR SCORE ACCURATELY OR CONSISTENTLY PREDICTS NEONATAL MORBIDITY OR MORTALITY Marit Bovbjerg, Mekhala Dissanayake, Jennifer Brown, Melissa Cheyney, Jonathan Snowden (Oregon State University)

Background: Dr. Apgar created her namesake score in 1953 for use in clinical practice. However, researchers quickly adopted low (<7) and very low (<4) Apgars as proxy endpoints for neonatal morbidity. We sought to determine, in modern US clinical practice, which cutoff better predicts adverse neonatal outcomes. Method: We used two datasets, to assess predictive ability across practice settings and provider types. The first comprises 48,587 home or birth center births; the second contains linked birth certificate and discharge data from 444,500 hospital births. Outcomes included neonatal transfer to a higher-level facility (including transfers from community settings to any hospital), asphyxia, meconium aspiration syndrome, respiratory distress syndrome, seizure, sepsis, NICU admission, prolonged hospitalization, and neonatal death. For each outcome, separately for each dataset, we dichotomized the 5-minute Apgar at every possible cutpoint (e.g., 10 vs. <10; 9 or 10 vs. <9, etc.), creating 2x2 tables for the score (as the "test") vs. the known outcome. We drew Receiver Operating Characteristic curves, and then calculated the "best" cutoff for each outcome using 3 different criteria: Youden's index, the closest to (0,1) criterion, and Liu's accuracy criterion. Result: Little variation was observed among "best" cutoffs chosen by the 3 criteria, and nearly-identical results were observed when comparing the two datasets. For almost all outcomes, the "best" cutoff was a 5-minute Apgar score of <9, though discrimination was still poor (30-60%). For no outcomes, in either dataset, did any of the 3 criteria indicate that <7 or <4 would provide optimal discrimination between those infants who experienced the outcome vs. those who did not. Conclusion: At no cutoff did 5-minute Apgar scores yield sufficiently-accurate discrimination of our study outcomes for research purposes. If investigators use Apgar scores as proxy measures, a cutoff of <9 yields the best predictive ability.

IMPACT ON NEONATAL MORBIDITY OF DELAYING EARLY TERM PLANNED BIRTHS–A PROPENSITY-MATCHED LINKED DATA ANALYSIS Deborah Randall, Jane Ford, Jonathan Morris (University of Sydney)

Background: Over the past two decades in New South Wales (NSW) Australia, there has been a major change in birth practices with more women having planned births (inductions or prelabor cesareans) before 40 weeks. At the same time, neonatal morbidity has increased. Our study aimed to assess the impact on neonatal morbidity of delaying early term planned births by 1 week. Methods: This was a retrospective cohort study using linked birth, hospital and deaths data from July 2002 to June 2015 in NSW. We used propensity score matching to compare outcomes for planned births at 36-38 weeks' gestation, with planned births one week later, excluding stillbirths and births with major congenital anomalies, prelabor rupture of membranes and placenta previa. Pregnancies were matched on 16 covariates including mother's age, parity, chronic diseases, diabetes and hypertension. A validated composite indicator was used to ascertain neonatal morbidity, and Poisson regression accounting for matched pairs was used to calculate rate ratios (RR) and 95% confidence intervals (CI). Results: There were 284 118 planned births of 36 to 39 weeks gestation in the study period. Comparing planned births across gestational week showed that earlier births were more likely to be to younger and older mothers, mothers with a chronic disease, or those with diabetes and hypertension during pregnancy. After propensity score matching, those infants born at 37 weeks had less than half the rate of morbidity (RR 0.46, 95% CI 0.43-0.50), those born at 38 weeks had 0.54 (0.50-0.58) times the rate of morbidity, and those born at 39 weeks had 0.70 (0.66-0.74) times the rate of morbidity, as matched infants with planned births 1 week earlier. Discussion: While early planned births are more common in more complicated pregnancies, our study suggests that overall rates of neonatal morbidity could be reduced among some pregnancies if planned births could be delayed safely for 1 week.

Plenary Session 2

PRECONCEPTION URIC ACID IS ASSOCIATED WITH ANOVULATION BUT NOT TIME TO PREGNANCY IN EUMENORRHEIC WOMEN

Matthew Connell, Keewan Kim, Torie Plowden, Lindsey Sjaarda, Neil Perkins, Carrie Nobles, Sunni Mumford, Enrique Schisterman (NIH)

Background: Uric acid is a heterocyclic compound that is the end product of purine metabolism. Uric acid has been shown to stimulate a pro-inflammatory hormonal milieu leading to vascular inflammation and damage. It has previously been shown that in healthy volunteers, uric acid was associated with anovulation. Whether this anovulation leads to a delay in pregnancy is not known. Our aim is to determine if preconception uric acid concentration is associated with anovulation and time to pregnancy in a cohort of women attempting pregnancy. Materials and Methods: This was a prospective cohort study of 1,228 women enrolled in the EAGeR Trial. Women ages 18-40 years with regular menstrual cycles, 1-2 prior pregnancy losses, and no diagnosis of infertility were randomized to daily preconception low-dose aspirin versus placebo and followed for up to six menstrual cycles. Uric acid concentrations were measured at baseline. We assessed anovulation using fertility monitor data and urinary progesterone concentrations where available. To investigate the association between uric acid and anovulation, a log-binomial regression model with robust error variance was used to estimate risk ratios (RR) and 95% confidence intervals (CI). For time to pregnancy, we used discrete Cox proportional hazard regression models to calculate fecundability odds ratios (FOR) and 95% CI. All models were adjusted for age, BMI, race, physical activity, alcohol intake, income, education, treatment arm, and serum cholesterol. Results: Anovulation occurred in 12.6% of cycles. A log-unit increase of uric acid concentration was associated with a higher risk of anovulation (RR 1.87, 95% CI 1.16, 3.02). However, uric acid was not associated with time to pregnancy (FOR 0.97, 95% CI 0.65, 1.44). Conclusions: We observed that uric acid was associated with a risk of sporadic anovulation, but not with a longer time to pregnancy, in eumenorrheic women. Support: Intramural Research Program, DIPHR, NICHD, NIH

ASSOCIATION BETWEEN SMOKING AND OVARIAN RESERVE AMONG FEMALES SEEKING FERTILITY TREATMENT, AND INTERACTION WITH N- ACETYLTRANSFERASE 2(NAT2) GENOTYPE

Islamiat Oladipupo, T'shura Ali, Henry Bohler, Kelly Pagidas, David Hein, Merry Lynn Mann, Adrienne Gentry, Yelena Dondik, Jasmine Chiang, Kira Taylor (University of Louisville)

Background: Studies of associations of smoking with ovarian reserve have been inconsistent. NAT2, a polymorphic phase 2 metabolic enzyme, is important in the metabolism and detoxification of xenobiotic substances found in tobacco smoke. The purpose of the study was to examine the association of smoking with ovarian reserve among women seeking fertility treatment, and examine a possible interaction between smoking and NAT2 genotype. Methods: Demographic and smoking data, including the number of cigarettes smoked and duration, were collected by questionnaire on 135 women seeking fertility treatment. Urine was obtained, and cotinine was assayed to verify smoking status. DNA was extracted from urine, and 4 single nucleotide polymorphisms in NAT2 were genotyped to determine acetylator status (slow, intermediate, or fast). Serum anti-Müllerian hormone (AMH)levels were extracted from medical record. Diminished ovarian reserve (DOR) was defined as baseline AMH <1ng/mL. Logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for the associations of current smoking and cumulative life-time exposure and DOR adjusting for age, polycystic ovary syndrome status and parity, and examine effect modification by NAT2. Results: 28% of participants were smokers. For every additional cigarette currently smoked, the odds of DOR increased by 11% (OR=1.11; 95% CI:1.01-1.21, p=0.03). For every 1 pack-year increase in lifetime exposure, the odds of DOR increased by 8% (OR=1.08; 95%CI: 0.98-1.20). There was no significant interaction with NAT2; however, among slow acetylators, the association between smoking and DOR was OR=0.55 (95% CI:0.04-6.96); whereas in intermediate/fast acetylators, it was OR=2.57 (95% CI:0.38-17.30). Conclusions: In this ongoing study, smoking is associated with diminished ovarian reserve. Effect modification by NAT2 acetylator status continues to be explored.

ENVIRONMENTAL EXPOSURES RELATED TO THE 9/11 TERRORIST ATTACKS AND AGE AT MENOPAUSE

Melanie Jacobson, Jiehui Li, James Cone (New York City Department of Health)

Research indicates that chemical exposures may influence age at menopause. The 9/11 terrorist attacks resulted in a large chemical release from the collapse of the towers and subsequent clean-up activities, thus exposing the surrounding community to a complex mixture of potentially endocrine-disrupting compounds. This study examined female participants from the World Trade Center Health Registry, a longitudinal cohort of first responders, residents, area workers, and others present in lower Manhattan on 9/11. On three surveys administered during 2003-2012, participants reported their 9/11-related environmental exposures including location and activity on 9/11 and in subsequent weeks and the degree of dust and debris exposure; an environmental hazards score was developed for rescue and recovery workers. Participants also reported whether they had experienced menopause and at what age. To be eligible, women had to complete all surveys and be premenopausal at the start of follow-up (n=8,276). We fit adjusted Cox proportional hazards models to evaluate associations between measures of 9/11-related exposures and age at menopause, stratified by participation in rescue and recovery. The average age at menopause for rescue and recovery workers (N=2,082) was 52.8 years, and 53.1 for residents and area workers (N=6,194). Rescue and recovery workers with higher environmental hazards scores had similar ages at menopause compared with those with lower scores (interquartile range: hazard ratio (HR)=0.92, 95% confidence interval (CI): 0.80, 1.07). Similarly, among community members, intense dust exposure on 9/11 was not associated with age at menopause (HR=1.03, 95% CI: 0.90, 1.17). However, current versus never smoking was associated with earlier menopause in both groups (rescue and recovery workers: HR=1.87, 95% CI: 1.43, 2.44; community members: HR=1.19, 95% CI: 1.01, 1.41). Measures of environmental exposure from the 9/11 terrorist attacks were not related to age at menopause.

REPRODUCTIVE FACTORS AND INCIDENCE OF EARLY NATURAL MENOPAUSE

Christine R. Langton, Brian W. Whitcomb, Alexandra C. Purdue-Smithe, Susan E. Hankinson, JoAnn E. Manson, Bernard A. Rosner, Elizabeth R. Bertone-Johnson (University of Massachusetts, School of Public Health and Health Sciences)

Early menopause, defined as the cessation of ovarian function before the age of 45, affects roughly 10% of women and is associated with higher risk of premature mortality, cognitive decline, osteoporosis, and cardiovascular disease. The reproductive aging process may be delayed by factors that prevent ovulation and slow the depletion of the ovarian follicle pool. Higher parity and longer duration of breastfeeding are reproductive risk factors that may lower the risk of early menopause. Few studies have assessed this relationship and results have been conflicting. Our study included 108,811 participants in the prospective Nurses' Health Study II who were 25-44 years old and premenopausal in 1989. Baseline and follow-up questionnaires assessed parity, age at childbirth, and duration of breastfeeding. We used Cox proportional hazards models to estimate hazard ratios (HR) and 95% confidence intervals (CI) adjusted for factors including age, smoking, body mass index, age at menarche and dietary factors. During 1.5 million person-years of follow-up, 2794 members of the analytic cohort experienced early natural menopause. In multivariable-adjusted models, higher parity and longer duration of breast feeding were each associated with lower risk of early menopause. Compared to nulliparous women, those reporting 1, 2, 3 and 4 or more births had HR for early menopause of 0.97 (95% CI: 0.84-1.11), 0.83 (95% CI: 0.73-0.95), 0.77 (95% CI: 0.66-0.90) and 0.87 (95% CI: 0.71-1.06), respectively. Among parous women, risk decreased with increasing duration of breastfeeding, with women who breastfed for ≥24 months having a significant 18% lower risk of early menopause compared to women who breastfed for <1 month (HR=0.82, 95% CI: 0.71-0.96). In this large prospective cohort, we observed an inverse relationship with parity, breastfeeding and risk of early menopause. These findings are significant in helping to elucidate the complex physiology of early menopause.

FERTILITY INDICATORS AND FECUNDABILITY IN THE PRESTO COHORT Sydney Willis, Joseph Stanford, Elizabeth Hatch, Kenneth Rothman, Lauren Wise (Boston University)

Couples attempting to conceive often use fertility indicators, self-assessed biomarkers for ovulation or the fertile window. There is a lack of evidence comparing the effect of the different biomarkers on fecundability. We sought to assess the effect of using different fertility indicators on fecundability among participants in Pregnancy Online Study (PRESTO), a North American internet-based prospective preconception cohort. Eligible participants included women aged 21-45, in a stable relationship with a male partner, and not using fertility treatment. Our analysis was restricted to 4,345 women attempting pregnancy for ≤6 months at study entry. Baseline and bi-monthly follow-up questionnaires collected information on demographic and lifestyle characteristics and information on fertility indicators used to improve chances of pregnancy: basal body temperature (BBT), cervical fluid, cervical position, urine ovulation (luteinizing hormone) testing, electronic fertility monitors, and charting or tracking days of the cycle. Fertility indicator use was assessed bimonthly until a reported pregnancy, fertility treatment initiation, twelve cycles of attempt time, or loss-to-follow-up, whichever came first. A proportional probabilities model was used to estimate fecundability ratios (FR) and 95% confidence intervals (CI). At baseline, relative to not using the stated fertility indicator and mutually adjusting for all other indicators and demographic and lifestyle factors, FRs for BBT, cervical fluid, cervix position, ovulation testing, and charting cycles were 0.95 (CI: 0.86-1.06), 1.03 (CI: 0.94-1.13), 1.07 (CI: 0.95-1.21), 0.99 (CI: 0.91-1.08), and 1.32 (CI: 1.19-1.46). The FR for using any fertility indicator relative to none was 1.28 (CI: 1.17-1.40). Similar results were found using a time-varying model. Our results indicate a potential relationship between charting cycles and improved fecundability, but suggest no additional benefit of specific fertility indicators.

S/T=Student/Trainee

Plenary Session 3

DOWN SYNDROME AMONG PRIMIPARAE AT OLDER MATERNAL AGE: A TEST OF RELAXED SELECTION Tim Bruckner, Nathalie Lelong, Babak Khoshnood (UC Irvine)

The risk of Down syndrome increases substantially with maternal age. Explanations for this age-related increase typically invoke chromosomal drive (CD) for trisomy 21. An alternative explanation, which remains sparsely tested, involves relaxed selection of chromosomally abnormal conceptuses among older mothers nearing reproductive senescence. According to relaxed selection, older mothers with no previous children reduce fetal selectivity against trisomy 21 given the high probability of having no subsequent offspring. We exploit the parity prediction of relaxed selection—specifically, that primiparae of older mothers would show the highest prevalence of Down syndrome relative to higher parity gestations—and examine Down syndrome by parity and maternal age in Paris, France (1983-2015). We retrieved maternal age and parity information on 2,748 Down syndrome cases (born live, stillborn, and terminated due to anomaly) from the Paris Birth Defects Registry. We also used several waves of the Enquête Fertility Survey (unweighted n=5,460 Parisian mothers) and counts of stillbirths (from the National Institute of Statistics) to calculate total prevalence of Down syndrome by maternal age and parity. As with earlier reports, the prevalence of Down syndrome rises strongly with maternal age. Consistent with relaxed selection, primiparae mothers 35+ years show the greatest prevalence of any parity group (i.e., 9.8 cases per 1,000 deliveries, relative to 8.0 per 1,000 for all other parities in that age group). Tests for additive interaction of primiparity and older maternal age also reject the null (relative excess risk due to interaction= 1.01; 95% CI: 0.33, 1.69). Relaxed selection may account for 10% of the increase in the prevalence of Down syndrome among primiparae delivered to older mothers. Future work on relaxed selection may hold implications not only for basic science but also for efforts to restore, among older mothers, a stricter maternal screen.

PREDICTION OF RISK OF PRETERM BIRTH USING INDIVIDUAL AND NEIGHBOURHOOD LEVEL RISK FACTORS: KNOWLEDGE ABOUT PREGNANT WOMEN'S NEIGHBOURHOOD MATTERS Kamala Adhikari Dahal, Scott Patten, Tyler Williamson, Shahirose Premji, Suzanne Tough, Nicole Letourneau, Gerald Giesbrecht, Amy Metcalfe (University of Calgary)

Introduction Existing studies have examined the association between preterm birth (PTB) and neighborhood socioeconomic status (SES); however, our understanding of the ability of neighborhood SES to predict PTB is limited. Objective To assess the ability of neighborhood SES to predict PTB Methods Individual-level data from two prospective cohort studies in Alberta, Canada (All Our Families and Alberta Pregnancy Outcome and Nutrition (n=5,538)) were linked to neighborhood SES data measured by the Pampalon deprivation index. Multilevel logistic regression models that included individual-level predictors (e.g., parity, ethnicity, income, and smoking) and random intercept for neighborhood, with or without neighborhood SES were developed. The predictive ability of the models was assessed using area-under the receiver operating characteristic curve (AUC) and the agreement between predicted and observed PTB. Results The rates of PTB in the least and most deprived-neighborhoods were 7.54% and 10.64%, respectively. In the model that excluded neighborhood SES, neighborhood-level variance in PTB was 0.11, with intra-class correlation (ICC)=3.40% and median odds ratio (MOR)=1.38. After the addition of neighborhood SES, neighborhood-level variance in PTB was 0.16 (ICC=4.65% and MOR=1.47). However, an association between neighborhood SES and PTB was not significant (OR=1.08, 95% CI=0.70, 1.67). The predictive ability of the models with or without neighborhood SES was significantly different (AUC=71.00% vs 68.35%, p<0.001). Both models had adequate model calibration as suggested by an agreement between predicted and observed PTB. Conclusion Neighborhood SES explained some proportion of neighborhood-level variance in PTB, and improved the prediction of PTB. Addition of other neighborhood-level risk-factors may further optimize risk prediction. By understanding the context in which pregnant women live, healthcare providers may effectively identify woman most at-risk of delivering preterm.

OPERATIVE VAGINAL DELIVERY, OBSTETRIC TRAUMA, AND BIRTH TRAUMA Giulia Muraca, (University of British Columbia)

Background: The inverse relationship between rates of operative vaginal delivery (OVD) and cesarean delivery (CD) has led to recommendations for increasing OVD rates as a strategy to reduce the CD rate. These recommendations assume that OVD has greater relative safety compared with CD; however, recent studies have shown high rates of trauma following OVD. Objective: To quantify the associations between population rates of operative vaginal delivery and obstetric trauma and birth trauma. Methods: OVD, obstetric trauma and birth trauma frequencies among live born, term, singletons in four Canadian provinces were obtained using information from the Canadian Institute for Health Information between 2004 and 2014 (n=1,938,913). The primary outcomes were obstetric trauma (e.g., severe perineal lacerations) and severe birth trauma (e.g., intracranial hemorrhage). Adjusted rate ratios (ARR) and 95% confidence intervals (CI) were estimated using ecological Poisson regression. In addition, absolute percent rate increases and excess cases of trauma were calculated. Results: Among nulliparous women, OVD rates were positively associated with obstetric trauma (ARR 1.06, 95% CI 1.05-1.06; i.e., 1% absolute increase in OVD was associated with a 6% relative increase in obstetric trauma; approximately 708 excess cases of obstetric trauma per year). This association was stronger in parous women. ARRs were lower following vacuum compared with forceps delivery. OVD rates were also associated with severe birth trauma in nulliparous women (ARR 1.05, 95% CI 1.03-1.07; approximately 18 excess cases of birth trauma per year) but not in parous women. Conclusion: Increased rates of OVD are associated with higher rates of obstetric trauma, as well as severe birth trauma in nulliparous women. Recommendations to reduce CD rates by increasing rates of OVD should be tempered by the understanding that such actions will result in higher rates of obstetric trauma.

PRENATAL AND NEONATAL LEVELS OF INFLAMMATION AND NEWBORN DNA METHYLATION Edwina Yeung, (NICHD)

Prenatal inflammation may be detrimental. Newborn DNA methylation may point to which pathways are impacted but whether it only reflects proximal exposures around delivery or the influence of prenatal inflammation is unclear. We examined DNA methylation using the Infinium MethylationEPIC BeadChip in DNA extracted from cord blood of 391 singletons from the EAGeR Trial (2007-2011). The trial randomized women with previous pregnancy loss to low dose aspirin (LDA) or placebo prior to conception. Maternal levels of high sensitivity c-reactive protein (hsCRP) were measured before pregnancy and at 8, 20 and 36 weeks gestation Homocysteine was measured prior to pregnancy. Cord blood levels of hsCRP and other cytokines (i.e., interferon-gamma, interleukin (IL)-1a, IL-2, IL-4, IL-5, IL-10, IL-15, IL-23, TNFa) were measured by a multiplex ELISA. We tested methylation differences with respect to randomization to LDA or placebo and both maternal and neonatal measures of inflammatory markers. Linear mixed models were used to test for associations at each CpG site with adjustment for estimated cell count (using a cord blood reference), maternal age, race, sex and smoking, while correcting for batch effects with random effects and multiple testing with Bonferonni method. Randomization to LDA was not associated with methylation differences. Higher maternal homocysteine was associated with lower methylation at the POLR2B gene (p=6.7x10^-9) and hsCRP at 36 weeks was associated with lower methylation in a region near DNAJC25 and GNG10 (p=3.2x10^-9). Many significant associations were identified with cord blood levels of inflammatory markers including 24 CpGs for hsCRP, 6 for interferon-gamma, 5 for IL-2, 6 for IL-4, 3 for IL-5, 1 for IL-10, 8 for IL-15, and 4 for IL-23. The strongest association was for neonatal hsCRP and decreased methylation at a CpG near SLC12A9 and TRIP6 (p=1.8x10^-52). Cord blood DNA methylation strongly reflects newborn inflammation rather than prenatal levels.

CHARACTERIZATION OF OVARIAN GROWTH AND DEVELOPMENT OF FOLLICLES IN GIRLS FROM BIRTH TO 9 MONTHS Helen Chin, (National Institute of Environmental Health Sciences, NIH, Research Triangle Park, NC)

Childhood ovarian development may influence adult ovarian function, but there are limited descriptions of healthy ovarian growth in girls, particularly during infancy. We used data from the Infant Feeding and Early Development Study, a longitudinal cohort study of estrogen-responsive outcomes in healthy infants, to estimate ovarian growth trajectories and describe the presence of ovarian follicles in girls 0-9 months old. There were 136 girls who completed the study and were included in the analysis. Ultrasounds were performed on the infants within 72 hours of birth and at 4, 16, 24, and 32 weeks. Ovarian volume was calculated as the geometric mean of the right and left ovary at each ultrasound visit. The number of ovarian follicles present was recorded as none, 1-3, or more than 3, and the diameter of the largest follicle was measured. A week-specific analysis was done to assess the association between follicle size and ovarian volume. We used mixed-effects regression splines to examine the overall age trajectory of ovarian volume. The mean ovarian volume increased from 0.2 cm3 (SD=0.2) at birth to a maximum mean value of 1.0 cm3 (SD=0.6) at 16 weeks, which was followed by a slight shrinking and leveling off in later weeks. The largest follicle varied in size over the 9-month study period from a mean diameter of 0.3 cm (SD=0.1) at birth to 0.6 cm (SD=0.2) at week 16. We observed a positive association between the diameter of the largest follicle and overall ovarian volume at each individual study visit. Among girls with observable ovaries at the first visit, the growth trajectory differed by the number of follicles identified (none vs. 1-3, $p < 0.01$; none vs. more than 3, $p < 0.01$). Our results show an increase in infant ovarian volume shortly after birth, which may be driven by the number and size of developing follicles. Further research is needed to understand the stimulus for early increases in follicular and ovarian development.

Plenary Session 4

MATERNAL POLYCYSTIC OVARY SYNDROME AND RISK OF NEURODEVELOPMENTAL DISORDERS IN OFFSPRING: IN UTERO ANDROGEN EXPOSURE OR GENETIC CONFOUNDING? Carolyn Cesta, (Karolinska Institute)

Background Maternal polycystic ovary syndrome (PCOS) has been proposed as a model for investigating the role of prenatal androgen exposure on the development of neurodevelopmental disorders. However, women with PCOS are themselves at higher risk of developing a range of psychiatric disorders and previous studies might be confounded by genetic influences. Methods A nation-wide register-based cohort study in Sweden was conducted to disaggregate the influence of prenatal androgen exposure from familial confounding in the association between maternal PCOS and offspring attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders (ASD), Tourette's and chronic tic disorders (TD/CTD), obsessive-compulsive disorder (OCD), and eating disorders (ED). Offspring of women with PCOS (n=21,280) were compared with unrelated PCOS-unexposed offspring (n=200,816), and their PCOS-unexposed cousins (n=17,295). Associations were estimated with stratified Cox regression models. Results PCOS-exposed offspring had an increased risk of being diagnosed with ADHD (adjusted HR=1.35 [95%CI 1.23, 1.48]), ASD (aHR=1.47 [95%CI 1.28, 1.69]), or TD/CTD (aHR=1.43 [95%CI 1.01, 2.03]) when compared with PCOS-unexposed unrelated offspring. Similar estimates were found when comparing PCOS-exposed offspring with their PCOS-unexposed cousins (ADHD: aHR=1.26 [95%CI 1.11, 1.43]; ASD: aHR=1.30 [95%CI 1.07, 1.58]; TD/CTD: aHR=1.46 [95%CI 0.88, 2.43]). No associations were found between PCOS-exposed and unexposed unrelated offspring for OCD (aHR = 0.99 [95%CI 0.68, 1.43]) or ED (aHR=1.14 [95%CI 0.86, 1.52]). Conclusions Risk estimates were similar when accounting for familial confounding (i.e., genetics and environment shared by cousins), thereby strengthening the evidence for prenatal androgen exposure, and not maternal psychiatric illness, as the primary factor behind the association between maternal PCOS and offspring neuropsychiatric disorders.

FETAL GROWTH AND NEUROLOGIC DEVELOPMENT Marianna Cortese, Dag Moster, Allen J. Wilcox (Department of Nutrition, Harvard School of Public Health, Boston MA, USA, and Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway)

Fetal growth restriction is associated with infant mortality and morbidity, but later health outcomes have received less attention. We used a large population-based data set to explore a range of neurodevelopmental outcomes and their associations with birth weight at term. Data are from the national health registries of Norway, starting in 1967, and including the entire Norwegian population. We identified 1,826,073 singleton babies born at 39-41 weeks of gestational age by ultrasound measures (or by last menstrual period if ultrasound measures were unavailable), and who survived to age 4. There were strong trends of higher risk among smaller term births. When compared with babies at 3.5-<4.0 kg, babies at 1.5-<2.0 kg had odds ratios of 18 for cerebral palsy (95% confidence interval 11-30), 11 for mental retardation (7.0-16), 11 for vision or hearing disorders (5.5-21), 5.8 for epilepsy (2.9-12), 3.4 for attention deficit hyperactivity disorder (2.1-5.4), 3.3 for autism spectrum disorder (1.2-8.8), and 2.7 for schizophrenia (1.0-7.3). All estimates were adjusted categorically for year of birth (5-year groups). Results were minimally changed after further adjustments for sex, parity, maternal age, maternal marital status, immigrant status, and education of the mother and father. The results were similar when babies with malformations recorded at birth and surviving to age 4 were excluded from the analyses. Odds ratios were lower among preterm babies (34-36 weeks) at the same birth weight, suggesting that results are not due to misclassification by gestational age and effects related to preterm birth. Reduced fetal growth among term births appears to be a marker of prenatal events that can lead to later neurologic abnormalities.

METABOLOMIC PROFILES OF GESTATIONAL DIABETES MELLITUS EXPOSURE DURING LATE CHILDHOOD AND ADOLESCENCE IN THE EPOCH COHORT Wei Perng, Weiming Zhang, Katerina Kechris, Brandy M. Ringham, Dana Dabelea (Colorado School of Public Health)

Background: Intrauterine exposure to gestational diabetes mellitus (GDM) has implications for offspring metabolic health. Metabolomics can provide insight on relevant biochemical pathways. Here, we characterized metabolite patterns associated with GDM exposure among 100 youth in EPOCH, a prospective cohort of youth exposed to GDM. Methods: We carried out untargeted metabolomics profiling in fasting serum collected at median age 9.5 (T1) and 16.4 y (T2) among 50 exposed and 50 unexposed youth. Next, we used principal components analysis to consolidate the metabolites into factors. Finally, we identified factors that differed by GDM exposure at each time ($\alpha<0.05$) and explored significant associations using multivariable models that accounted for sex, age, and race, followed by concurrent body mass index (BMI). We evaluated for effect modification by sex and stratified models accordingly. Results: Mean age of participants was 9.8±1.5 y at T1 and 16.3±1.3 y at T2; 47% were male and 64% were White. We consolidated 1193 metabolites into factors and retained 7 at T1 and 9 at T2 based on Scree plots. Together, these factors accounted for 49.6% and 53.7% of the variance in the original data at each time, respectively. At T1, GDM was associated with 0.49 (95% CI: 0.02, 0.97) units higher score for Factor 2, which comprised compounds on branched chain amino acid (BCAA) pathways, like carboxyethylleucine, carboxyethylvaline, and carboxyethylisoleucine. Accounting for BMI slightly attenuated the estimate (0.43 [-0.03, 0.89]). At T2, GDM exposure corresponded with 0.69 (0.17, 1.22) higher Factor 6 score in boys. This factor comprised N-3 and N-6 polyunsaturated fatty acids (PUFA), including docosahexaenoate, arachidonate, and dihomolinolenate. Accounting for BMI did not change results. Conclusions: GDM exposure is associated with higher serum levels of metabolites on BCAA pathways during late childhood, and higher serum PUFAs during adolescence in males, independent of adiposity.

GESTATIONAL WEIGHT GAIN AND EARLY CHILDHOOD OVERWEIGHT/OBESITY: A SIBLING ANALYSIS Sylvia Badon, Charles Quesenberry, Monique Hedderson (Kaiser Permanente Northern California)

Several previous studies have observed associations of excessive gestational weight gain (GWG) with childhood obesity. However, previously observed associations may be confounded by genetics or shared family environment, which are difficult to measure. Using a sibling analysis approach allows for control of unmeasured genetic and environmental factors that remain constant over time. Using Kaiser Permanente Northern California electronic health records, we identified 13,804 women with more than one singleton birth from 2008-2015 (N=27,435 children). Total GWG was categorized according to 2009 Institute of Medicine (IOM) recommendations. Child height and weight at 3 years old was used to calculate body mass index (BMI)-for-age percentiles using the 2000 Centers for Disease Control Growth Charts. Childhood overweight/obesity was defined as BMI-for-age>85th percentile. Generalized estimating equations, accounting for clustering by mother and adjusted for maternal age and pre-pregnancy BMI, were used to estimate relative risk (RR) of childhood overweight/obesity associated with GWG. Children of women with GWG above IOM recommendations had 0.2 greater BMI z-score at 3 years old compared to children of women with GWG within recommendations. GWG above IOM recommendations was associated with 11% greater risk of child overweight/obesity at 3 years old (95% confidence interval (CI): 1.05, 1.18) compared to GWG within IOM recommendations. GWG below recommendations was not associated with childhood overweight/obesity (RR=0.95; 95% CI: 0.88, 1.02). Additional adjustment for child sex, gestational age at delivery, gestational diabetes mellitus, and birth order did not change results. Our results suggest that associations of excessive GWG with greater risk of childhood obesity are not explained by constant genetic and shared family environmental factors across pregnancies. Our findings support the need for interventions to limit excessive GWG for childhood obesity prevention.

PRENATAL EXPOSURE TO ORGANOPHOSPHATE ESTERS AND COGNITIVE AND BEHAVIORAL DEVELOPMENT Brett Doherty, (UNC Chapel Hill)

Background: Limited evidence suggests that organophosphate esters (OPEs) may be neurotoxic or endocrine-disrupting, and may interfere with cognitive and behavioral development in humans. Objective: To estimate the effect of maternal OPE metabolite levels during pregnancy on cognitive and behavioral development in offspring. Methods: Women provided a urine sample during pregnancy that was analyzed for concentrations of OPE metabolites (n=349), including diphenyl phosphate (DPHP), bis(1,3-dichloro-2-propyl phosphate) (BDCIPP), 1-hydroxyl-2-propyl bis(1-chloro-2-propyl) phosphate (BCIPHIPP), and isopropyl-phenyl phenyl phosphate (ip-PPP). Approximately 36 months after birth, assessments of cognitive development using the Mullen Scales of Early Learning (MSEL; n=341) and behavioral development using the Behavioral Assessment Scale for Children (BASC; n=332) were obtained. Generalized Linear Models were used to estimate associations between ln-transformed, specific gravity-corrected OPE metabolite concentrations and children's scores on the neurodevelopmental assessments, adjusted for maternal age, maternal race, maternal education, familial poverty, child's age at testing, and child's sex. Results: ip-PPP was inversely associated with scores on the MSEL Cognitive Composite (β=-4.6; SE=1.7), Expressive Language (β=-2.5; SE=0.9), and Fine Motor (β=-3.3; SE=1.2) scales. Other compounds were not associated with MSEL scales. Both DPHP and BDCIPP were significantly positively associated with Attention Problems and Atypicality Scores. BDCIPP was also positively associated with Aggression, Withdrawal, Externalizing, and Behavioral Symptoms Index scores. ip-PPP was inversely associated with scores on Anxiety, Depression, and Internalizing Problems. BCIPHIPP was not associated with any BASC measures. Conclusions: We identified several associations suggestive of adverse neurodevelopmental effects of prenatal exposure to OPEs that warrant further investigation for neurotoxicity.

S/T=Student/Trainee

Poster Session A

RISK FACTORS FOR CONGENITAL GLAUCOMA AND ANTERIOR CHAMBER DEFECTS IN THE NATIONAL BIRTH DEFECTS PREVENTION STUDY Nina Forestieri, Tania Desrosiers, Sharon Freedman, Arthur Aylsworth, Kristin Voltzke, Andrew Olshan, Robert Meyer (NC Department of Health and Human Services)

Objective: Primary congenital glaucoma (PCG) and other related anterior chamber defects (ACDs) are a rare but serious group of ocular malformations that can lead to blindness if left untreated. A number of genetic mutations have been implicated in this group of conditions, but very little is known about non-genetic risk factors. The purpose of this study is to investigate a range of potential demographic and clinical risk factors for PCG and other ACDs in the National Birth Defects Prevention Study (NBDPS). Methods: The NBDPS is a large population-based multisite case-control study of major birth defects in the United States. This analysis includes 187 case infants with PCG and other ACDs, and 10,084 control infants without birth defects from birth years 2000-2011. Information on pregnancy and infant clinical characteristics, demographic factors, and maternal health history was collected through maternal interview. Crude and adjusted odds ratios (aORs) and 95% confidence intervals (CIs) were computed to examine associations between potential risk factors and all cases, as well as PCG and ACD subgroups. Results: Positive associations with PCG and other ACDs include the following: winter season of conception (aOR=1.65, 95% CI 1.07-2.55), non-Hispanic black maternal race/ethnicity (aOR=1.66, 95% CI 1.03-2.68), maternal antihypertensive use (aOR=2.30, 95% CI 1.06-4.98), and maternal doxylamine use (aOR=2.66, 95% CI 1.38-5.10). In the subgroup analysis, maternal sexually transmitted infection (aOR=2.80, 95% CI 1.12-7.01) was associated with PCG, but not other ACDs. Conclusions: This study is among the first to examine a wide array of potential risk factors for PCG and other ACDs in a population-based sample. We have identified several possible associations that provide leads for further investigation. Future studies should also consider how the presence of genetic mutations known to be associated with these defects may affect associations observed in this study.

ATYPICAL ANTIPSYCHOTIC MEDICATION USE DURING PREGNANCY AND RISK FOR BIRTH DEFECTS—UNITED STATES, 1997–2011 Kayla Anderson, Elizabeth Ailes, Jennifer Lind, Cheryl Broussard, Rebecca Bitsko, Jan Friedman, William Bobo, Jennita Reefhuis, Sarah Tinker (National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention)

Background: Atypical antipsychotic medications are used to manage psychotic and mood disorders, which are often diagnosed in adolescence or early adulthood and may require ongoing treatment. Limited data are available about these medications' use and safety among pregnant women. Methods: We analyzed data from the National Birth Defects Prevention Study (1997–2011), a U.S. population-based multicenter case-control study. Cases were identified from birth defect surveillance systems; controls were randomly-sampled liveborn infants without major birth defects. Mothers completed a computer-assisted telephone interview. We estimated the prevalence of and maternal factors associated with atypical antipsychotic medication use during pregnancy for case and control mothers separately. We used logistic regression to assess associations between any early pregnancy atypical antipsychotic medication use and 14 selected specific birth defects. Results: Atypical antipsychotic medication use during pregnancy was rare (cases: 0.2%, controls: 0.2%). Among control mothers, illicit drug use before or during pregnancy [crude odds ratio (cOR): 9.6, 95% confidence interval (CI): 3.5–25.9], pre-pregnancy obesity [cOR: 4.0, 95% CI: 1.5–10.3], smoking during pregnancy [cOR: 3.2, 95% CI: 1.2–8.3], and comorbid medication use [e.g., anticonvulsant: cOR: 92.5, 95% CI: 31.5–271.9] were associated with atypical antipsychotic medication use during pregnancy. Case mother results were similar. Any early pregnancy atypical antipsychotic medication use was not associated with an increased risk for the 14 birth defects examined. Conclusions: Atypical antipsychotic medication use during pregnancy was rare but associated with risk factors for adverse maternal and infant outcomes. As women treated by antipsychotics likely access healthcare services before pregnancy, there may be opportunities for communication between providers and women about how to reduce other adverse pregnancy outcome risk factors.

SYMPTOMATIC ZIKA VIRUS DISEASE IN PREGNANT WOMEN AND PARTNERS – COLOMBIA 2016 Christina Sancken, Romeo Galang, Suzanne Gilboa, Maritza Gonzalez Duarte, Marcela Mercado Reyes, Jennita Reefhuis, Sarah Tinker, Van Tong, Diana Valencia, Martha Ospina Martinez (ORISE / CDC)

In 2016, Colombia's Instituto Nacional de Salud (INS) and the U.S. Centers for Disease Control and Prevention implemented Programa Vigilancia Intensificada de Embarazadas con Zika (VEZ), an enhanced surveillance system in three Colombian cities that built upon existing surveillance of pregnant women with symptomatic Zika virus disease. Because lab testing may not be immediately available, data regarding partner symptoms could be a useful surveillance tool in areas with Zika virus transmission and limited lab capacity. We describe symptoms among pregnant women's partners and examine relative timing of symptom onset among partners. From April to November 2016, women were enrolled if reported to the surveillance system or if seen in participating clinics for symptomatic illness. Symptom data among pregnant women and partners were collected at the time of enrollment through self-report and medical record abstraction. Of 1,224 pregnant women enrolled, 1,113 reported on partner symptoms. Of the 1,113, 51% reported no partner symptoms, 40% did not know, and 10% reported partner symptoms. Of 112 partners with symptoms reported, symptoms included fever (85%), rash (77%), headache (69%), joint pain (67%), myalgia (44%), and conjunctivitis (39%). Of 111 partners with any timing of symptom onset data available, 46% had symptom onset before the pregnant woman's trimester of onset, 41% had symptom onset in the same trimester, and 14% had symptom onset after the pregnant woman's trimester of onset. For 74 partners who had an exact date of symptom onset, the median number of days between partner and pregnant woman symptom onset was 0 days. In the context of a Zika epidemic, ongoing national surveillance based on pregnant women's and partners' symptoms, with and without lab confirmation, could be useful to identify at-risk pregnancies to monitor for adverse fetal and infant outcomes associated with Zika virus infection.

UPDATE FROM THE UNITED STATES ZIKA PREGNANCY AND INFANT REGISTRY Christopher Carr, Sascha Ellington, Abbey Jones, Anna Fulton, Megan Reynolds, Suzanne Gilboa, Margaret Honein, Ellen Lee, Amanda Elmore, Juliana Prieto, Esther Ellis, Braeanna Hillman, Scott Anesi, Noemi Hall, Kamesha Owens, Catherine Brown, Similoluwa Sowunmi, Nicole Longcore, Amelie Mafotsing-Fopoussi, Leah Lind, Dana Perella, Muhammad Ahmed, Shea Browne, Debbie Freeman (Centers for Disease Control and Prevention)

To collect information about pregnant women with laboratory evidence of recent possible Zika virus (ZIKV) infection and outcomes in their fetuses/infants, CDC established the United States Zika Pregnancy and Infant Registry (USZPIR) in collaboration with state, local, and territorial health departments. Data on pregnant women and fetal/infant outcomes from pregnancies completed January 2016-October 2017 were analyzed, including a subset of women with positive nucleic acid test confirming ZIKV infection (NAT-confirmed). Data are reported in aggregate for U.S. states and DC (States), and for U.S. territories (Territories). As of October 2017, in the States, USZPIR was following 1,993 completed pregnancies, including 1,878 liveborn infants; in the Territories, USZPIR was following 3,375 completed pregnancies, including 3,260 liveborn infants. Of all completed pregnancies, 107 (5%) fetuses/infants in the States and 145 (4%) fetuses/infants in the Territories had ZIKV-associated birth defects reported. Of 371 pregnancies with NAT-confirmed ZIKV infection in the States and 1,752 pregnancies with NAT-confirmed ZIKV infection in the Territories, 43 (12%) and 90 (5%) resulted in ZIKV-associated birth defects, respectively. Among pregnancies with NAT-confirmed ZIKV infection in the 1st trimester, 20 (16%) had ZIKV-associated birth defects in the States and 27 (7%) in the Territories. Neuroimaging was reported for 48% and 54% of liveborn infants in the States and Territories, respectively. At least one ZIKV laboratory test result was reported for 66% of liveborn infants in the States and 55% in the Territories. When compared to previously reported data from USZPIR, this analysis uses twice the completed pregnancies in the States and one-third more completed pregnancies in the Territories, and is consistent with previous findings on the frequency of birth defects among NAT-confirmed pregnancies in the States and Territories (10% and 5%, respectively).

CHILDREN WITH HEART CONDITIONS AND THEIR SPECIAL HEALTHCARE NEEDS— UNITED STATES, 2016 Meng-Yu Chen, (Centers for Disease Control and Prevention)

Background: Congenital heart disease (CHD) is the most common birth defect in the United States; the vast majority of children with CHD survive beyond infancy. Children also experience acquired heart conditions, such as myocarditis. Little is known about the total number of children living with a heart condition and their special healthcare needs. Methods: Using parent-reported data from the 2016 National Survey of Children's Health, we estimated the prevalence of diagnosed heart conditions among U.S. children aged 0-17 years. By heart condition status, we compared demographic characteristics, using chi-square tests, and the prevalence of five special healthcare needs (prescription medication use, more medical care than other children, activity limitations, needing special therapy, and needing counseling or treatment for developmental/behavior problem), using multivariable logistic regression. All analyses were conducted in SUDAAN to account for complex sampling and weighted to generate population-based estimates. Results: Of 48,487 children in the analysis, 2.4% (representing 1.7 million U.S. children) had heart conditions and were more commonly male (55%), non-Hispanic white (53%), and privately insured (53%). Of demographic characteristics, only insurance type differed significantly among children with and without heart conditions (privately insured: 53% and 62%, respectively; p<0.05). One or more special healthcare needs were reported among 51% of children with heart conditions compared to 19% of those without (adjusted prevalence ratio: 2.6; 95% confidence interval: 2.3-3.0). Commonly reported special healthcare needs of children with heart conditions were prescription medication use (36%), more medical care (33%), and activity limitations (24%). Conclusions: Of the 1.7 million U.S. children with heart conditions, half have special healthcare needs. These findings can inform public health resource planning to ensure that these children receive necessary services.

LINK BETWEEN MALE GENITAL ANOMALIES AND ADULT MALE REPRODUCTIVE DISORDERS: A POPULATION-BASED RECORD LINKAGE STUDY SPANNING OVER 40 YEARS Natasha Nassar, Francisco Schneuer, Elizabeth Milne, Sarra Jamieson, Gavin Pereira, Michele Hansen, Andrew Barker, Andrew Holland, Carol Bower (University of Sydney)

Background: Male genital anomalies, hypospadias and undescended testes (UDT) have been linked to testicular cancer (TC) and sub-fertility in adulthood and may share a common aetiology in early fetal life. We investigated the association between male genital anomalies and adult reproductive disorders; and impact of timing of UDT surgery on outcomes. Methods: We conducted a population-based cohort study of all liveborn males in Western Australia, 1970-2000 followed-up until 2016 via data linkage to administrative hospital, congenital anomaly, cancer and assisted reproductive technology (ART) registries. Study factors were hypospadias or UDT (with corrective surgery); and study outcomes: TC, paternity and ART for male sub-fertility. Cox regression (Hazard ratio, HR) was used to estimate the association between genital anomalies, TC and paternity; and log-binomial regression (relative risk, RR) to examine future ART use. Results: The cohort included 355,964 liveborn males; 7,505 (2.1%) with UDT, 2,494 (0.7%) hypospadias, 501 (0.1%) TC cases, 109,544 (31%) men fathering children (paternity) and 2,680 (0.8%) men having ART. Although, UDT was associated with increased rates of TC (HR 2.46; 95%CI 1.67-3.62), hypospadias was not (HR 1.42; 0.53-3.81). Both UDT and hypospadias were associated with 30% reduction in paternity (HR 0.72; 0.69-0.75 and HR 0.71; 0.64-0.77). UDT, but not hypospadias, was associated with an increased risk of ART use (RR 1.99; 1.66-2.38). For every 6 months of increasing age of UDT surgery, there was a 6% increase in risk of TC (HR 1.06; 1.04-1.09), 3% increase in ART use (HR 1.03; 1.02-1.05) and 2% reduction in paternity (RR 0.98; 0.98-0.99). Conclusion: UDT is associated with increased risk of TC and male sub-fertility in adulthood, while results for hypospadias were inconclusive due to small numbers. We provide new evidence to support early corrective surgery for UDT to decrease risk of malignancy and male sub-fertility later in life.

PA007

THE ASSOCIATION BETWEEN EXPOSURE TO NATURAL GAS WELLS AND SPECIFIC CONGENITAL ANOMALIES IN OKLAHOMA, 1997-2009 Amanda Janitz, Hanh-Dung Dao, Janis Campbell, Julie Stoner, Jennifer Peck (University of Oklahoma Health Sciences Center)

Introduction: Natural gas drilling may pose multiple health risks, including congenital anomalies, through exposure to air pollutants. We aimed to evaluate whether residence near natural gas wells is associated with congenital anomalies in Oklahoma, the third highest natural gas producing state in the US. Methods: We conducted a retrospective cohort study among singleton births in Oklahoma (n=483,919) to evaluate exposure to natural gas wells and congenital anomalies. We calculated an inverse distance weighted (IDW) score based on the number of producing wells within a two-mile radius of the maternal residence during the month of delivery. We used modified Poisson regression with robust error variance to estimate prevalence proportion ratios (PPR) and 95% confidence intervals (CI) for the association between tertiles of exposure (compared to no wells) and CHD, NTD, and oral clefts. Results: Compared to no exposure, exposure to the third tertile (7.6-450.1 wells per mile) was associated with transposition of the great arteries (PPR: 1.65, 95% CI: 1.03, 2.64), exposure to the second tertile (2.2-<7.6 wells per mile) with pulmonary valve atresia and stenosis (PPR: 2.60, 95% CI: 1.28, 5.30) and interrupted aortic arch (PPR: 2.24, 95% CI: 1.01, 4.99), and exposure to the first tertile (0.5-<2.2 wells per mile) with total anomalous pulmonary venous connection (PPR: 1.90, 95% CI: 1.01, 3.54). We observed no association with NTDs or oral clefts. Discussion: Our results support the findings of a previous study for CHDs, but not reported increased prevalence of NTDs. Future directions include evaluating specific phases of the drilling process to better refine the relevant exposure period.

PA008

UNCONTROLLED MATERNAL CHRONIC RESPIRATORY DISEASES IN PREGNANCY INCREASE THE RISK OF ANORECTAL MALFORMATIONS IN OFFSPRING Nel Roeleveld, Romy van der Putte, Ivo de Blaauw, Rianne Boenink, Monique Reijers, Paul Broens, Cornelius Sloots, Arno van Heijst, Marleen van Gelder, Iris van Rooij (Radboud university medical center, Nijmegen, The Netherlands)

Background: Chronic respiratory diseases and the use of anti-asthmatic medication during pregnancy may both play a role in the etiology of congenital anorectal malformations (ARM). However, it is currently unclear whether the medication use or the underlying condition would be responsible. Therefore, the aim of this study was to unravel the role of maternal chronic respiratory diseases from that of anti-asthmatic medication use in the etiology of ARM in offspring. Methods: We obtained 412 patients with ARM and 2,137 population-based controls from the AGORA (Aetiologic research into Genetic and Occupational/environmental Risk factors for Anomalies in children) data- and biobank in the Netherlands. We used maternal questionnaires and follow-up telephone interviews to obtain information on chronic respiratory diseases, such as asthma and chronic bronchitis, anti-asthmatic medication use, and potential confounders from 3 months before conception until 10 weeks of pregnancy. Multivariable logistic regression analyses were performed to estimate ORs with 95%CIs corrected for confounders. Results: We observed a higher risk among women with chronic respiratory diseases without medication use (OR 2.0, 95%CI 0.8–5.0) than among women with chronic respiratory diseases with medication use (OR 1.4, 95%CI 0.8–2.7). When the latter group was studied in more detail, increased risks of ARM were found in women using rescue medication (OR 2.4, 95%CI 0.8–7.3) or a combination of maintenance and rescue medication (OR 2.6, 95%CI 1.0–7.3). In addition, increased risks were found for women having non-allergic triggers (OR 2.5, 95%CI 1.0–6.1) or experiencing exacerbations during the periconceptional period (OR 3.3, 95%CI 1.3–7.9). Conclusion: The results of this study indicate that uncontrolled maternal chronic respiratory diseases in pregnancy, with or without the use of rescue medication to alleviate exacerbations, seem to be associated with ARM in offspring.

                                           S/T=Student/Trainee

INTERVIEW QUALITY IN THE NATIONAL BIRTH DEFECTS PREVENTION STUDY Eleni Papadopoulos, (NYSDOH)

The National Birth Defects Prevention Study is among the largest data sources for birth defects research, so it is vital to consider limitations or biases in the data. We analyzed the relationship between various demographic, clinical and interview characteristics and interview quality, and evaluated if quality modifies the relationship between selected exposures and birth defects. Participants reported pregnancy exposures via telephone interview, after which interviewers rated each interview as high quality, generally reliable, questionable or unsatisfactory. We combined high quality and generally reliable ratings as "high quality" and questionable and unsatisfactory ratings as "low quality" in a dichotomous measure. After excluding mothers with missing interview quality (n=1,270), we included 31,277 cases and 11,482 controls. We used logistic regression to estimate odds ratios (ORs) and 95% confidence intervals for associations between hypertension and selected congenital heart defects and between cigarette smoking and oral clefts, each stratified by interview quality. In our preliminary analysis, 3% of cases (n=849) and 2% of controls (n=261) had low interview quality. Among controls, mothers with low interview quality were significantly more likely to be younger, Hispanic, born outside the United States, unintentionally pregnant, interviewed in Spanish, not have a high school degree or have an income less than $10,000. For analyses of both hypertension and smoking, ORs in low quality strata were generally higher than ORs in high quality strata. However, our estimates restricted to high quality interviews are very similar to published estimates not taking interview quality into account. We found that only a very small proportion of interviews are low quality and have a negligible effect on risk estimates. Further analyses are ongoing and will explore more objective measures of interview quality, including missingness and recall of specific dates during pregnancy.

USING SUPERVISED MACHINE LEARNING METHODS TO DEVELOP A LIST OF MEDICATIONS OF GREATEST CONCERN DURING PREGNANCY Elizabeth Ailes, John Zimmerman, Jennifer Lind, Fanghui Fan, Kun Shi, Jennita Reefhuis, Cheryl Broussard, Meghan Frey, Janet Cragan, Emily Petersen, Kara Polen, Margaret Honein, Suzanne Gilboa (Centers for Disease Control and Prevention)

Women and healthcare providers lack adequate information on medication safety during pregnancy. Our objective was to develop a list of medications of greatest concern during pregnancy to help healthcare providers counsel reproductive-aged and pregnant women about medication use. Prescription drug labels submitted to the U.S. Food and Drug Administration with information in the Teratogen Information System (TERIS) database and/or the 10th edition of Drugs in Pregnancy and Lactation by Briggs and Freeman were included (N=1,089). Each data source (drug labels, TERIS, or Briggs and Freeman) provided its own categorization and narrative summary of fetal risk. We applied two types of supervised machine learning (SML) models, support vector machine and sentiment analysis, to the narrative summaries in each data source. These methods create prediction models from the text to classify medications as 'high' or 'not high' fetal risk. Our final list of medications of greatest concern during pregnancy included those medications categorized as 'high' risk in at least three of four prediction models (if two data sources were used) or at least four of six prediction models (if all three data sources were used). We identified 106 (10%) medications that warrant careful consideration before use in pregnant women and women of reproductive age due to their associations with birth defects, pregnancy loss, or other adverse fetal effects. Most medications were antineoplastic agents (n=29), angiotensin converting enzyme inhibitors (n=10), angiotensin II receptor antagonist (n=8), and anticonvulsants (n=8). This evidence-based list could be a useful tool for healthcare providers in counselling reproductive-aged and pregnant women about prescription medication use. However, providers and patients should weigh the specific risks and benefits of any pharmacologic treatment to manage medical conditions before and during pregnancy.

PA011

NEUROIMAGING FINDINGS IN INFANTS WITH FIRST TRIMESTER PRENATAL ZIKA VIRUS INFECTION MARCELA MERCADO, MARITZA GONZALEZ, MARTHA OSPINA, MAY OSORIO, JOHANA OSORIO, GERMAN QUINCHE, MARCELA DAZA (Instituto Nacional de Salud)

Introduction: Prenatal ZIKV infection has been associated with severe congenital malformations predominantly affecting the developing central nervous system (CNS). Neuroimaging studies offer detailed information about type and extent of compromise, having better understanding of viral pathogenesis and prognosis. Objective: To describe neuroimaging findings in infants with prenatal exposure to ZIKV during the Colombian epidemics. Methods: During the ZIVK epidemics, the Colombian health system determined the evaluation by neuroimaging studies to all infants with a history prenatal exposure to ZIKV, with or without congenital CNS defect. Infant long-term follow-up allowed compilation and analysis of these neuroimaging results. Results: We evaluated 37 infants with prenatal exposure to ZIKV, 73%(27/37) were infected in the first trimester of pregnancy. 70%(26/37) were classified with microcephaly, defined as head circumference <2 standard deviations below the mean for age and sex. Either a brain Magnetic Resonance Imaging or Computed Tomography Scan was performed in 76%(28/37) of the cases, of which 93% of the images showed at least one abnormality. Three patients without microcephaly had altered neuroimaging results: lissencephaly (n=1), ventriculomegaly (n=1) and delayed myelination (n=1). As for the infants classified with microcephaly, all had abnormalities on imaging studies involving: I.Malformations of cortical development 53%(15/28), highlighting concomitant lissencephaly with polymicrogyria in two cases, 2.Ventricular system abnormalities, describing ventriculomegaly 54%(14/28), 3.Corpus callosum abnormalities 46%(13/28), 4.Calcifications 28%(8/28) with predominant involvement of the cortico-subcortical white matter junction 50%(4/8) and 5.Posterior fossa compromise 21%(6/28), four cases of enlarged cisterna magna, one Dandy-Walker complex and one of brain stem hypoplasia. Conclusions: Neuroimaging findings defined in this group of infants correspond to patterns of compromise described in patients with congenital Zika syndrome. Although CNS abnormalities were more frequent in infants with microcephaly and first trimester viral exposure. , the absence of these conditions does not imply normal CNS development, and thorough evaluation should be performed.

PA012

FREQUENCY AND DISTRIBUTION OF CONGENITAL ZIKA SYNDROME RELATED DISORDERS IN INFANTS MARCELA MERCADO, MARCELA DAZA, BLANCA RODRIGUEZ, MARIA LENGUA, MARITZA GONZALEZ, Johana Osorio, MARTHA OSPINA (Instituto Nacional de Salud)

Introduction: Zika virus is a recognized neurotropic agent. Its transmission during the prenatal period is related to anomalies configurating Congenital Zika Syndrome (CZS). Much has been learnt about the spectrum of birth defects related to this condition, but long-term follow-up allows identification and description of related disorders. Objective: To describe the frequency and distribution of CZS related disorders in infants. Methods: The Colombian National Institute of Health implemented long-term infant follow-up to a group of infants with ZIKV prenatal exposure. Frequent evaluations of these infants have allowed better understanding of the syndrome and its related conditions. Results: Thirty-seven infants aged between 10-19 months with prenatal exposure to ZIKV were evaluated, 73%(27/37) were infected in the first trimester of pregnancy. Microcephaly (defined as head circumference <2 standard deviations below the mean for age and sex) was diagnosed in 70%(26/37) of the infants. Complete clinical evaluation was performed and four main CZS related disorders were inquired. Dysphagia was the most frequent related disorder identified in 38% (14/37) of the infants, being present in 50%(13/26) of patients with microcephaly and only in one patient without this condition. 85% (11/13) of dysphagia cases had ZIKV exposure during the first trimester of pregnancy. Sleep disorders were present in 32%(12/37) of the patients 9 cases belonging to the microcephaly and first trimester exposed group. Ten cases of epilepsy were identified, condition that was only present in patients with microcephaly and first trimester infection, four cases needing two or more antiepileptic drugs for seizure control. Frequent respiratory infections (more than 3 hospital admissions) were identified in 24%(9/37), 7 cases had microcephaly and first trimester infection. Conclusions: Most CSZ related disorders were identified in infants with microcephaly and first trimester infection. Thorough and trans-disciplinary evaluations should be performed to infants with this diagnosis as early intervention improves patient and family life quality.

S/T=Student/Trainee

AUTISM-LIKE BEHAVIOR(S) AND EXPOSURE TO POLLUTANTS AMONG UNDERSERVED CHILDREN IN KENTUCKY Chisom Odoh, (University of Louisville)

Background: Environmental exposures are thought to be associated with the development of autism spectrum disorders. Children on the autistic spectrum experience impaired socialization that adversely affects their daily functioning. Aluminum is a known neurotoxin and one pollutant found in coal ash, a waste product generated from burning coal. Few studies have linked aluminum with neurobehavioral disorders. The purpose of this study is to evaluate the association between behaviors underlying autism and aluminum among children residing close to coal ash. Methods: Research is being conducted among children ages 6-14 living within a 10-mile radius of two coal ash storage sites in Kentucky. Aluminum exposure was estimated using filters from air samplers placed inside the homes of children. Concentrations of aluminum were determined by Proton Induced X-Ray Emission (PIXE) analysis. The Child Behavior Checklist was used to measure social problems. Logistic regression and the Wilcoxon test were used to assess the relationship between social problem and aluminum exposure. Results: Among our child population, 21% had social problems. Aluminum was found in 51% of participants' homes. After adjusting for sex, age, ethnicity, and smoking, an odds ratio (OR) of 2.73 (95% CI = 0.95-7.9) was determined. In addition, the social problem t-scores for children exposed to aluminum were higher compared to children not exposed to aluminum. Conclusion: This is the first study to assess social problem CBC score and aluminum exposure in children residing near coal ash storage sites. While not significant, the OR was elevated and the Wilcoxon results were higher in exposed children, indicating a possible relationship between aluminum exposure and social functioning. It is important to understand exposures linked to behaviors that can be targeted for intervention.

PRENATAL ANTIBIOTICS EXPOSURE AND THE RISK OF AUTISM SPECTRUM DISORDERS: A POPULATION-BASED COHORT STUDY Amani Hamad, (University of Manitoba)

Background: Prenatal antibiotic exposure induces changes in infants' gut microbiota composition and is suggested as a possible contributor in the development of autism spectrum disorders (ASD). In this study, we examined the association between prenatal antibiotic exposure and the risk of ASD. Methods: This was a population-based cohort study of all live births born in Manitoba, Canada between April 1, 1998 and March 31, 2016. We utilized administrative health data from the Manitoba Population Research Data Repository, which captures all encounters with the health system by the provincial population under a universal health system. Exposure was defined as having filled one or more antibiotic prescriptions during pregnancy. The main outcome was ASD diagnosis identified at least once in hospital, physician claims or education special needs funding data. Cox proportional hazards regression, adjusted for potential confounders, was used to estimate the risk of ASD in the overall population and in a discordant siblings' cohort. Results: Out of the study cohort (n=214,834), 80,750 (37.6%) were exposed to antibiotics prenatally. During a follow-up period of 1,943,612 person-years, 2,965 children received a diagnosis with ASD. Prenatal exposure to antibiotics was associated with a small increase in the risk of ASD (adjusted hazard ratio [aHR] 1.10, 95% CI 1.01 − 1.19). ASD risk estimate did not change significantly in the discordant siblings' cohort (aHR 1.08, 95% CI 0.90 − 1.30), except it was no longer statistically significant. Conclusions: Our findings indicate that prenatal antibiotic exposure is associated with a small, but probably clinically non-significant increase in the risk of ASD.

ASSOCIATIONS OF AGE AT INFANCY BMI PEAK WITH ADIPOSITY AND CARDIOMETABOLIC RISK DURING PERIPUBERTY IN MEXICAN ADOLESCENTS Wei Perng, Jonggyu Baek, Christina Zhou, Alejandra Cantoral, Maria Martha Tellez-Rojo, Peter Song, Karen Peterson (Colorado School of Public Health)

Associations of age at infancy BMI peak with adiposity and cardiometabolic risk during peripuberty in Mexican adolescents Wei Perng PhD1,2, Jonggyu Baek PhD3, Christina W. Zhou BS3, Alejandra Cantoral PhD4,5, Maria Martha Tellez-Rojo PhD4, Peter X.K. Song PhD3, Karen E. Peterson PhD1 1 Department of Nutritional Sciences, University of Michigan School of Public Health, Ann Arbor, MI, USA 2 Department of Epidemiology, University of Michigan School of Public Health, Ann Arbor, MI, USA 3 Department of Biostatistics, University of Michigan School of Public Health, Ann Arbor, MI, USA 4 Center for Nutrition and Health Research, National Institute of Public Health, Mexico City, MX 5 CONACYT, National Institute of Public Health, Center for Research on Nutrition and Health, MX. Objective: To examine associations of the infancy body mass index (BMI) peak with adiposity and cardiometablic risk during peripuberty. Study design: This study included 207 participants in a Mexico City birth cohort. We estimated age at infancy BMI peak from birth to 36 months (~8 measurements per child) using Newton's Growth Models, an acceleration-based Bayesian stochastic process model. We then categorized age at BMI peak as "early," "mid," and "late," and examined associations with adiposity (BMI z-score, waist circumference) and cardiometabolic biomarkers (C-peptide, C-peptide based insulin resistance [CP-IR], lipids, blood pressure) at 8-14 years using linear regression models that accounted for maternal calcium supplementation and age, and child's age, sex, and pubertal status. Results: Median age at BMI peak was 8.4 (n=116), 20.4 (n=47), 36.0 (n=44) months for the early, mid, and late categories, respectively. Later age at BMI peak was associated with higher future adiposity and metabolic risk in a stepwise fashion. Children categorized as having mid and late BMI peaks had 0.79 (95% CI: 0.40, 1.18) and 1.47 (1.09, 1.86) units higher BMI z-score during peripuberty, respectively, than those with an early peak. Likewise, those in the mid and late categories had 0.17 (0.04, 0.29) and 0.20 (0.08, 0.32) units higher CP-IR than those with an early peak. Conclusion: Later age at infancy BMI peak is related to greater adiposity and metabolic risk during peripuberty. Future studies are warranted to disentangle etiological pathways, and to identify modifiable determinants of infance BMI peak.

NEONATAL CONCENTRATIONS OF ENDOCRINE DISRUPTING CHEMICALS AND CHILD BEHAVIORAL DIFFICULTIES IN A LONGITUDINAL US COHORT Akhgar Ghassabian, Erin M. Bell, Wanli Ma, Rajeshwari Sundaram, Mrudula Naidu, Kurunthachalam Kannan, Germaine M. Buck Louis, Edwina Yeung (New York University School of Medicine)

Background: Experimental studies suggest that prenatal exposure to endocrine disrupting chemicals interferes with developmental processes in the fetal brain. Yet, evidence is inconclusive. Methods: In a birth cohort (2008-2010, upstate New York), we quantified concentrations of bisphenol A (BPA), perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) in banked newborn dried blood spots using liquid chromatography tandem mass spectrometry. Mothers reported on children's behavior using the Strength and Difficulties Questionnaire at age 7 (650 singletons and 138 twins). Difficulties in behavior (i.e., emotional, conduct, hyperactivity, and peer problems) and prosocial skills were classified at validated cut-offs. We used logistic regression with generalized estimating equations to estimate the odds of having difficulties per exposure category. Models were adjusted for maternal and child characteristics, e.g., ethnicity, smoking, parity, and pre-pregnancy body mass index (and preterm delivery for BPA). Results: 111 children (12.1%) had behavioral difficulties and 55 had problems in prosocial skills. The median (interquartile range) of PFOS, PFOA, and BPA were 1.74 ng/ml (1.33), 1.12 ng/ml (0.96), and 7.93 ng/ml (10.79), respectively. Higher PFOS levels were associated with increased odds of having behavioral difficulties (OR per SD of log PFOS=1.33, 95%CI: 1.05-1.67). We observed associations between PFOS in the high relative to the lowest quartile and behavioral difficulties (OR for PFOS1.14-1.74=1.73, 95%CI:0.87-3.44; PFOS1.75-2.48=1.83, 95%CI:0.93-3.57; and PFOS>2.48=2.56, 95%CI:1.34-4.91 compared to PFOS<0.71). Higher PFOA levels were linearly associated with problems in prosocial skills (OR=1.36, 95%CI:1.05-1.76). We found no association of child behavior with BPA, nor interactions with sex or plurality. Conclusion: Increasing prenatal exposure to PFOS and PFOA, as reflected in neonatal concentrations, may pose risk of child behavioral difficulties.

PREDICTORS OF INDIVIDUALS WITH DISABILITIES EDUCATION ACT (IDEA) SERVICE USE PATTERNS AMONG CHILDREN BORN IN NEW YORK CITY Matthew Romo, Katharine McVeigh, Pui Ying Chan, Phoebe Jordan, George Askew (New York City Department of Health and Mental Hygiene)

Introduction. Little is known about how demographics, pregnancy risk factors, and child birth outcomes among children with disabilities predict patterns of Individuals with Disabilities Education Act (IDEA) service use over time across early intervention (EI), early childhood special education (ECSE), and K-12 special education (SE) programs. Methods. Linked data were obtained for all New York City (NYC) children born in 1998 who had a record in at least one of the five contributing data sources (birth and death certificates, lead testing, EI, Department of Education) and were still alive in 2007 (N=113,627). We used logistic regression to compare children with and without any IDEA service use, and multinomial regression to identify characteristics associated with each of 5 distinct IDEA service use patterns we previously identified. Results. Compared with children of White mothers, children of Black (adjusted odds ratio [aOR] 0.65; p<.001) or Asian (aOR 0.42; p<.001) mothers were less likely to have any IDEA service use. Odds of any IDEA service use were similar between children of Hispanic (aOR 0.95, p=.080) and White mothers, but children of Hispanic mothers were more likely to use IDEA services intermittently (pattern 3, aOR 1.19, p<.001) or to have late entry into EI with high occupational therapy use (pattern 4, aOR 1.31, p=.010). As expected, children with any IDEA service use had more adverse risk factor profiles, with the exception of children with service use pattern 4. For example, children with service use pattern 4 were similar to children without IDEA services with regard to maternal obesity (aOR 0.96, p=.735) and small size for gestational age (aOR 1.06; p=.489). Conclusions. The risk profiles of children who use IDEA services vary by service use pattern. Understanding the differences in children's risk profiles across service use patterns enriches our knowledge of the relationship between children's needs and the ways in which they access care.

EFFECT OF DOCOSAHEXAENOIC ACID SUPPLEMENTATION ON DEVELOPMENTAL OUTCOMES OF TODDLERS BORN PRETERM: THE OMEGA TOTS RANDOMIZED CLINICAL TRIAL Sarah Keim, Kelly Boone, Mark Klebanoff, Abigail Turner, Joseph Rausch, Mary Ann Nelin, Lynette Rogers, Keith Yeates, Leif Nelin, Kelly Sheppard, (Nationwide Children's Hospital/Ohio State U)

Background: Dietary docosahexaenoic acid (DHA) intake among toddlers is low. Supplementation may benefit developmental outcomes of those born preterm. Objective: To determine whether daily DHA supplementation for 6 months improves developmental outcomes of toddlers born preterm, a randomized, fully masked, placebo-controlled trial was conducted 2012-17 at a large US pediatric academic center with nine NICUs. Design/Methods: Children born at ≤35,000 (difference in change=-0.3, effect size=-0.37, interaction P=0.01). Bayley-III motor scores and activity level scores were unaffected. Conclusions: Daily supplementation with 200mg DHA and AA for 6 months, versus placebo, resulted in no improvement in cognitive development and early measures of executive function, and may have resulted in negative effects on language development and effortful control in certain sub-groups. These findings do not support DHA supplementation in the second year of life for children born preterm.

MATERNAL PSYCHOLOGICAL DISTRESS, ECONOMIC HARDSHIP AND CHILD NEURODEVELOPMENTAL OUTCOMES IN THE CHARGE STUDY Tanya Taiwo, (University of California - Davis)

Background: Autism spectrum disorder (ASD) is a complex neurodevelopmental condition with increasing prevalence that has a high degree of inheritability and evidence of susceptibility to environmental factors. The environmental factors that may play an indirect or direct role include: infections, drug abuse, environmental contaminants and maternal metabolic conditions and prenatal stress. This study examined whether maternal report of inability to pay for basic needs (food, clothing and shelter) and maternal psychological distress are associated with ASD. Study Design/Methods: Children aged 2 to 5 years (728 ASD and 482 controls) were enrolled in the CHARGE (Childhood Autism Risks from Genetics and the Environment) study, a population-based, case-control investigation between January 2003 and September 2016. Eligible children were born in California, had parents who spoke English or Spanish, and were living with a biological parent in selected regions of California. Children's diagnoses were confirmed by using standardized assessments. Information regarding maternal periconceptional and prenatal exposures and experiences were determined from a structured telephone interview. These interviews were examined to identify maternal stressors or measures of stress and coping during pregnancy, and explore how these social factors were associated with the child's ASD diagnosis. Results: Those mothers who reported perinatal depression or anxiety were more likely to have a child with ASD: odds ratio (OR)= 2.02 (95% CI 1.48, 2.75). A trend for increased odds of ASD were detected for children whose mothers experiencing extreme financial hardship OR= 1.23 (95% CI 0.83, 1.83). Conclusions: The results of this investigation add to the increasing evidence that social factors must be addressed to eliminate the greater health burdens that are carried by our most vulnerable and underserved communities. The consideration of maternal prenatal stress effects in child neurodevelopmental outcomes is critically important to realistically improve current prevention and intervention strategies.

PATTERNS OF INDIVIDUALS WITH DISABILITIES EDUCATION ACT (IDEA) SERVICE USE IN NEW YORK CITY Katharine McVeigh, (NYC Department of Health and Mental Hygiene (DOHMH))

Introduction. The federal Individuals with Disabilities Education Act (IDEA) mandates services for children from birth through age 21 with developmental delays, or developmental or educational disabilities. As children age, they receive IDEA services through different programs, and transitions between programs are complicated by differences in eligibility criteria. Little is known about children's patterns of IDEA service across early intervention (EI, for children younger than 3), early childhood special education (ECSE, for ages 3 and 4), and K-12 special education (SE). Methods. Linked data were obtained for all New York City (NYC) children born in 1998 who had a record in at least one of the five contributing data sources (birth and death certificates, lead testing, EI, Department of Education, N=175,973). We applied sequence analysis methodology using 'TraMineR' and 'cluster' packages in R to data representing the factorial combination of 4 service modalities recorded at 10 ages to examine patterns of educational service use from birth through third grade. Results. Five non-overlapping patterns of IDEA service use were identified: 1) EI with transition to NYC public schools, with and without ECSE/SE (16.1%); 2) EI without transition to NYC public schools (24.0%); 3) intermittent services (mostly speech-only, 38.4%); 4) late EI with ECSE/SE use of both occupational and speech therapies (8.5%); and 5) continuous use of multiple therapeutic services starting in early life (13.0%). Conclusions. Children's use of IDEA services over time varies considerably depending on their age and the types of services they need. Additional information about child characteristics associated with each service use pattern could further enrich our understanding of these findings.

PRENATAL AND EARLY LIFE EXPOSURES TO AIR POLLUTION AND CHILDHOOD DEVELOPMENT Sandie Ha, (University of California, Merced)

Particulate matter <2.5μm (PM2.5) and ozone (O3) have been linked to poor fetal outcomes but few studies simultaneously explored prenatal and early life exposures in relation to childhood development. Participants included 3,754 singletons and 2,071 twins from the Upstate KIDS Study, a pediatric cohort in upstate New York (2008-2010). Census tract level PM2.5 and O3 estimated by the Environmental Protection Agency Downscaler models were linked to each child's addresses during pregnancy and early life incorporating residential history, and locations of maternal work and day-care. Parents reported on their children's development at ages 4, 8, 12, 18, 24, 30 and 36 months in 5 domains using the Ages and Stages Questionnaire. Generalized mixed models were used to obtain the RRs and 95% CIs for the risk of failing any developmental domain per μg/m3 increase in PM2.5 and ppb increase in O3. Models were adjusted for maternal demographics, lifestyle, birth characteristics, gestational complications, season, and exposures during other windows. Among twins, exposures to PM2.5 during trimester 2 [RR: 1.06(1.01,1.11)], and the first two years [RRY1: 1.57(1.33,1.84); RRY2: 1.67(1.40,2.01)] were associated with the risk of failing any developmental domain. Whole-pregnancy and first-year PM2.5 exposures also increased the risk of failing fine motor [RR:1.10(1.03,1.18)] and communication [RR: 1.24(1.04,1.48)] domains, respectively. Third trimester O3 exposure increased the risk of failing the personal-social domain [OR: 1.03(1.01,1.05)], but exposure during the first three years was associated with a slightly lower risk of failing the communication, fine motor, and personal-social domains. Similar findings were observed for singletons but they were weaker and not significant. We found evidence suggesting that PM2.5 exposures during pregnancy and early life may increase the risk of delayed childhood development, especially among twins. The associations with O3 appear inconsistent.

MORTALITY RELATED TO CEREBRAL PALSY IN THE UNITED STATES: ANALYSIS OF MULTIPLE CAUSES OF DEATH AND COMPARISON WITH DEATHS IN THE GENERAL POPULATION FROM 2005 TO 2014. Steven Day, Robert Reynolds (Mortality Research & Consulting Incorporated)

Background: Cerebral palsy (CP) is a common developmental disability, with prevalence 2 per 1000 in young ages. Life expectancy is lower than average in CP. Multiple cause of death records provide information on ages and causes of death in CP. Method: We analyzed multiple cause of death data from the US Centers for Disease Control and Prevention (CDC). We compared age distributions and causes of deaths in CP and the general population (GP). We compared complexity of deaths in CP and GP based on number of contributing causes. Results: There were 24,975,798 deaths in the US from 2004 through 2015; Of these, 26,667 (0.11%) included CP (ICD 10 G80) as a cause of death or as a condition contributing to death. Age at death in CP (mean 42.0, SD 23.8 years) was lower than in the GP (mean 72.8, SD 18.6 years) (p < 0.0001). Age distribution of deaths in the GP was skewed left, while in CP it was bimodal. The complexity of deaths in CP was greater than in the general population (mean number of contributing causes 3.8 in CP versus 3.0 in gp, median 4.0 and 3.0, p < 0.0001). The leading underlying cause of death was circulatory disease (I00-I99) in the GP; nervous system conditions (G00-G99) in CP. The latter due to CP being a nervous system condition (G80). The leading immediate cause of death in the GP was circulatory disease (I00-I99); for CP respiratory disease (J00-J99). Leading underlying causes of death varied widely by age at death in both CP and GP. Secondary analyses of underlying causes of death in CP by excluding or reassigning uninformative G80 cases shed further light on causes of death in CP. Conclusion: The distribution of age at death and causes of death in CP reported here are consistent with published reports of mortality rates, life expectancy, and causes of death based on cohort analyses. It is likely that some deaths of persons with CP are missed this analysis, in particular deaths in very mild CP, or due to causes considered wholly unrelated to CP.

ANTI-MüLLERIAN HORMONE LEVELS IN NURSES WORKING NIGHT SHIFTS Candice Johnson, Lauren Tanz, Christina Lawson, Penelope Howards, Elizabeth Bertone-Johnson, Heather Eliassen, Eva Schernhammer, Janet Rich-Edwards (Centers for Disease Control and Prevention)

Background. Associations have been reported between night shift work and women's reproductive health outcomes. We used serum anti-Müllerian hormone (AMH) levels in a cohort of nurses to determine if night shift work is also associated with ovarian reserve (number of eggs remaining in the ovary), a marker of the length of the reproductive lifespan. Methods. Between 1996 and 1999, blood samples were collected from female nurses participating in the Nurses' Health Study II biomarker substudy; 807 samples were later assayed for serum AMH. We used quantile regression to estimate differences and 95% confidence intervals (CI) in serum AMH levels between women working and not working night shifts, accounting for age, body mass index, smoking, and hormone use at the time of blood draw, among women with no missing data on variables of interest. We separately analyzed three measures of night shift work, reported via questionnaire: recent night shifts (shifts worked in the two weeks before blood draw, n = 623), usual night shifts (typical work schedule during the decade of blood draw, n = 507), and history of usual night shifts (typical work schedule before or during the decade of blood draw, n = 543). Results. We found no associations between recent, usual, or history of night shift work and AMH. The difference at the median of the AMH distribution was 0.14 (95% CI: -0.06, 0.26) ng/mL for nurses recently versus not recently working nights, -0.11 (95% CI: -0.28, 0.02) ng/mL for nurses with versus without usual night shifts, and -0.03 (95% CI: -0.19, 0.20) ng/mL for nurses with versus without a history of usual night shifts. Conclusion. Night shift work was not associated with ovarian reserve, as measured by serum AMH. This does not preclude associations between night shift work and fertility operating through other mechanisms.

CADMIUM EXPOSURE AND OVARIAN RESERVE IN WOMEN AGES 35-49 YEARS: THE IMPACT OF URINARY CREATININE ADJUSTMENT METHOD ON RESULTS Kristen Upson, Katie M. O'Brien, Janet E. Hall, Donna D. Baird (Epidemiology Branch, National Institute of Environmental Health Sciences)

Several animal studies have demonstrated ovarian follicle depletion with exposure to cadmium, indicating its detrimental effect on ovarian reserve. In humans, urinary cadmium (uCd) characterizes long-term exposure, since the kidney is a major cadmium storage compartment. However, two prior human studies of uCd and serum follicle stimulating hormone (FSH), a biomarker of ovarian reserve, had inconsistent findings. We used data from the National Health and Nutrition Examination Survey III, 1988-94, to investigate the association between uCd (collected using spot urine samples) and serum FSH among 1,692 women ages 35-49 years with at least one intact ovary and not pregnant, breastfeeding, using oral contraceptives, or exhibiting a luteinizing hormone (LH):FSH ratio>2 (indicative of ovulation). We used a recently developed method to correct for urinary dilution using creatinine, covariate-adjusted standardization with covariate adjustment (CAS+CA), and compared our results to those obtained using two common methods, standardization and covariate adjustment (CA). Adjusted relative risks (RR) and 95% confidence intervals (CI) for the associations between quartiles of uCd and FSH concentrations ≥10 IU/L (indicating declining ovarian reserve) were estimated using Poisson regression. Our analysis using CAS+CA suggested a positive association between uCd concentrations and FSH (4th vs. 1st quartile: RR 1.4, 95% CI: 0.9-2.0, Ptrend=0.03). However, we observed estimates closer to the null with standardization (4th vs. 1st quartile: RR 1.2, 95% CI: 0.8-1.9, Ptrend=0.07) and larger in magnitude with CA (4th vs. 1st quartile: RR 1.8, 95% CI: 1.1-2.8, Ptrend=0.03). The difference in estimates may be due to the lack of appropriate adjustment for factors, such as fat-free mass, that can affect creatinine independent of hydration effects. After accounting for these factors using the CAS+CA method, our data suggest that cadmium exposure may contribute to ovarian aging in women.

FACTORS DETERMINING THE USE OF INTRACYTOPLASMIC SPERM INJECTION IN WOMEN WITHOUT MALE FACTOR INFERTILITY Xu Xiong, (Tulane University School of Public Health and Trop)

Factors Determining the Use of Intracytoplasmic Sperm Injection in Women without Male Factor Infertility *Xu Xiong, Richard P. Dickey, Pierre Buekens, Jeffrey G. Shaffer, Gabriella Pridjian Background and Objective: Intracytoplasmic sperm injection (ICSI) technique was used to initially treat couples with male factor infertility. Despite questionable evidence of benefits over conventional in vitro fertilization (IVF), ICSI use has markedly increased in recent decades among couples without male factor infertility. The reasons for this increasing trend of ICSI use are unknown. We assessed the frequency of ICSI use and factors associated with the use of ICSI in women without male factor infertility. Methods: A retrospective cohort study was conducted in 83,868 women diagnosed without male factor infertility, using 2006-2010 data from the Society for Assisted Reproductive Technology Clinic Outcome Reporting System (SART CORS). Results: Between 2006 and 2010, overall ICSI use in women without male factor infertility increased from 53.0% to 59.2%. The factors associated with an increased use of ICSI were Hispanic ethnicity (adjusted odds ratio [aOR]: 1.3, 95% confidence interval [CI]: 1.2-1.4), obesity (aOR: 1.1, 95% CI: 1.1, 1.3), those women who had prior history of ART treatments with fresh eggs (aOR: 1.4, 95% CI: 1.3, 1.6 for 4 and more treatments), and women diagnosed with diminished ovarian reserve (aOR: 1.2, 95% CI: 1.2, 1.3) and other factor for infertility (aOR: 1.4, 95% CI: 1.3, 1.5). Multigravida, women with prior history of miscarriages, and women diagnosed with tubal factor infertility were less likely to use ICSI. Conclusions: ICSI procedures were performed among more than half of couples without male factor infertility. Although several demographic and reproductive factors were found to be associated with an increased use of ICSI, the questions remain whether its use is necessary or justified in women without male factor infertility.

VITAMIN D AND REPRODUCTIVE HORMONES AMONG WOMEN WITH PROVEN FECUNDITY Sunni Mumford, Keewan Kim, Lindsay Levine, Daniel Kuhr, Robert Silver, Lindsey Sjaarda, Neil Perkins, Enrique Schisterman (DIPHR, NICHD)

Objective: Vitamin D concentrations have been shown to be important for reproductive health outcomes, possibly via influencing steroidogenesis. Our purpose was to assess the relationship between vitamin D and reproductive hormones among women with proven fecundity. Design: Secondary analysis of the EAGeR Trial, a multicenter, block-randomized, double-blind, placebo-controlled clinical trial to evaluate the effect of preconception-initiated daily low dose aspirin on reproductive outcomes in women with a history of pregnancy loss. Methods: Participants aged 18 to 40 years, with 1-2 prior pregnancy losses, no history of infertility, and were attempting pregnancy were followed for up to 6 cycles. We assessed 25-hydroxyvitamin D in serum at baseline among 1185 women. Urinary hormone levels, including estrone-1-glucuronide (EIG), pregnanediol-3-glucuronide (PdG), follicle stimulating hormone (FSH), and luteinizing hormone (LH) were measured up to 5 times per cycle for the first 2 cycles of study participation. Linear mixed models and harmonic models were used to estimate associations between vitamin D and hormone concentrations adjusting for age, body mass index, race, season, number of prior losses and prior live births, and weighted for the number of contributed cycles. Results: Overall, 47% of women had sufficient vitamin D levels (≥30 ng/mL). Vitamin D levels were negatively associated with FSH (percent change -10.7, 95% confidence interval -0.8%, -19.7% comparing >30 versus ≤30 ng/mL), though no associations were observed with EIG, PdG, or LH. Similar results were observed using harmonic models. Conclusions: Vitamin D was negatively associated with FSH, though was not associated with EIG, PdG, or LH. These results suggest that vitamin D may play a role in the hypothalamic-pituitary-ovarian axis which may provide a possible mechanism for its associations with reproductive endpoints.

S/T=Student/Trainee

**FERTILITY TREATMENT USE AND BREASTFEEDING OUTCOMES:
PRAMS 2012-2014** Chloe Barrera, (Centers for Disease Control and Prevention)

Background: About 6% of married women in the US experience infertility.
Infertility can be addressed with medications, intrauterine insemination, or assisted
reproductive technology. Physiological factors associated with infertility may also
be associated with lactation difficulties. Limited data exist examining the impact of
infertility or mode of conception on breastfeeding outcomes. Methods: Maternal-
reported data from 6 states from the 2012-2014 Pregnancy Risk Assessment and
Monitoring System (PRAMS) were available to explore use of any fertility
treatment and breastfeeding initiation and continuation at 8 weeks (n=9,224
women). A subset of 4 states had data on specific types of fertility treatment and
breastfeeding (n=6,225 women). Data were weighted to represent all women
delivering live births within each state; SAS survey procedures were used to account
for PRAMS complex survey design. Multivariable logistic regression, adjusted for
maternal demographics, parity, plurality, mode of delivery, and maternal health
before pregnancy, was used to quantify the associations between fertility treatment
use and breastfeeding. Results: Mothers who conceived with any fertility treatment
(n=1,163) were more likely to initiate breastfeeding than mothers who conceived
spontaneously (92.7% vs 89.7%, prevalence odds ratio (POR) = 1.48, 95%
confidence interval [CI], 1.01, 2.11); however, this relationship was no longer
significant after adjusting for covariates (adjusted POR = 1.13, 95% CI, 0.78, 1.63).
No significant differences were found between mode of conception and
breastfeeding at 8 weeks. No differences in breastfeeding outcomes were observed
between women who used specific types of fertility treatment and women who
conceived spontaneously. Conclusions: Fertility treatment was not associated with
two breastfeeding outcomes. Studies are needed to understand if mode of
conception impacts other aspects of breastfeeding.

URINARY PHYTOESTROGENS AND MENSTRUAL CYCLE LENGTH
Lindsay Levine, Keewan Kim (NICHD, NIH)

Background: Phytoestrogens, found in soy products, seeds, and whole grains, are
known to have estrogenic and antiestrogenic activity. However, their impact on
menstrual cycle length, a proxy for the hormonal milieu, remains unclear. Therefore,
we investigated associations between urinary phytoestrogens and menstrual cycle
length in healthy women attempting pregnancy. Design: This was a population-based
prospective cohort study using data from the Longitudinal Investigation of Fertility
and the Environment (LIFE) Study. 501 women ages 18-44 with self-reported cycles
21-42 days and no hormonal contraception injections in the past year were followed
until pregnant or for 12 months of trying. Methods: Genistein, daidzein, O-
desmethylangolensin, equol, enterodiol, and enterolactone were measured in urine at
baseline and categorized into quartiles. Cycle length was determined from daily
journals that captured menses and fertility monitor data and categorized as 35 days.
Average cycle length was considered, as well as length of the first cycle only, given
the short half-life of phytoestrogens. Logistic regression models were used to assess
odds ratios (ORs) and 95% confidence intervals (CIs) of cycles 35 days, compared
to 26-35 days. Models were adjusted for age, BMI, race, creatinine, exercise,
supplement use, lipids, cotinine, parity, and alcohol. Results: Genistein levels in the
3rd quartile, compared to the 1st quartile, were associated with increased odds of a
cycle length <26 days on average (OR 2.64; 95% CI 1.16, 6.21) and for the first
cycle only (OR 2.39; 95% CI 1.02, 5.55). No associations were observed for the
highest quartile of genistein and cycle length, or for other phytoestrogens.
Conclusion: Our results suggest that urinary genistein levels are associated with
cycles <26 days, though the associations appear to be non-linear. These findings
highlight the potential importance of phytoestrogens for reproductive health.

PA029

**MEASUREMENT OF CONTRACEPTIVE METHOD USE AMONG
WOMEN, NSFG 2011-2015** Katherine Ahrens, (Office of Population Affairs)

Objective: Nationally, nearly half (45%) of pregnancies in the United States are
unintended. Healthy People 2020 establishes objectives both for reducing this
proportion and for improving contraceptive use for this purpose. This analysis
augments two National Survey of Family Growth (NSFG) measures of contraceptive
use (current use and use at last vaginal sex) to better estimate contraceptive use for
the purpose of unintended pregnancy prevention by aligning the timing of use
assessment with periods of risk. Methods: We used data from the 2011-2015 female
NSFG. For current use, we compared the standard measure with an augmented
estimate looking back to the last month of sex in the past 12 months, among women
coded as non-users in the current month. For use at last sex, we compared the
standard measure with an augmented estimate excluding women who were pregnant
at last sex. Results: For current use, the augmented versus the standard measure was
lower for no method use (7.3% vs 15.4%; p<0.001) and higher for condom use
(18.7% vs 13.5%; p<0.001); these differences were greatest for teens aged 15-19
years. For use at last sex, estimates with the augmented versus the standard measure
were again lower for no method use (15.8% vs 21.0%; p<0.001) but higher for most
effective method use (33.3% vs 31.1%; p<0.05). Conclusions: In estimating
contraceptive use for the purpose of unintended pregnancy prevention, accounting
for timing of sexual activity and pregnancy status can better align measurement of
method use with periods of risk. Implications: When assessing contraceptive use for
the purpose of unintended pregnancy prevention, researchers may want to consider
the methods described here to further align measurement of contraceptive use with
periods of risk.

PA030

**TRENDS IN AGE AT FIRST SEX AMONG PERSONS BORN 1968-1993 IN
THE UNITED STATES** Katherine Ahrens, (Office of Population Affairs)

Background: The percentage of teenagers in the United States who have had sex has
decreased since the 1980s, yet trends in the distribution of age at first sex have not
recently been examined. Methods: Using data from the National Survey of Family
Growth 2006-2010, 2011-2013, and 2013-2015, we constructed curves showing the
cumulative incidence of first vaginal sexual intercourse for females (n=21,691) and
males (n=18,052), separately, by 5-year birth cohorts (1968-1997) using the Kaplan-
Meier survival function estimator and estimated hazard ratios (HR) using Cox
proportional hazards models. Results: Females belonging to 5-year birth cohorts
between 1968 and 1992 were more likely to have experienced first sex at any
particular age compared with the birth cohort 1993-1997 (HR range: 1.19 to 1.35; p-
values <0.01). Similarly, for males, all older birth cohorts were more likely to have
experienced first sex at any particular age compared with birth cohort 1993-1997
(HR range: 1.20-1.40; p-values 10% for ages 14-17 for all birth cohorts and both
sexes. Conclusion: Although teens born 1993-1997 had first sex at a later age
compared with earlier birth cohorts, both males and females born between 1968 and
1997 were at highest incidence of experiencing first sex during ages 14-17.
Understanding the factors influencing trends in sexual initiation may help inform
sexual education curricula and family planning service provision.

ASSOCIATIONS BETWEEN SERUM LIPID AND LIPOPHILIC MICRONUTRIENT CONCENTRATIONS AND IN VITRO FERTILIZATION OUTCOMES

Erica Jamro, Michael Bloom, Richard Browne, Keewan Kim, Eleni Greenwood, Victor Fujimoto (University at Albany)

Levels of serum lipids and lipophilic micronutrients are associated with oxidative stress levels, and recent studies linked concentrations to fecundity among couples with spontaneous conceptions. Here, we evaluated associations for serum lipids and lipophilic micronutrients with vitro fertilization (IVF) outcomes. We collected blood samples at the time of oocyte retrieval, from n=180 women undergoing IVF at an academic reproductive health center, between 2010 and 2011. We measured levels of lipids (phospholipids, total cholesterol, high and low density lipoproteins, and triglycerides) and lipophilic micronutrients (δ, γ, and α-tocopherols, retinol, lutein, β-cryptoxanthin, α- and β-carotenes, and lycopene) in serum. Using multiple Poisson regression with robust variance estimation, we evaluated Z-scores for serum lipids and lipophilic micronutrients as predictors of embryo implantation, clinical pregnancy, and live birth, among n=167 with embryo transfers. Models were adjusted for age, body mass index (BMI), race, smoking status, infertility diagnosis, ovarian stimulation protocol, and other lipids and lipophilic micronutrients as confounders. We used multiple imputation for n=23 with missing covariates. We also tested for statistical interactions by BMI <25 kg/m2 or $\geq$25 kg/m2. A higher α-tocopherol concentration was associated with a higher likelihood for a live birth (risk ratio [RR]=1.68; 95% confidence interval [CI]=1.13-2.52), whereas higher β-cryptoxanthin concentration was associated with a lower chance of embryo implantation (RR=0.81; 95% CI=0.67-0.99). We detected statistical interactions (p<0.10) for BMI with triglycerides, α-tocopherol, and lycopene as predictors of clinical pregnancy, and for BMI with triglycerides and γ-tocopherol as predictors of live birth. Despite a limited sample size, these data suggest the potential importance of lipophilic micronutrient levels for IVF outcomes, and thus underscore a possible role for diet and supplementation.

ANTI-MüLLERIAN HORMONE IN AFRICAN AMERICAN WOMEN WITH SYSTEMIC LUPUS ERYTHEMATOSUS

Meghan Angley, Jessica B. Spencer, S. Sam Lim, Penelope P. Howards (Emory University)

Background: Women with systemic lupus erythematosus (SLE) may be at risk of early menopause and infertility because of the disease itself or treatments such as cyclophosphamide (CYC). Anti-Müllerian hormone (AMH) is a biomarker that is predictive of time to menopause and in vitro fertilization response. Methods: We enrolled women ages 22-40 years, living in the Atlanta metropolitan area, diagnosed with SLE after age 17 who had not had a hysterectomy before diagnosis. African-American women ages 22-40, without hysterectomies and who were from the same area were recruited from a marketing list for comparison. AMH was measured in serum using the Ansh Labs assay. Low AMH was defined as AMH <1.00 ng/ml. An analysis of covariance was used to generate age-adjusted mean AMH values. We fit logistic models to examine the relationship between SLE, CYC treatment and low AMH. Models controlled for age, body mass index, diagnosis with polycystic ovarian syndrome and hormonal contraception use in the past year. Results: At the average age of the full sample (33.9 years), the predicted mean AMH levels were 3.07 (standard error [SE]=0.35) ng/ml for women with SLE and no history of CYC (n=72), 1.10 (SE=0.83) ng/ml for women with SLE treated with CYC (n=13) and 3.59 (SE=0.35) ng/ml for women without SLE (n=79). Compared to women without SLE, women with SLE not treated with CYC had greater odds of low AMH (odds ratio [OR]: 2.22, 95% confidence interval [CI]: 0.94, 5.26). Women with SLE treated with CYC had greater odds of low AMH both compared to women with SLE not treated with CYC (OR: 3.59, 95% CI: 0.92, 14.01) and women without SLE (OR: 14.45, 95% CI: 2.35, 88.88). Conclusions: Treatment with cyclophosphamide appears to be associated with low AMH in women with SLE. SLE itself may also be associated with reduced AMH, but to a lesser extent.

: LEFT VENTRICULAR MASS INCREASE IN WOMEN DURING CHILDBEARING YEARS IS ASSOCIATED WITH PARITY: THE CARDIA STUDY

Gabrielle Snyder, Erica Gunderson, Cora Lewis, João Lima, Donald Lloyd-Jones, Janet Catov (University of Pittsburgh)

Objective: Increased left ventricular (LV) mass is a marker of vascular remodeling and is consistently greater in black versus white women. The reproductive years are a critical period for weight changes in women, yet it is unknown if pregnancy history is related to changes in LV mass. We examined total parity at exam year 25 and 20-year change in LV mass in white and black women in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Methods: We studied 1373 women (50.3% black) with echocardiograms at baseline (1990-91, ages 23-35 years) and again 20 years later and direct measures of visceral and subcutaneous adipose tissue at exam year 25. Parity categories were: 385 (28.0%) nulliparous (no live births >20 weeks), 284 (20.7%) primiparous (parity=1), and 704 (51.3%) multiparous (parity$\geq$2). Nulliparous was the referent. LV mass change was calculated between baseline and year 25 and indexed for height2.7. Results: Linear regression models controlled for baseline age, race, systolic blood pressure, body mass index, physical activity, education, and 20-year changes in systolic blood pressure and weight. Primiparity was associated with a 20-year increase in LV mass (2.15 g/m2.7, p=0.01) but multiparity was not (0.79 g/m2.7, p=0.26). Separately controlling for visceral (2.00 g/m2.7, p=0.02) and subcutaneous adipose tissue (2.11 g/m2.7, p=0.01) produced similar results among primiparas. While race interaction was nonsignificant (p=0.23), greater change in LV mass was associated with primiparity in black women (3.59 g/m2.7, p$\leq$0.01) but not in white women (0.81 g/m2.7, p=0.45). Conclusions: Primiparity is associated with greater change in LV mass versus nulliparity, particularly among black women. Higher parity was not associated with change in LV mass and adjustment for weight gain and direct measures of fat did not explain the association.

TEMPERATURE AND TERM LOW BIRTH WEIGHT IN CALIFORNIA
Rupa Basu, (Cal EPA/OEHHA)

Background: Few epidemiologic investigations have explored adverse birth outcomes from ambient temperature exposure. Methods: In a retrospective cohort study conducted in California from 1999 to 2009, we examined apparent temperature, a combination of temperature and relative humidity, and term low birth weight (LBW) among 43,629 full-term LBW infants and 2,032,601 normal weight infants. We relied on birth certificate data provided by the California Office of Vital Statistics and meteorologic data from the California Irrigation Management Information System, the US EPA, and the National Climatic Data Center. Results: After considering several apparent temperature metrics with various cut-off values, we observed the greatest associations between term LBW and exposures over the full gestation (13.0%; 95% confidence interval: 4.1, 22.7% per 10 degrees Fahrenheit (°F) increase in apparent temperature) above 55°F and third trimester exposure above 60°F (15.8%; 5.0, 27.6%). Higher apparent temperature exposure during the first month of pregnancy exhibited no significant risk, while the first trimester had a significantly negative association, and second trimester, last month and last two weeks had slightly increased risks. Mothers who were Black, older, delivered male infants, or gave birth during the warm season conferred greater risks from higher temperatures. Conclusions: Our findings provide further evidence for risks of adverse birth outcomes from high temperatures for pregnant women, particularly for vulnerable subgroups.

REPRODUCTIVE HISTORY, 17OHP USE, AND TIME TO SPONTANEOUS RECURRENT PRETERM BIRTH Valery Danilack, Desmond Sutton, Mara Bensson, Linda Nelson, Erika Werner (Brown University, Women & Infants Hospital)

To determine the influence of maternal history and 17-alpha-hydroxyprogesterone (17OHP) on time to spontaneous recurrent preterm delivery, we conducted a retrospective chart abstraction study of pregnant women who received at least one dose of 17OHP for the prevention of recurrent preterm birth through our hospital's pharmacy. We included women who delivered between January 1, 2006 and December 31, 2016 at ≥ 20 completed weeks gestation and excluded multifetal gestations and severe fetal anomalies. Information collected from pharmacy and medical records included gestational age at delivery of current pregnancy, dates of 17OHP doses received, maternal demographics, parity, maternal medical conditions, pregnancy conditions in prior pregnancies, and cause of prior preterm deliveries. We used time to event analyses to study our main outcome of interest, spontaneous preterm delivery (<37 weeks gestation). Observations were censored at the time of delivery for iatrogenic preterm deliveries, or at 37 completed weeks gestation for all term deliveries. Out of 286 women, 53 (19%) had a recurrent spontaneous preterm delivery. Time to spontaneous preterm delivery was significantly related to gestational age at earliest prior preterm delivery (hazard ratio (HR)=0.94, p=0.003), number of prior preterm births (HR=1.87, p=0.001), number of prior term births (HR=0.54, p=0.002), history of previable rupture of membranes (HR=2.42, p=0.030), and undetermined reason for a prior preterm birth (HR=2.32, p=0.013). Time to spontaneous preterm delivery was not related to maternal age, race, or weight; history of chronic infectious disease; gestational diabetes, fetal growth restriction, placental abruption, chorioamnionitis, or intrauterine fetal demise in a prior pregnancy; or the amount of 17OHP received in this pregnancy. Reproductive history is an important determinant of risk of recurrent spontaneous preterm delivery and can assist clinicians in estimating recurrent preterm birth risk.

PA036 S/T

FIRST-TRIMESTER DEPRESSION IS NOT ASSOCIATED WITH BIRTH OUTCOMES IN A DIVERSE URBAN COHORT: PRELIMINARY RESULTS FROM THE NEW YORK UNIVERSITY CHILDREN'S ENVIRONMENTAL HEALTH STUDY Linda Kahn, Sara Brubaker, Akhgar Ghassabian, Shilpi Mehta-Lee, Lisa Nathan, Leonardo Trasande (New York University School of Medicine)

Objectives: To investigate whether offspring of women who screen positive for depression in early pregnancy are at increased risk of adverse birth outcomes. Background: Prior studies of prenatal depression and perinatal outcomes have been inconclusive. Methods: This analysis uses preliminary data from an ongoing pregnancy cohort in which women are recruited during their first prenatal visits to three socioeconomically diverse hospitals. At enrollment, participants completed the validated Patient Health Questionnaire (PHQ-9) to assess depression risk. Birth outcomes were extracted from medical records. We used linear and logistic regression to estimate associations of PHQ-9 score ≥10 with continuous and dichotomous birth outcomes. Results: Among the first 261 study participants to give birth who had completed PHQ-9s at <18 weeks, Latinas and non-Hispanic Black women had increased risk of depression, as did those without partners and those with less than a bachelor's degree. PHQ-9 ≥10 was not associated with gestational age, weight, length, or head circumference at birth, nor with increased odds of preterm birth (<37 weeks), low birth weight (<2500g), cesarean section, or low Apgar score (<7). Discussion: This preliminary report does not support an association between depression in early pregnancy and adverse perinatal outcomes. We look forward to future analyses in which we can utilize data from more participants and access information on physical activity and antidepressant use.

PA037

AIR POLLUTION, DIABETES AND PRETERM BIRTH IN CALIFORNIA
Amy Padula, Wei Yang, Frederick Lurmann, John Balmes, S. Katharine Hammond, Gary Shaw (University of California, San Francisco)

Prenatal exposure to ambient air pollution has been associated with preterm birth in several studies. Associations between air pollution and gestational or Type 2 diabetes have been hypothesized but are not well established. We examined the association between air pollution exposure in pregnancy and gestational diabetes and whether the association between air pollution and preterm birth is modified by diabetes (gestational or pre-existing) in a highly polluted area of California. Birth certificates and hospital discharge data from all singleton births from 2000-2006 to women living in four counties in the San Joaquin Valley of California were linked to criteria air pollution and traffic density measurements at the geocoded maternal residence. Pollutants were dichotomized at the highest quartile and compared to the lower three quartiles. Logistic regression models were adjusted for maternal race-ethnicity, age, education, payment of birth expenses, and prenatal care. There were consistent inverse associations between exposure to air pollution during the first two trimesters and gestational diabetes (statistically significant odds ratios (OR) less than 1). When stratified by any diabetes (gestational or pre-existing), associations between air pollution exposure during pregnancy and categories of preterm birth (20-27, 28-31, 32-33, 34-36 weeks) were generally similar with one notable exception (Wald chi-squared p<0.05). The association between particulate matter <2.5 microns (PM2.5) and extremely preterm birth (20-27 weeks) was stronger among those with any diabetes (OR=2.57; 95% confidence interval (CI): 1.60, 4.14) compared with those without diabetes (OR=1.57; 95% CI: 1.40, 1.75). The associations between traffic-related air pollution and gestational diabetes were in the unexpected ("protective") direction. Among those with any diabetes, associations were stronger between PM2.5 and extremely preterm birth. Several previous studies have also reported increased risk of Type 2 diabetes in association with exposure to PM2.5.

THE RELATIONSHIP BETWEEN SKIN COLOR AND PRETERM DELIVERY IN AFRICAN AMERICAN WOMEN IN THE LIFE-COURSE INFLUENCES OF FETAL ENVIRONMENT (LIFE) STUDY. Jaime Slaughter-Acey, Tony Brown, Verna Keith, Dawn Misra (Drexel University)

African American (AA) women exhibit persistently higher rates of preterm delivery (PTD, <37 weeks of gestation) than White women. We examined whether race-related social change (marked by Jesse Jackson's 1984 and 1988 presidential campaigns promoting social justice and racial equality) and skin tone interacted to influence rates of PTD in AA women. We analyzed the 2009-2011 LIFE data comprised of 1410 AA women, age 18-45 years, residing in Metropolitan Detroit, MI. We stratified women by birth cohort: a) born pre-1984 and b) born post-1984. Self-reported skin tone was categorized: light, medium, dark. Descriptive results showed similar PTD rates by birth cohort, pre- vs. post-1984: 16.3% vs. 16.1%. Yet, within each birth cohort, PTD rates varied by skin tone. In the born pre-1984 group, PTD rates were 10.1%, 18.0%, and 20.8% for light, medium, and dark brown women, respectively; the rate for light brown women was similar to the 2010 PTD rate for U.S. non-Hispanic Whites (10.5%, z=0.17 P=0.87). In the born post-1984 group, light brown women had the highest (20.3%) and dark brown women had the lowest (11.9%) rates; the PTD rate for medium brown women was 14.8%. Poisson regression models confirmed a significant interaction between maternal birth cohort and self-reported skin tone predicting PTD (P=0.001); it remained significant net of demographics, place of birth, current residence, parity, life satisfaction, income and education. Results suggest a salubrious association between light brown skin tone (as compared to medium and dark brown skin tone) and the probability of PTD for AA women in the pre-1984 group; however, AA women born post-1984 with medium and dark brown skin tone experienced lower PTD rates than their light brown counterparts. Future research should consider sociopolitical context when investigating the intersectionality of race and skin color in relation to birth outcomes.

NEONATAL VS. FETAL GROWTH STANDARDS TO IDENTIFY SMALL FOR GESTATIONAL AGE INFANTS AT RISK OF ADVERSE OUTCOMES Nansi Boghossian, Marco Geraci, Erika Edwards, Jeffrey Horbar (University of South Carolina)

It is unclear whether small for gestational age (SGA) defined by a neonatal or by a fetal growth standard is a better predictor of adverse newborn outcomes. We aimed to evaluate and compare the predictive power of SGA for adverse neonatal outcomes using three fetal growth charts [National Institute of Child Health and Human Development (NICHD), World Health Organization (WHO), Intergrowth-21st)] and one neonatal sex-specific birth weight standard. SGA was defined as <10th centile of birth weight for gestational age. Outcomes included mortality, necrotizing enterocolitis (NEC), severe intraventricular hemorrhage (sIVH), severe retinopathy of prematurity (sROP), and chronic lung disease (CLD). Inborn singleton infants from 2006-2014 with gestational age between 22 and 29 weeks and enrolled at one of the 852 U.S. centers participating in Vermont Oxford Network were studied. Receiver operating characteristic (ROC) curve analysis was used to compare the four methods of calculating birth weight centiles in relation to the outcomes. The percentage of SGA newborns ranged between 25.9% and 29.7% when using the fetal growth charts. In contrast, the percentage was 10% when using the neonatal charts. The areas under the ROC curves (AUCs) for different outcomes were similar across charts: mortality (0.82), NEC (0.64), sIVH (0.75), sROP (0.84), and CLD (0.77). After adjusting for maternal race/ethnicity, antenatal corticosteroids, postnatal life support, and newborn sex, the AUCs increased but did so similarly regardless of the chart used to classify SGA newborns. In conclusion, the predictive power of SGA for adverse outcomes is comparable across neonatal and fetal growth charts.

AMBIENT AIR POLLUTION AND INTRAUTERINE GROWTH RESTRICTION: PHYSICIAN DIAGNOSIS OF INTRAUTERINE GROWTH RESTRICTION VERSUS POPULATION-BASED SMALL-FOR-GESTATIONAL AGE Carrie Nobles, (National Institutes of Health, NICHD)

Introduction: Ambient air pollution, associated with systemic inflammation and oxidative stress, may affect placentation and induce epigenetic changes associated with intrauterine growth restriction (IUGR). Prior studies of air pollution and small-for-gestational age (SGA), a commonly used proxy for IUGR, have had inconsistent results. We assessed ambient air pollution in relation to both IUGR and SGA in the NICHD Consecutive Pregnancy Study. Methods: This study included 50,005 women with at least two singleton births (112,203 total births) at 20 Utah hospitals between 2002-2010. IUGR was captured from medical records and ICD-9 codes (656.5 "Poor fetal growth"), and SGA determined by population standards for birthweight <10th, <5th and <3rd percentile. Community Multiscale Air Quality (CMAQ) models estimated ambient levels of 7 criteria air pollutants for whole pregnancy, 3-month preconception, and 1st, 2nd and 3rd trimester exposure. Generalized estimating equations with robust Poisson regression accounted for interdependency of pregnancies within participant. Models adjusted for maternal age, race/ethnicity, pre-pregnancy body mass index, smoking, alcohol use, parity, insurance type, marital status, asthma and ambient temperature. Results: IUGR was diagnosed in 1.5% of infants, and 6.7% were <10th, 2.7% <5th and 1.5% <3rd percentile for SGA. Consistent positive associations of SO2, NO2 and PM10 and negative associations of O3 with IUGR were observed throughout preconception and pregnancy. For example, an interquartile increase in whole pregnancy SO2 was associated with a 16% (95% confidence interval [CI] 1.08, 1.25), NO2 a 17% (95% CI 1.09, 1.26) and PM10 a 12% (95% CI 1.06, 1.19) greater risk of IUGR. The association with SGA was less clear, with inferences limited by small and imprecise estimates. Conclusion: Results suggest chronic air pollution exposure may be associated with IUGR and that SGA may not be an adequate proxy for IUGR in this low-risk population.

ASSOCIATION BETWEEN SLEEP QUALITY AND PREGNANCY OUTCOMES: EVIDENCE FROM A CHINESE BIRTH COHORT Zehong Zhou, Lifang Zhang, Jinhua Lu, Songying Shen, Niannian Chen, Mingyang Yuan, Dongmei Wei, Wanqing Xiao, Huimin Xia, Xiu Qiu (Guangzhou Women and Children's medical center)

Background: Recent studies suggested that sleep disorder and short sleep duration during pregnancy may increase the risk of preterm birth (PTB) or gestational diabetes mellitus (GDM). Little analysis about the correlation of the sleep quality and duration with multiple perinatal outcomes is performed among a large population. Methods: 11640 pregnant women with singleton live born between 26 and 42 weeks of gestation from the Born in Guangzhou Cohort Study in China were recruited from Feb 2012 to Feb 2017, and completed the 19-item Pittsburgh Sleep Questionnaire before 20 weeks. Sleep exposure variables were poor sleep quality (sleep quality index >=5) and short sleep duration (<7 hours/day). Multivariable logistic regression was used to estimate the association between sleep quality and duration with pregnancy outcomes, including PTB, GDM, pregnancy induced hypertension (PIH), small and large for gestation age (SGA and LGA). All analyses were adjusted for maternal age, ethnicity, education, income, pre-pregnancy BMI, smoking, second hand smoking, drinking and parity. Results: Poor sleep quality and short sleep duration increased the risk of PTB (adjusted odd ratio (aOR) =1.33, 95% confidence interval (95%CI): 1.09-1.62; aOR=1.34, 95%CI: 1.05-1.68). No significant associations were found between poor sleep quality and short duration with GDM (aOR=1.11, 95%CI: 0.98-1.27; aOR=1.09, 95%CI: 0.92-1.52), PIH (aOR=0.95, 95%CI: 0.73-1.24; aOR=1.06, 95%CI: 0.74-1.50), SGA (aOR=1.06, 95%CI: 0.90-1.26; aOR=0.92, 95%CI: 0.72-1.16) and LGA (aOR=0.94, 95%CI: 0.79-1.12; aOR=0.89, 95%CI: 0.62-1.37). Conclusion: Our results demonstrated that poor sleep quality and short sleep duration pregnancy increased the risk of PTB, which highlights the importance of adequate sleep quality and duration for pregnant women. Further research is needed to better understand the biology of sleep in pregnancy and whether interventions can modify the risk of PTB.

PA042

DO LGA INFANTS HAVE DECREASED FETAL INSULIN SENSITIVITY AND BETA-CELL FUNCTION?

Zhong-Cheng Luo, Yu Dong, Anne Monique Nuyt, Francois Audibert, Shu-Qin Wei, Haim Abenhaim, Emmanuel Bujold, Pierre Julien, Hong Huang, Emile Levy, William Fraser (Mount Sinai Hospital, University of Toronto)

Fetal overgrowth is associated with increased risk of type 2 diabetes in adulthood. It is unclear whether there are alterations in insulin sensitivity and beta-cell function in early life. In the 3D (design, development and discover) birth cohort in Quebec, we studied 106 pairs of large-for-gestational-age (LGA, birth weight >90th percentile, an indicator of fetal overgrowth) vs. optimal birth weight (OBW, 25-75th percentiles) infants matched by maternal ethnicity, smoking status and gestational age. Cord plasma concentrations of glucose, insulin, proinsulin, leptin and high-molecular-weight (HMW) adiponectin were measured. Cord plasma glucose-to-insulin ratio was used as an indicator of fetal insulin sensitivity, and proinsulin-to-insulin ratio an indicator of β-cell function. Cord plasma leptin was negatively correlated to glucose-to-insulin ratio (r=-0.41, P<0.001) and positively correlated to proinsulin-to-insulin ratio (r=0.20, P=0.003). Comparing LGA vs. OBW infants, cord blood insulin, proinsulin and leptin concentrations were significantly higher, while HWM adiponectin concentrations were similar. Glucose-to-insulin ratios were significantly lower (15.4±28.1 vs. 22.0±24.9, P=0.001), while proinsulin-to-insulin ratios significantly higher (0.73±0.82 vs. 0.60±0.78 P=0.02) in LGA vs. OBW newborns, indicating lower insulin sensitivity and β-cell function in LGA newborns. These significant differences remained after adjusting for maternal and infant characteristics, virtually unchanged further adjusting for cord blood adiponectin levels, but disappeared further adjusting for cord blood leptin levels. LGA infants may have decreased fetal insulin sensitivity and β-cell function. These alterations appear to be linked to elevated leptin levels.

PA043 S/T

PRETERM DELIVERY AND THE MATERNAL LIPID PROFILE DURING AND 7-15 YEARS AFTER PREGNANCY

Baiyang Sun, Claudia Holzman, Marnie Bertolet, Janet Catov (University of Pittsburgh; Magee-Womens Research Institute)

There is little information on trajectories of maternal lipids measured in pregnancy and years later, particularly comparing trajectories of women with full-term delivery (FTD) and preterm delivery (PTD). We examined relationships between lipids, measured at two time points, and PTD, using POUCHmoms, a sub-cohort recruited in pregnancy and reassessed at follow-up, 7-15 years post index birth. We included 648 women having lipids (total cholesterol [TC], HDLc, LDLc, triglycerides [TG]) measured at 16-27 weeks' gestation and at follow-up. We used generalized linear models to compare each lipid between delivery outcomes (108 spontaneous PTD [sPTD], 51 indicated PTD [iPTD], and 489 FTD [referent]) and considered both mid-gestation and follow-up lipid levels. Changes from mid-pregnancy to follow-up were also compared. Models were adjusted for gestational age at blood draw, race, age, pre-pregnancy BMI, and parity. We additionally adjusted for mid-pregnancy lipids z-score, follow-up time, and lifestyle factors when comparing follow-up levels and changes. Compared with FTD, women with sPTD had 9.6% (p=0.01) higher TG, similar TC, HDL, and LDL during pregnancy, but had 4.2% (p=0.02) higher TC, 6.9% (p=0.01) higher LDL, and similar TG and HDL at follow-up. In contrast, iPTD had 5.5% (p=0.06) lower TC, similar TG, HDL, and LDL at mid-pregnancy, but had 19.1% (p=0.01) higher TG, similar TC, HDL, and LDL at follow-up. Average declines (mg/dL) in TC (37.6 vs. 45.9, p=0.03) and LDL (8.1 vs. 15.7, p=0.01) were less in sPTD than FTD, while declines in TG were less following iPTD (43.7 vs. 73.3, p=0.07), even after accounting for mid-pregnancy level. In conclusion, lipids were associated with PTD differently at mid-pregnancy and at follow-up. Blunted trajectory of lipids from mid-pregnancy to follow-up in the PTD group may reflect an impaired lipid adaptation to pregnancy compared to FTD, which may in part explain the excess risk of later cardiovascular diseases in women with PTD.

PA044 S/T

ASSOCIATION BETWEEN MATERNAL PSYCHOSOCIAL STRESS DURING PREGNANCY AND GESTATIONAL AGE IN PUERTO RICO

Stephanie Marie Eick, Rafael Rios-McConnell, Zaira Rosario Pabon, Carmen Vélez Vega, John D. Meeker, Akram N. Alshawabkeh, José F. Cordero, Kelly K. Ferguson (University of Georgia, College of Public Health)

Preterm birth (PTB), the leading cause of infant morbidity and mortality worldwide, disproportionally impacts infants in Puerto Rico (PR). Psychosocial stress may be an important risk factor for PTB and hasn't been examined in PR. We examined associations between stress and gestational age continuously and PTB (<37 weeks gestation) using multiple dimensions of stress in order to optimally define exposure. Stress was measured using the Perceived Stress Scale (PSS), Life Experiences Survey (LES), Center for Epidemiologic Studies-Depression (CES-D), and ENRICHD Social Support Instrument (ESSI). We included 922 mother-infant pairs of the Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) Cohort, which examines environmental risk factors for PTB in the Northern Karst region of PR. Data on stress measures was collected during the 3rd trimester visit, except for LES, which was collected at the 2nd trimester. Responses on each scale were scored to create a continuous measure. Higher scores on each scale, except the ESSI, were indicative of increased stress. There were 93 PTBs in this analysis. Lower maternal education, unemployment, and public insurance were more common among women who delivered preterm and were associated with higher scores on all stress measures. Higher scores on the PSS (ß: 0.00; 95% CI (confidence interval): -0.02, 0.01), LES (ß: 0.01; 95% CI: -0.02, 0.04), ESSI (ß: 0.01; 95% CI: -0.02, 0.04), and CES-D scales (ß: -0.01; 95% CI: -0.02, 0.01) were not associated with gestational age or PTB. Although our findings show that stress as measured by these scales is not associated PTB, there are other facets of stress, such as anxiety and neighborhood perceptions, that were not captured in our scales but may be important. Our study indicates that stress in pregnancy is not a major risk factor for PTB in our population. Other environmental exposures, such as chemical exposures in pregnancy, will be investigated in this population in the future.

PA045

NEIGHBORHOOD TAX FORECLOSURES AND PRETERM BIRTH AMONG URBAN BLACK WOMEN: EFFECT MODIFICATION BY EDUCATIONAL ATTAINMENT

Shawnita Sealy-Jefferson, (Virginia Commonwealth University)

No studies have examined the contextual effect of neighborhood tax foreclosures on preterm birth (PTB) risk among Black women. We assessed whether living in a neighborhood with high tax foreclosures is associated with preterm birth risk, and whether educational attainment modified the association. Data from the Life Influences on Fetal Environments Study (2009-2011, n=1410) of postpartum Black women were used; data from the subsample of participants residing in Detroit, Michigan (n=662, 47%), were linked to archival tax foreclosure data from the Wayne County Treasurer. A count variable enumerated the tax foreclosed homes across 380 block groups, and was rescaled by the interquartile range (75th versus 25th percentile). Educational attainment was self-reported, and dichotomized as ≤ 12, > 12 years. PTB was defined as birth before 37 completed weeks of gestation, and occurred in 16.3% of the sample. Log binomial regression models, adjusted for predictors of residential selection, estimated prevalence ratios (PR) and 95% confidence intervals (CI), and included a foreclosure X education interaction term (p < 0.10 was considered statistically significant). 13.4% (n=89) of block groups experienced no tax foreclosures, and 'high' tax foreclosures ranged from 13-69/block group. In the overall sample, neighborhood tax foreclosures did not predict PTB (aPR: 0.95, CI: 0.77, 1.18), but the association was modified by educational attainment (interaction p=0.01). In women with low education (n=171), neighborhood tax foreclosures was positively associated with PTB risk (aPR: 1.42, CI: 1.00, 2.01). The association in women with high education (n=401) was in the opposite direction (aPR: 0.76, CI: 0.56, 1.04). Results were robust to sensitivity analyses which excluded women who themselves experienced a home foreclosure. Future studies should examine women's experiences of living in neighborhoods with high tax foreclosures to understand the mechanisms of the reported associations.

VALIDITY OF MATERNAL RECALL OF GESTATIONAL AGE AND WEIGHT AT BIRTH: COMPARISON OF STRUCTURED INTERVIEW AND MEDICAL RECORDS Julie Petersen, Allen Mitchell, Carla Van Bennekom, Martha Werler (Boston University School of Public Health)

Background: Identification of preterm birth (PtB), low birth weight (LBW), and small-for-gestational age (SGA) requires accurate information on gestational age (GA) at delivery and birthweight (BW). While the accuracy of maternal self-report has long been questioned, few studies have quantitatively assessed validity of GA and BW. Using the case-control Slone Birth Defects Study, we assessed agreement between maternal self-report and medical records for BW and dating-derived GA and whether any maternal characteristics were associated with greater likelihood of discrepancies. Methods: Within 6 months of delivery, nurses interviewed by telephone mothers of infants with and without major structural malformations. In a subset of ~5,000 U.S. participants (2008-12), a research nurse abstracted relevant data from medical records. GA was calculated as the difference between birthdate and due date or last menstrual period for both self-reports and medical records. Positive and negative predictive values (PPV, NPV) for PtB and LBW used medical records as the standard. Results: After exclusions for missing and extreme data, 3122 and 4760 pregnancies were included in the GA and BW analyses, respectively. The PPV and NPV were high (>92% and 99%, respectively) for all categories of GA and BW. Women of low income, less education, and non-white race were more likely to have discrepancies, though the PPV and NPVs were still fairly high (>84% and 97%, respectively). Conclusion: Our findings suggest that maternal self-report may be a valid alternative to medical records to estimate delivery GA and BW. This study used standardized interviews conducted by trained research nurses, had a short recall period, and focused on date-derived GA. Further research is needed on the potential impact of study design, population characteristics, and comparison to other data sources.

INFLUENCE OF MATERNAL AND OFFSPRING GENETIC SUSCEPTIBILITY TO OBESITY ON BIRTHWEIGHT IN AFRICAN ANCESTRY POPULATIONS: INTRA-UTERINE VS SHARED GENETIC INFLUENCE? Deepika Shrestha, (Division of Intramural Population Health Research, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health)

Genetic susceptibility to adulthood obesity can influence birthweight through mechanisms involving the fetus (through shared genetic effect) and/or the mother (by modulating the intra-uterine environment). We investigated the effects of fetus and maternal genetic risk of obesity on birthweight and evaluated whether these genetic influences modify the well-known association between maternal pre-pregnancy BMI (ppBMI) and birthweight. Genotypic and phenotypic data of 950 mother-baby pairs of African ancestry were obtained from the Hyperglycemia Adverse Pregnancy Outcome study (dbGAP study accession phs000096.v4.p1). A genetic risk score for obesity was generated for mothers (mGRS) and babies (bGRS) as the weighted sum of 97 BMI-increasing alleles. The median GRS was used to categorize samples as having high-low genetic risk for obesity. Linear regression analysis was performed to calculate the association adjusting for birth weight covariates and proportion of African ancestry. A one allele increase in bGRS was significantly associated with a 13.0 g lower birthweight [95% CI=-24.7, -1.4]. High bGRS was significantly associated with 70.9 g lower birthweight (95% CI=-130.5, -15.2) compared to low bGRS. However, mGRS was associated with a modestly higher birthweight but did not reach statistical significance. The significant birthweight-increasing effect of maternal ppBMI (β=6.5,95% CI=1.2,11.9) was modified by mGRS (P for interaction =0.03); ppBMI had a stronger and significant association with birthweight among low mGRS pregnancies (β=8.7,95% CI =1.1,16.2) but not among high mGRS pregnancies (β=4.5,95% CI=-2.9,12.0). Fetal genetic risk to obesity in later life had strong birthweight-lowering effect as opposed to the weak birthweight-increasing effect of maternal genetic risk to obesity. Findings suggest that obesity genetic risk loci are important components of the life course associations between birthweight and obesity in later life.

PA048

PREVALENCE OF SMALL FOR GESTATIONAL AGE AMONG LIVE BIRTHS WITH CONFIRMED AND POSSIBLE PRENATAL EXPOSURE TO ZIKA VIRUS INFECTION, UNITED STATES ZIKA PREGNANCY AND INFANT REGISTRY, 2015-2017 Abbey Jones, Regina Simeone, Sascha Ellington, Megan Reynolds, Carrie Shapiro-Mendoza, Ellen Lee, Hannah Cooper, Kristine Aviles, Juliana Prieto, Esther Ellis, Julie Dunn, Aja Griffin, Amelie Mafotsing Fopoussi, Nina Ahmad, Viola Glaze, Lisa D'Amico, Cristina Suarez, Shea Browne, Jonathan Popovitch, Dana Perella, Margaret Honein, US Zika Pregnancy and Infant Working Group (Centers for Disease Control and Prevention)

The United States Zika Pregnancy and Infant Registry (USZPIR) monitors infant outcomes from pregnancies with confirmed and possible Zika virus (ZIKV) infection. A higher prevalence of ZIKV-associated birth defects (birth defects) among nucleic acid test (NAT) confirmed ZIKV infection compared to possible ZIKV infection has been reported. We examined associations between NAT confirmed ZIKV infection during pregnancy and small for gestational age (SGA; birthweight <10th percentile for gestational age and sex) among live births stratified by birth defects. NAT-confirmed ZIKV infection was defined as a positive nucleic acid test in maternal, infant, or placental specimens; possible ZIKV infections were those with serologic evidence and were the comparison group. From December 2015-December 2017, 5579 singletons were reported to the USZPIR; 36% from the US States and 64% from US Territories. Among 1567 State and 3170 Territory live births with gestational age and weight at delivery, 12% and 10% were SGA and 6% and 4% had birth defects, respectively. In the States, among live births with birth defects, the prevalence of SGA was higher among pregnancies with NAT-confirmed ZIKV (68%) compared to possible infection (34%) (prevalence ratio (PR): 2.0 (95% confidence interval: 1.1, 3.6)). The association between NAT-confirmed infection and SGA among those without birth defects was not significant (PR: 1.3 (0.8, 1.9)). In the Territories, among those with birth defects, the prevalence of SGA was similar for NAT-confirmed (45%) and possible ZIKV infection (43%) (PR: 1.0 (0.6, 1.8)); a similar association was observed among those without birth defects (PR: 0.8 (0.6, 1.0)). The prevalence of SGA might be higher among pregnancies with NAT-confirmed ZIKV infection compared to possible infection. This finding was observed only in pregnancies with birth defects in the States. Results are limited by differences in completeness of data collection, testing, and reporting within USZPIR.

PA049

NOVEL GENETIC LOCI LINKING EARLY AND LATER LIFE CARDIOMETABOLIC AND ANTHROPOMETRIC TRAITS Fasil Tekola-Ayele, Anthony Lee, Tsegaselassie Workalemahu, Deepika Shrestha (NICHD, NIH)

Background: Previous studies have shown correlations of early growth and childhood traits with the development of cardiometabolic diseases and anthropometric traits in later life. Genetic variants that influence both traits may underlie these associations. Methods: Using genome-wide single nucleotide polymorphism (SNP) data contributed by five Consortia studies, we implemented a unified statistical approach to test for pleiotropy and enrichment of functional loci in 75 pairs of traits consisting five early life (ELTs) including birth weight, birth length, birth head circumference, childhood body mass index, and childhood obesity and fifteen later life traits or diseases (LLTs) including adult body mass index, waist-to-hip ratio, waist circumference, height, fasting plasma glucose, fasting plasma insulin, glycated hemoglobin, insulin secretion, insulin sensitivity, coronary artery disease, myocardial infarction, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, total cholesterol, and total glycerides. Results: Pleiotropic genetic effects were significant for 73 out of the 75 ELT-LLT pairs (P<5 x 10-4); functional deleteriousness was significantly higher for SNPs associated with both an ELT and a LLT compared to SNPs associated with neither trait or only one trait for 69 ELT-LLT pairs (P<5 x 10-4). In addition, 142 loci were associated with both traits in ELT-LLT pairs at a false discovery rate of 5%; 40 out of the 142 loci were novel. Variants with birthweight-reducing effect were associated with higher risk of type 2 diabetes, myocardial infarction, and coronary artery disease. For 18 novel loci, the lead SNPs were cis-eQTLs which are associated with the expression of genes in tissues implicated in cardiometabolic diseases. Conclusions: This first comprehensive investigation of pleiotropy found shared genetic variants that contribute to the associations between early and later life cardiometabolic and anthropometric traits.

S/T=Student/Trainee

CHILDHOOD CARDIOVASCULAR RISK FACTORS AND BIRTH OUTCOMES: THE BOGALUSA HEART STUDY Emily Harville, Maeve Wallace, Lydia Bazzano, Gabriella Pridjian (Tulane University)

Background: Given the limited effectiveness of prenatal interventions in preventing adverse birth outcomes, health outside the time of the pregnancy may be important. Some studies have assessed preconception adult cardiovascular risk, but few have considered cardiovascular health since childhood. Methods: Childhood (ages 6-16) measurements of cardiometabolic indicators from 1252 women in the Bogalusa Heart Study included body mass index, systolic and diastolic blood pressure (SBP and DBP), low- and high-density lipoprotein cholesterol, total cholesterol, triglycerides, insulin, and glucose. Average childhood values were estimated by area under the curve (AUC) computed from longitudinal quadratic random-effects growth models to account for the unequally-spaced repeated measures, with control for confounders. Women reported the birthweight and gestational age of each pregnancy, and delivery medical records were linked to interview data where possible. Possible effects of pregnancy complications (gestational diabetes, gestational hypertension, and pre-eclampsia) were considered both by adjustment and restriction. Results: 8.3% of participants reported preterm birth and 8.6% low birthweight. Lifetime cholesterol and LDL were associated with increased risk of preterm birth (aRR for an IQR increase in AUC 1.39, 95% CI 1.06-1.81 and 1.40, 1.07-1.83, respectively). Lifetime glucose (1.32, 1.01-1.71) and systolic blood pressure (1.38, 1.05-1.81) were associated with increased risk of low birthweight. When pregnancy complications were adjusted for or removed from the dataset, results were similar although confidence intervals wider. Conclusions: Lifetime levels of some, though not all, cardiovascular risk factors may predict adverse birth outcomes, only partially due to pregnancy complications.

PRECONCEPTION MATERNAL LIPIDS AND RISK OF LARGE-FOR-GESTATIONAL AGE NEONATES IN THE EAGER STUDY Alaina Bever, (Eunice Kennedy Shriver National Institute of Child Health and Human Development)

Large-for-gestational age (LGA) births are associated with labor and delivery complications and poor adulthood cardiovascular and metabolic health, though the mechanisms are not well understood. Abnormal maternal lipid profiles during pregnancy have been associated with increased risk of LGA. Associations between preconception lipid profile and birthweight outcomes are not well understood, and may offer an important window for potential intervention. Our objective was to assess relationships between preconception lipid profiles and risk of LGA in 1,228 women enrolled in the Effects of Aspirin on Gestation and Reproduction Trial. Serum levels of maternal cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides were measured preconception. Total cholesterol:HDL (TC:HDL) ratio was calculated, given its previously demonstrated potential to predict vascular risk more successfully than individual lipids. Of 597 women with live birth, 590 had birthweight data available. Logistic regression was used to estimate associations between lipid levels [≤10th, 10th-90th (reference), ≥90th percentile] and LGA defined as ≥90th percentile birthweight, with adjustment for maternal age, race, education level, smoking, fasting status at blood draw, and total cholesterol. Results were compared after additional adjustment for BMI. Inverse probability weights were used to account for potential selection bias due to restriction to those with available birthweight data. Preconception TC:HDL ratio ≥90th percentile was associated with risk of a LGA neonate (relative risk 1.95, 1.08-3.53 compared to 10th-90th percentile); this risk was attenuated after adjustment for BMI (relative risk 1.86, 0.99-3.5). LGA was not associated with individual lipid components. Preconception TC:HDL may be predictive of LGA, and more research is necessary to elucidate mechanisms by which abnormal preconception lipid profiles contribute to fetal overgrowth and body composition.

PA052

ASSOCIATION OF MATERNAL CAFFEINE AND PARAXANTHINE CONCENTRATIONS WITH NEONATAL ANTHROPOMETRY Katherine Grantz, Germaine Buck Louis, Nicole Gerlance, Melissa Amyx, Alaina Bever, Kurunthachalam Kannan, Melissa Smarr, Masato Honda, Rajeshwari Sundaram (NICHD, NIH)

High caffeine intake is associated with lower birthweight (BW), but little is known about association with individual neonatal biometrics. In the NICHD Fetal Growth Studies cohort of low-risk, self-reported non-smoking pregnant women with singletons (n= 2101), caffeine and paraxanthine were measured in plasma at enrollment (10-13 weeks' gestation). Adjusted generalized linear models assessed caffeine, its major metabolite paraxanthine, and caffeine+paraxanthine (Σ) as log-transformed continuous variables and as quartiles to assess potential non-linearity (1st quartile, referent) in association with neonatal anthropometrics: BW (g); length (cm); head (HC), mid-upper arm (ArmC), abdominal, mid-upper thigh circumference (cm); subscapular, triceps, abdominal flank, anterior thigh skinfolds (mm); % fat mass. Caffeine and paraxanthine were detectable in 93% and 88% of samples, with median (IQR) of 155 (28-652) and 72 (15-230) ng/mL, respectively. Caffeine, paraxanthine, and their Σ were negatively associated with neonatal length (P=.01 for all 3 biomarkers), HC (P

PA053

ANTENATAL CORTICOSTEROID ADMINISTRATION AMONG WOMEN WITH PRETERM BIRTHS Kari Teigen, Bradford Jackson, Rohit Ojha (JPS Health Network)

Background: The American College of Obstetricians and Gynecologists (ACOG) recommends universal administration of antenatal corticosteroids to improve neonatal outcomes for women at risk of imminent preterm delivery, but the implementation of this guideline has not been systematically assessed. We aimed to assess the prevalence of and potential racial/ethnic inequalities in antenatal corticosteroid administration among women with preterm births. Methods: We used data from the 2016 United States Natality file to identify a cohort of nulliparous women aged ≥18 years with singleton live births between 24 0/7 and 33 6/7 gestational weeks. Antenatal corticosteroid administration was reported as a dichotomy (yes/no) and race/ethnicity was based on self-report. We used binomial regression with an identity link to estimate prevalence differences (PDs) and 95% confidence limits (CL) for the association between race/ethnicity and antenatal corticosteroid administration. To reduce bias from conditioning on an index-event, we adjusted for maternal age, insurance, and receipt of early prenatal care, which were identified using the back-door criterion in a directed acyclic graph. Results: Our study population comprised 30,217 women eligible for antenatal corticosteroid administration. Overall, 39% (95% CL: 39%, 40%) received antenatal corticosteroids, ranging from 36% for Hispanics to 42% for non-Hispanic Whites. Antenatal corticosteroid administration was lower for Hispanic (PD= -6.0%; CL: -7.5%, -4.4%) and non-Hispanic Black women (PD= -4.7%; CL: -6.2%, -3.2%) compared with non-Hispanic White women. Conclusion: Assuming limited impact of biases, our results suggest poor implementation of guidelines for the administration of antenatal corticosteroids among women with preterm births. Future studies should assess barriers to implementation and potential mediation of racial/ethnic inequalities in neonatal outcomes by antenatal corticosteroid administration.

S/T=Student/Trainee

LONGITUDINAL ASSOCIATIONS OF MATERNAL VITAMIN D STATUS DURING PREGNANCY WITH NEONATAL ANTHROPOMETRIC MEASURES Ellen Francis, Stefanie Hinkle, Yiqing Song, Shristi Rawal, Sarah Donnelly, Liu Danping, Yeyi Zhu, Michael Tsai, Liwei Chen, Cuilin Zhang (Clemson University)

This work was supported by the intramural research program of the Eunice Kennedy Shriver National Institute of Health and Human Development. Previous findings on maternal vitamin D [25(OH)D] and neonatal anthropometry are conflicting, partly due to lack of longitudinal 25(OH)D measurements across gestation. The current study investigated longitudinal associations of maternal 25(OH)D during pregnancy with neonatal anthropometric measures. The study included 321 mother-offspring pairs enrolled in the prospective NICHD Fetal Growth Study-Singletons. Maternal 25(OH)D was measured 4 times during pregnancy (10-14, 15-26, 23-31, and 33-39 gestational weeks (GW)), and categorized as deficiency, insufficiency and sufficiency using cutoffs of 50 and 75 nmol/L. Weighted generalized linear models with robust variance were used to examine adjusted associations of maternal 25(OH)D concentrations at each visit with birthweight z-score, length, and sum of skinfolds at birth. At 10-14 GW, 16.8% and 49.2% of women had 25(OH)D deficiency and insufficiency, respectively. The direction of association of maternal 25(OH)D with neonatal anthropometry differed by women's prepregnancy obesity and GW. Among overweight/obese women, 25(OH)D deficiency compared to sufficiency at 10-14 GW was associated with lower birthweight z-score [β=-0.56 (95% confidence interval (CI) -0.99, -0.13)] and length [β=-1.56 cm (95% CI -3.07, -0.06)]. In the normal weight group, women with 25(OH)D deficiency at 33-39 GW had neonates with higher birthweight z-scores [β=1.22 (95% CI 0.71, 1.73)]. Among overweight/obese women before prepregnancy, 25(OH)D deficiency at 23-31 GW was associated with lower neonatal length [β=-2.77 cm (95% CI -13.38, -4.98)] and sum of skinfolds [β=-9.18 mm (95% CI -13.38, -4.98)]. Among women with normal weight, 25(OH)D deficiency at 10-14 GW was associated with lower neonatal sum of skinfolds [β=-2.64 mm (95% CI -5.03, -0.24)]. Our findings suggest that maternal 25(OH)D status during pregnancy is significantly related to neonatal anthropometric measures, and the associations vary by GW and maternal prepregnancy obesity status.

ELEVATED PRECONCEPTION LIPIDS INCREASE THE RISK OF PRETERM BIRTH Catherine Haggerty, Kalpana Betha, Kusneniwar Govind, Roberta Ness, Brandie Taylor, Gong Tang, P.S. Reddy (University of Pittsburgh)

Background: Preterm birth is a primary contributor to neonatal morbidity and mortality as well as later maternal cardiovascular disease. Pregnancy is considered a "stress test" for maternal carbohydrate, lipid, inflammatory and vascular function, and these are atherosclerosis risk markers. Any or all of these mediators might underlie the link between preterm birth and later cardiovascular disease. However, preconception studies examining prenatal susceptibility for adverse pregnancy outcomes including preterm birth are rare. Methods: We conducted a pilot study of preconception cardiovascular markers and preterm birth <37 weeks of gestation among 518 women recruited preconception and contributing their first study pregnancy resulting in a singleton live birth in the Longitudinal Indian Family hEalth (LIFE) study in Telangana State, India. Mean preconception total cholesterol, high density lipoprotein, low density lipoprotein, very low density lipoprotein, and triglycerides were compared between 74 women with pregnancies delivered preterm and 444 women who delivered at term using the Student's t-test. Results: Preconception triglycerides (mean 80.1 ± 58.0 mg/dL vs. 64.6 ± 34.2 mg/dL, p=0.02) and very low density lipoprotein (16.0 ± 11.6 mg/dL vs. 12.9 ± 6.8 mg/DL, p=0.03) were significantly higher among women who experienced a subsequent preterm birth as compared to women who delivered at term. Conclusions: In a general Indian population birth cohort, elevated preconception lipids were associated with an increased risk of subsequent preterm birth. These findings support the need for large scale preconception biomarker studies of preterm birth and suggest a potential need for preconception lipid screening in clinical practice.

RATES OF STILLBIRTH FROM 2006 TO 2014 IN GUANGZHOU, CHINA - A POPULATION BASED RETROSPECTIVE STUDY Lifang Zhang, Wanqing Xiao, Jinhua Lu, Songying Shen, Mingyang yuan, Jia Yu, Li Yang, Huiyun Xiao, Huimin Xia, Xiu Qiu (Guangzhou Women and Children's Medical Center)

Introduction: Stillbirths cause large global burden in worldwide. It was estimated over 122,000 stillbirths in 2015 in China. Unfortunately, few studies reported the rates of stillbirth in China based on population data. The objective of the study was to report the population-based trends of stillbirth rate (SBR) in Guangzhou, China. Methods: Stillbirth was defined as baby born with no signs of life weighing ≥ 1000 g or after 28 completed weeks of gestation. SBR was calculated as the number of stillbirth per 1000 total (live and stillborn) births All the data of births from 2006 to 2014 were obtained from the Guangzhou Perinatal Health Care and Delivery Surveillance System. Joinpoint regression analysis was conducted to quantify the changes of SBR in total and in stratification by maternal age (<25, 25-29, 30-34, ≥35 years) and the gender of babies. Average annual percent change (AAPC) was used to indicate change in trends during the research years. Results: There were 9989 cases of stillbirth from 2006 to 2014 in Guangzhou, China. In total, the SBR has decreased from 8.82 to 4.56/1000 total births during the years, with the AAPC of -7.0% (95% CI, −5.3%, -8.6%). For both male and female babies, there were significant decreases from 2006 to 2014 (AAPC for males was -7.6% [95% CI, -5.6%, -9.6%], AAPC for females was-6.3% [95% CI, -4.4%, -8.2%], respectively). More reductions of SBRs were observed in the higher maternal age groups. The SBR of maternities over 35 years old showed the fastest decreasing, which from 15.05/1000 in 2006 to 5.16/1000 in 2014, with the AAPC of -12.6% (95% CI, −9.8%, -15.3%). Conclusion: The rate of stillbirth decreased during 2006-2014 in Guangzhou, China. The underlying contributions for the reduction of SBR will be further explored, which may provide scientific evidence to improve the quality of perinatal health care and prevent more pregnant losses before delivery.

HIGH PRE-CONCEPTIONAL HOMOCYSTEINE IS ASSOCIATED WITH ELEVATED RISK OF PREGNANCY LOSS AMONG FERTILE FOLATE-REPLETE WOMEN WITH PRIOR HISTORY OF LOSS Elizabeth DeVilbiss, (NIH)

While it is well established that preconception folic acid supplementation can prevent approximately 70% of neural tube defects, much existing research between maternal folate status and other reproductive outcomes has been conducted among sub-fertile women of low folate status. Our objective was to examine associations between pre-conceptional folate and homocysteine and reproductive outcomes in a population of healthy and fertile folate-replete women at high risk for pregnancy loss. All 1,228 women enrolled in the Effects of Aspirin in Gestation and Reproduction (EAGeR) trial, a block-randomized, double-blind, placebo-controlled trial conducted in 2007-2011, had 1-2 previous pregnancy losses and no documented infertility. Participants were allocated 400 μg/day folic acid supplements and were attempting pregnancy for up to 6 menstrual cycles. Restricted cubic splines of weighted log-binomial regression models were used to estimate relative risks (RR) and 95% confidence intervals between serum folate and plasma homocysteine for anovulation, pregnancy, pregnancy loss, and live birth. Relative risks were defined relative to median values for folate (40 nmol/L) and homocysteine (6.0 μmol/L) in U.S. populations of reproductive-aged women. Adjusted models accounted for age, BMI, previous number of losses, and parity. Serum folate measurements were characteristic of a folate-replete population (median: 58.2 nmol/L). No relationships were found between serum folate and any reproductive outcome or between plasma homocysteine and anovulation or pregnancy. Higher homocysteine values were associated with higher risks of pregnancy loss corresponding to reduced probability of live birth (pregnancy loss RR= 1.36 [1.00, 1.86] and live birth RR = 0.86 [0.76, 0.99], for women above 11.2 μmol/L – 95th percentile), though verification of these findings in fertile, folate-replete women is now needed.

INTERPREGNANCY INTERVAL AND INJURY-RELATED INFANT MORTALITY IN THE UNITED STATES Marie Thoma, Lauren Rossen, Kate Ahrens, Dane De Silva, Margaret Warner, Alan Simon, Susan Moskosky (University of Maryland, School of Public Health)

Background: Understanding the relationship between interpregnancy interval (IPI) and injury-related infant mortality could provide insight into intervention strategies to improve infant health, as both short IPI and injury-related death are potentially preventable. Objective: To examine the relationship between IPI and infant mortality overall and, specifically, injury-related infant mortality. Methods: We used 2011-2015 period linked infant-death vital statistics files to generate multiyear birth cohort files using restricted-use identification numbers. After restricting the cohort to non-firstborn singleton births (N=9,782,029), we used ICD-10 cause of death codes to identify external causes of death in the first year of life. Hazard ratios were estimated using Cox proportional hazards models adjusted for birth order, county poverty level, and maternal characteristics (marital status, race/ethnicity, education, age at previous birth). Results: Approximately 29% of births occurred after an IPI <18 months (<6 months, 5%; 6-11 months, 11%; 12-17 months, 13%). Risks of infant mortality overall and injury-related infant mortality were 48.1 and 4.4, respectively, per 10,000 live births. Risk of overall infant mortality was higher for shorter and very long IPIs compared with IPI 18-23 months: <6 months, aRR= 1.61 (95%CI:1.54, 1.68); 6-11 months, aRR=1.22 (95%CI:1.17, 1.26); IPI 60+ months, aRR=1.12, (95%CI:1.08, 1.16). Risk of injury-related infant mortality increased for shorter and decreased for longer IPIs: <6 months, aRR= 1.77 (95%CI:1.55, 2.01); 6-11 months, aRR= 1.41 (95%CI:1.25, 1.59); 12-17 months, aRR= 1.25 (95% CI:1.10, 1.41); 24-59 months, aRR= 0.78 (95%CI:0.69, 0.87); and 60+ months, aRR= 0.55 (95%CI:0.48, 0.62). Conclusion: Unlike the J-shaped relationship with overall infant mortality, injury-related infant mortality decreased monotonically with length of IPI, suggesting different underlying mechanisms for these types of infant deaths.

LOW LUTEAL PHASE PROGESTERONE, FECUNDABILITY, AND EARLY PREGNANCY LOSS Lindsey Sjaarda, Christina E Boots, Neil J Perkins, Sunni L Mumford, Robert M Silver, Enrique F Schisterman (NICHD, NIH)

Progesterone is essential for the establishment and maintenance of pregnancy. Debate continues as to whether low luteal progesterone (e.g. luteal phase deficiency) is associated with pregnancy loss, but women at risk of loss are still commonly treated with exogenous supplemental progestins To evaluate links between luteal progesterone and fecundability and loss, prospective ascertainment from preconception through early pregnancy is essential. Therefore, this association was examined in the EAGeR trial, which enrolled women attempting pregnancy with a history of 1-2 pregnancy losses and prospectively tracked menstrual cycle phase, pregnancy, and loss using fertility monitors and systematic urine human chorionic gonadotropin (hCG) testing. Women attempted pregnancy up to six menstrual cycles. In the first two cycles of participation, urinary follicular phase estrone glucuronide (E1G) and mid-luteal phase pregnanediol glucuronide (PdG) were measured. Fecundability odds ratios were estimated using Cox proportional hazard models for luteal PdG < vs ≥ 5000 ng/mL. Pregnancy loss risk (including loss after hCG detection, and clinical loss after ultrasound confirmation at 6-7 weeks' gestation) was evaluated using log-binomial models weighted for the probability of pregnancy. All models adjusted for age, BMI, and follicular phase E1G. No association was detected between PdG and fecundability (FOR [95%CI]: 1.04 [0.80, 1.35] for hCG pregnancy). Among 221 pregnancies with luteal PdG measured in the cycle of conception, there were 51 losses (26 hCG losses, and 25 clinical losses). No association was observed between PdG and pregnancy loss overall (RR [95%CI]: 1.0 [0.8, 1.24] per ng/mL increase in PdG), hCG loss (0.84 [0.60, 1.16]), or clinical loss (1.17 [0.84, 1.63]). In sum, these findings from a preconception, prospective study indicate that luteal progesterone is unrelated to fecundability and pregnancy loss risk among fertile women in natural conception cycles.

AN INTERNATIONAL COHORT STUDY MEASURING ADVERSE BIRTH OUTCOMES ASSOCIATED WITH INTERPREGNANCY INTERVAL FOLLOWING STILLBIRTH Annette Regan, Mika Gissler, Maria Magnus, Siri Håberg, Stephen Ball, Eva Malacova, Natasha Nassar, Helen Leonard, Gavin Pereira (Curtin University)

Background: The World Health Organization recommends waiting ≥2 years following a live birth, and ≥6 months following a spontaneous or induced abortion, before becoming pregnant again to reduce the risk of adverse birth outcomes. There is currently no recommendation for the optimal interval following a stillbirth. Method: We conducted an international cohort study (Finland, Norway, Western Australia) investigating the associations of interpregnancy interval after stillbirth (at ≥22 weeks) with preterm birth, small-for-gestational age, and stillbirth in the next pregnancy. Odds of adverse birth outcomes by interpregnancy interval category were determined for each country using multivariate logistics regression, adjusting for age, parity, and decade of delivery. A random effect meta-analysis was used to calculate pooled effect estimates. Results: A total of 23,775 women in the study had a pregnancy following a stillbirth. Women with interpregnancy interval 59 months following a stillbirth. Conclusions: Women who conceived <12 months after a stillbirth were at lower risk of preterm and small-for-gestational-age birth. Stillbirth is a traumatic experience for families, and this information is valuable for counselling families around the optimal time to conceive their next child following a stillbirth.

RISK OF STILLBIRTH AMONG FETUSES WITH NON-SYNDROMIC MAJOR BIRTH DEFECTS: A POPULATION-BASED STUDY INCORPORATING ESTIMATES OF THE IMPACT OF COMPETING EVENTS Dominique Heinke, Eirini Nestoridi, Sonia Hernandez-Diaz, Paige Williams, Janet Rich-Edwards, Angela Lin, Carla Van Bennekom, Allen Mitchell, Wendy Nembhard, Ruth Fretts, Drucilla Roberts, Charles Duke, Suzan Carmichael (Harvard School of Public Health)

The risk of stillbirths in the US population is 0.6%. We sought to estimate the risk of stillbirth (fetal death ≥ 20 weeks gestational age (GA) or birth weight (BW)≥ 500g) among cases of non-syndromic major birth defects and to quantify the impact of elective termination and first day neonatal death on estimates. We included major birth defect cases in the National Birth Defects Prevention Study identified through active population-based surveillance programs in nine US states between 1997 and 2011. Birth defects were confirmed and classified by clinical geneticists after medical records review. Estimates excluded defects unreliably ascertained in stillbirths (e.g., heart defects). We calculated the observed risk of stillbirth, termination-corrected minimum (terminations assumed live born) and maximum (terminations assumed stillborn) risk, and risk of combined mortality (termination, stillbirth, and first-day neonatal death) among cases of specific birth defects surviving ≥ 20 weeks GA overall and stratified by defect pattern. Among 19,718 cases, 843 were stillborn, 689 electively terminated, and 18,186 live born. Observed stillbirth risk ranged from 1.2% for cerebellar hypoplasia to 49.2% for limb-body-wall complex. The difference in minimum and maximum termination-corrected risk estimates ranged from 0.2 percentage points for cleft lip without cleft palate (range: 1.3 – 1.5%) to 35.1 percentage points for limb-body-wall complex (range: 31.9 – 67.0%). Isolated cases had lower risks of stillbirth and combined mortality than multiple defect cases. Stillbirth comprised half or more of the combined mortality for isolated cases of most birth defects. Fetuses with major non-syndromic birth defects have an increased risk of stillbirth which varies by specific defect and is further increased for multiple defect cases. Estimates may aid counseling after prenatal diagnosis; estimates which incorporate competing events can improve counseling and comparisons across studies.

EXAMINING THE "BIRTHWEIGHT PARADOX": DIFFERENCES IN MATERNAL AND NEWBORN CHARACTERISTICS AMONG SMOKING AND NON-SMOKING MOTHERS OF LOW BIRTH WEIGHT INFANTS Maria Sevoyan, Marco Geraci, Nansi Boghossian (University of South Carolina)

Several studies from different countries have shown a counterintuitive relationship between mortality in low birthweight (LBW) infants and maternal smoking during pregnancy: mortality among LBW infants born to non-smoking mothers is higher than mortality among those born to smoking mothers. However, little is known about differences in maternal and newborn characteristics in the exposed and unexposed groups. We analyzed data from two cohorts: 18,081 infant-mother dyads from the UK Millennium Cohort Study and 3,281,944 dyads from the US National Vital Statistics System. Maternal and newborn characteristics were compared between smoking and non-smoking mothers using Chi-square test. Prevalence of LBW among smokers was twice as much as the prevalence in non-smokers for both countries (UK: 10.0% vs. 5.3%; US: 11.0% vs. 5.7%). Overall, as compared to non-smokers, mothers who smoked during pregnancy were more likely to be young, white, unmarried, less educated, unemployed, and to have had pregnancy complications. These factors are known to be associated with higher LBW risk. However, other important unfavorable factors were more prevalent among non-smokers, namely non-smokers were more likely to have: pre-pregnancy diabetes (UK: 4.1% vs. 1.5%; US: 1.3% vs. 1.2%), pre-pregnancy hypertension (US: 3.8% vs. 3.0%), eclampsia (US: 1.1% vs. 0.7%), and gestational diabetes (US: 5.5% vs. 4.1%). Some unfavorable newborn conditions were more prevalent among infants of non-smokers as compared to smokers including preterm birth (UK: 61.2% vs. 52.7%; US: 64.3% vs. 54.1%) and congenital heart disease (US: 0.33% vs. 0.21%). It has been hypothesized that higher prevalence of unfavorable maternal and neonatal factors that are also associated with lower birthweight might explain higher infant mortality among LBW infants born to non-smokers. Future steps following our analysis include quantifying the contribution of each factor to LBW and subsequent mortality among smokers vs. non-smokers.

APPLICATION OF THE "INTENT TO ATTEND" ASSESSMENT TO PREDICT MISSING DATA AND ADHERENCE IN A PEDIATRIC CLINICAL TRIAL Sarah Keim, (Nationwide Children's Hospital/Ohio State U)

A 2010 National Research Council report on missing data in clinical trials recommended that trial participants be asked about their intent to attend subsequent study visits as a means to improve handling of missing data when participants fail to complete study activities. This method has not been applied outside a single adult psychiatric trial and a simulation study, so its general utility remains uncertain. Our Omega Tots trial (n=377, Columbus OH, 2012-17) tested a daily dietary supplement, with the goal of improving cognitive development in toddlers born preterm. We asked parents at the baseline visit to rate how likely (1=very unlikely–10=very likely) they were to complete the 6-month study (3 total study visits). 20% of parents gave a rating $45,000) were more likely to give a rating <10, compared to families with lower incomes ($\chi2$=4.6, p=0.03). Parents who rated 10 had a lower odds of attending the last study visit (OR=0.33, 95% CI: 0.06, 1.12) and having complete primary outcome data (OR=0.11, 95% CI: 0.003, 0.67). Conversely, higher intent to attend ratings were associated with fewer number of days late the family was for their last study visit (mean=5.5 days late for ratings <10 vs 2.4 for rating=10, r=-.17, p<.01). Intent to attend ratings were unassociated with how many medication diaries parents completed, medication adherence, or whether adherence data were missing entirely. In this pediatric clinical trial, intent to attend ratings had complex relationships to participant demographics and study participation indicators which had not been previously examined or were contrary to the prior small literature. It is possible that social desirability bias may influence question response and be differential by SES, and this may undermine the utility of the intent to attend approach.

CLASSIFYING PREGNANCY WEIGHT GAIN TRAJECTORIES IN THE NICHD FETAL GROWTH STUDIES Elizabeth Widen, Ciara Nugent, Jagteshwar Grewal, Chia-Ling Nhan-Chang, Radek Bukowski, Michael Daniels (University of Texas at Austin)

The pattern of gestational weight gain (GWG) is clinically important for maternal and child health and potentially modifiable. We sought to describe pregnancy weight gain trajectories and examine racial/ethnic differences. We conducted a secondary analysis of a prospective cohort of singleton pregnancies (n=2,530) enrolled from 12 US prenatal centers from 2009 to 2013, including 27.3% Non-Hispanic White, 27.8% Non-Hispanic Black, 28.5% Hispanic and 16.4% Asian/Pacific Islander. Prepregnancy weight was self-reported, and prenatal weight was measured at 6 visits and abstracted from medical records. Using the R package lcmm, we fit a latent-class trajectory model with splines and individual random slopes; prepregnancy BMI was used to predict class membership. Overall, 6 trajectory classes were identified. Four groups had different patterns, but similar total GWG (estimated GWG within 16±1 kg at 40 wk gestation): 1) Low-High-Stable (37.2%) gained 0.2 kg/wk in the 1st Trimester (T), 0.7 kg/wk in 2nd T and 0.4 kg/wk in 3rd T; 2) Steady-High-Low (27.9%) gained 0.4 kg/wk in 1st T, 0.6 kg/wk in 2nd T, and 0.2 kg/wk in 3rd T; 3) High-Stable-Low (12.1%) gained 0.8 kg/wk in 1st T, 0.3 kg/wk in 2nd T, and 0.2 kg/wk in 3rd T; and 4) Loss-High-Medium (7.8%) had weight loss in the 1st T (-0.1 kg/wk), and gain of 0.8 kg/wk in 2nd T and 0.5 kg/wk in 3rd T. The 5) EarlyHigh-Stable (1.2%; estimated 22 kg total GWG at 40 wk) gained 1.7 kg/wk in the 1st T, and then showed minimal gain thereafter, while the 6) SteadyGain group (13.8%; estimated 14 kg total GWG at 40 wk) gained 0.4, 0.4 and 0.3 kg/wk in the 1st, 2nd and 3rd T, respectively. When stratified by race/ethnicity some minor differences in trajectories were observed; but, overall the classes were similar to the full sample. Our findings suggest semiparametric methods can allow for a detailed understanding of pregnancy weight gain trajectories with potential to identify patterns associated with adverse pregnancy outcomes.

TOWARDS A UNIFIED PERINATAL THEORY: RECONCILING THE BIRTHS-BASED AND FETUS-AT-RISK MODELS OF PERINATAL MORTALITY K.S. Joseph, (University of British Columbia)

Background: Extant models of perinatal mortality present starkly different perspectives: rates decline exponentially with increasing gestation under the births-based formulation, and increase steadily under the extended fetuses-at-risk approach. There is a need to reconcile these opposing perspectives and to formulate a unified perinatal theory. Methods: Information on all births in the United States between 2004 and 2015 was used to calculate gestational age-specific perinatal death rates for several low- and high-risk cohorts using births-based and fetuses-at-risk models. Cubic splines were fitted to the fetuses-at-risk birth and perinatal death rates, and first and second derivatives were estimated. Births-based perinatal death rates, and fetuses-at-risk birth and perinatal death rates and their derivatives, were examined to identify potential interrelationships. Results: The rate of change in the birth rate dictated the pattern of births-based perinatal death rates in a triphasic manner: increases in the first derivative of the birth rate at early gestation corresponded with exponential declines in perinatal death rates, the peak in the first derivative presaged the nadir in perinatal death rates, and late gestation declines in the first derivative coincided with an upturn in perinatal death rates. Late gestation increases in the first derivative of the fetuses-at-risk perinatal death rate also matched the upturn in births-based perinatal death rates. Differences in the rate of change in birth rates among low- and high-risk cohorts resulted in intersecting perinatal mortality curves. Interpretation: The exponential decline and the late gestation upturn in births-based perinatal death rates are primarily a consequence of changes in the rate of increase or decrease in birth rates, and also the rate of change in the fetuses-at-risk perinatal death rate at late gestation. The extended fetuses-at-risk model subsumes the births-based model of perinatal mortality.

TOWARDS A UNIFIED PERINATAL THEORY: UNDERSTANDING MODAL, OPTIMAL AND RELATIVE BIRTH WEIGHT AND GESTATIONAL AGE K.S. Joseph, (University of British Columbia)

Background: Concepts such as modal, optimal, and relative birth weight and gestational age dominated the perinatal literature for decades but have faded from prominence in recent years. This study attempts to explain these constructs from the standpoint of the extended fetuses-at-risk model. Methods: Information on all births in the United States between 2004 and 2015 was used to estimate birth weight and gestational age distributions and birth weight- and gestational age-specific perinatal death rates in 12 low- and high-risk cohorts using births-based and fetuses-at-risk models. Inter-relationships between these indices and the first and second derivatives of fetuses-at-risk birth and perinatal death rates were examined. Results: The first derivative of the birth rate peaked at 40, 39, 37 and 35 weeks' gestation among low-risk singletons, singletons of hypertensive women, twins and triplets, respectively. There was a close correlation between the peak in the first derivative of the birth rate and the mean, mode, and median of the birth weight and gestational age distributions (Pearson's r >=0.96, P value <0.001). Gestational age distributions and births-based perinatal mortality curves were symmetrically affected by the first derivative of the birth rate. Optimal birth weight and gestational age were closely correlated with inflection points in the first derivatives of both the birth rate and the fetuses-at-risk perinatal death rate. Interpretation: The shape of the first derivative of the birth rate determines modal birth weight and modal gestational age, while inflection points in the first derivatives of both the birth rate and the fetuses-at-risk perinatal death rate determine optimal birth weight and optimal gestational age. This explains relationships between modal and optimal birth weight and gestational age, and also the mechanism by which relative birth weight and gestational age formulations resolve the paradox of intersecting perinatal mortality curves.

ESTABLISHING A THREE-GENERATION PROSPECTIVE STUDY: BOGALUSA DAUGHTERS Emily Harville, Lydia Bazzano, Dorothy Breckner (Tulane University)

Background: The Developmental Origins of Disease hypothesis has spurred increased interest in how prenatal exposures affect lifelong health, while mechanisms such as epigenetic transfer allow for the possibility of multigenerational influences on health. Such factors are not well captured within conventional epidemiologic study designs. We explored the feasibility of collecting information on the offspring and grand-offspring of a long-running study. Methods: The Bogalusa Heart Study is a long-running study of life-course cardiovascular health in a semirural, biracial population (65% white and 35% black). Female participants who had previously provided information on their pregnancies were contacted to obtain contact information for their daughters aged 12 and older. Daughters were then contacted to obtain reproductive histories, and invited for a clinic or lab visit to measure cardiovascular risk factors. Results: The recruitment goal of 240 participants within one year was met. 63% had a full clinic visit, 22% a phone interview only, and 14% a phone interview and agreed to visit a commercial lab located near to them. 42% of the daughters were black, 58% white. Mean and median age at interview was 27, with 17% under the age of 18. Mean age at menarche was 12.7, median 12.0, range 9-20. Mean age at first pregnancy was 21. 34% of women 18+ were nulligravid, while most had 1 or more pregnancies. The range of the grandchildren's age was 0-33 years old; mean age of the youngest child for a given mother was 5.2 (median 2.6) and of the oldest was 8.8 (median 7.8). Mean birthweight in generation 3 was 3278 g, range 2270 to 4117. Median gestational age was 40 weeks, range 34-42. Conclusions: It is feasible to contact the children of participants even when participants are adults, and initial information on the grandchildren can also be determined in this manner.

REGRESSION APPROACHES FOR ANALYZING U.S. NATIONAL PERIOD LINKED BIRTH-INFANT DEATH DATA Lauren Rossen, Marie Thoma, Katherine Ahrens, Dane De Silva, Ashley Hirai (National Center for Health Statistics)

Background: Timely national vital statistics data are critical for research on infant mortality. In the US, birth-infant death data are released in two formats: period data (infant deaths linked with births in the current or prior year and a denominator file of births in the current year) and cohort data (births in a given year linked with subsequent infant deaths). The period files are timelier and are used for reporting annual infant mortality rates, but multivariable modeling with these data has been underutilized due to the separate numerator and denominator files. Our objectives were to describe the application of aggregate regression options for multivariable models of period data and to contrast these with cohort data results using associations between interpregnancy interval (IPI) and infant mortality as a motivating example. Methods: Using period data from 2011-2015, we aggregated the data in two ways and applied different distributional models for each: 1) grouped data (deaths/births) for each unique covariate combination with a Poisson model and 2) frequency-weighted data for each unique covariate-outcome combination with a log-binomial model. We then created a multiyear cohort file from the period files, using restricted-use identifiers to link births in a given year to subsequent infant deaths (2011-2015). Rate ratios from log-binomial and Poisson models were estimated using the multiyear cohort file. Results: Rate ratios for short IPI (<6 versus 18-23 months) based on grouped Poisson and frequency-weighted log-binomial models using the period data were 1.59 (95%CI: 1.52, 1.66) and 1.60 (95%CI: 1.53, 1.67), respectively, and similar to cohort data estimates from comparable models (RRs=1.58, 95%CI: 1.49, 1.67). Conclusion: Period linked birth-infant death data can be successfully used for multivariable modeling. Results were comparable to cohort data, though further comparisons may be needed to evaluate consistency across various outcomes and exposures.

PA069 S/T

WITHIN-WOMAN PHENOL AND PHTHALATE VARIABILITY IN PERICONCEPTIONAL URINE SPECIMENS AFTER LONG-TERM STORAGE Ana Rosen Vollmar, Donna Baird, Allen Wilcox, Clarice Weinberg, Anne Marie Jukic (Yale School of Public Health)

Phthalates and phenols, endocrine disruptors, are rapidly excreted from the body. Sources of exposure can vary over time, making within-person variability a concern for assigning exposures in epidemiologic studies. We used data and urine samples from the North Carolina Early Pregnancy Study to characterize within-person variability. Women attempting pregnancy completed daily diaries and collected daily urine samples for up to 6 months preconception and 2 months postimplantation if they conceived. Urinary hCG was used to identify implantation day. Three daily urine specimens were selected from all menstrual cycles not resulting in clinical pregnancy, and preimplantation in conception cycles. Equal aliquots were combined to create cycle-specific pooled specimens (738 preimplantation cycles from 221 women). We also pooled 3 postimplantation urine aliquots (145 pregnancies). Concentrations of phenols and phthalate metabolites were measured by mass spectrometry and creatinine-adjusted. Temporal variability and changes from preconception to early pregnancy were assessed using intraclass correlation coefficients (ICCs) and mean within-woman differences. Preimplantation ICCs ranged from 0.36 for bisphenol-A and mono(2-ethyl-5-hydroxyhexyl) phthalate to 0.74-0.75 for dichlorophenols. All other ICCs were between 0.38 and 0.59. All but one phthalate metabolite decreased from the preimplantation average to early pregnancy (within-woman percent changes: -2.8% to -59.9%, p<0.02 for all). Parabens and other phenols decreased -9.7% to -15.7% (p0.1 for all). Preimplantation reproducibility is good for dichlorophenols, and poor to fair for all other analytes. Phenol and phthalate levels decline systematically from pre- to post-conception. As such, preconception levels may not accurately reflect early pregnancy levels.

PA070

MEASURING PREGNANCY INTENTION: ADDING INFORMATION ON BIRTH CONTROL USE BEFORE PREGNANCY TO AN INDICATOR BASED ON WOMEN'S STATED INTENTION Béatrice Blondel, Maxime Beuzelin, Camille Bonnet, Jennifer Zeitlin (INSERM)

Objective: Women's stated reaction upon learning they are pregnant is a commonly used indicator of pregnancy intention in studies on preventive behavior during pregnancy, but it is often criticized. Our objective was to assess whether adding information on birth control use before pregnancy improves our understanding of pregnancy intention. Method: We used a nationally representative sample of mothers delivering in France in 2016 (N=11700). Mothers were interviewed in the postpartum wards about their sociodemographic characteristics, pregnancy intention and prenatal care. We had two measures of intention: reaction at announcement (happy to be pregnant now, would have preferred sooner, would have preferred later, would have preferred not to be pregnant) and whether contraception was stopped in order to become pregnant (yes/no). Associations between pregnancy intention and maternal characteristics and prenatal care were assessed with logistic regression models. Inadequate prenatal care was an insufficient number of prenatal visits based on French guidelines. Results: 84.4% of women were happy to be pregnant now or would have preferred sooner (group A), 4.5% would have preferred to be pregnant later, but stopped contraception to become pregnant (group B), 7.6% would have preferred to be pregnant later and had not stopped contraception to become pregnant (group C) and 3.5% would have preferred not to be pregnant at all (group D). Compared to group A, women in groups C and D were more frequently grand multipara, not cohabiting and had low income; these associations were not found in group B. Inadequate care was more frequent in group C (adjusted odds ratio (aOR)= 1.6; 95% confidence interval: [1.1-2.2]) and D (aOR=2.7 [1.9-3.8]) but not in group B (aOR=1.1 [0.6-1.9]). Conclusion: Reaction at pregnancy announcement may overestimate the proportion of unintended pregnancies. A new measure of pregnancy intention based on a small number of questions would be necessary for perinatal research.

S/T=Student/Trainee

ARE ASSOCIATIONS BETWEEN PRENATAL ANTIDEPRESSANT EXPOSURE AND TODDLER BEHAVIOR MEDIATED BY GESTATIONAL AGE AT BIRTH? Mollie Wood, Sonia Hernandez-Diaz, Hedvig Nordeng (University of Oslo)

Studies have linked prenatal selective serotonin reuptake inhibitor (SSRI) exposure and internalizing behavior problems in childhood, but none have examined the role of potential mediators of this association, such as gestational age at birth. Controlling unmeasured confounding in such studies is challenging. Previous simulation show that applying sibling designs, a method for controlling familial confounding, to mediation analysis out-performs standard analyses in the presence of shared unmeasured confounding. We conducted mediation analyses comparing a standard cohort and a sibling design. We included 21 908 births from Norwegian Mother and Child Cohort Study that were part of a sibling group, and were present at 18-month follow-up. Exposure to SSRIs was ascertained from self-report, and internalizing behavior was rated using the Child Behavior Checklist; gestational age (GA) came from birth registry linkage. We used effect decomposition to quantify total (TE), natural direct (NDE) and natural indirect (NIE) effects of prenatal SSRI exposure on behavioral outcomes, adjusting for confounders. Results are reported as odds ratios; additional analyses will include bootstrapping of confidence intervals. Cohort models showed a small increased risk of internalizing behavior problems associated with SSRI exposure (OR-TE 1.29, OR-NDE 1.28), and a NIE of 1.01, suggesting that about 5% of the risk was due to shortened gestational age at birth. The sibling design showed stronger associations (OR-TE of 2.60, OR-NDE 2.63), and NIE of 1.005, suggesting no indirect effect (proportion mediated=0.54%). The sibling analysis showed a substantial increased risk of internalizing problems in 18-month-old children associated with SSRI exposure; this was not mediated through gestational age. Cohort estimates resulted in lower TE and larger NIE, which might be explained by unmeasured shared confounding. The sibling design may help control for unmeasured chronic common causes in mediation analyses.

IDENTIFYING AND VALIDATING PREGNANCY EPISODES IN LONGITUDINAL ELECTRONIC HEALTH RECORDS. Jennifer Campbell, Rachael Williams, Caroline Minassian, Sara Thomas (Clinical Practice Research Datalink)

Large datasets of electronic health records (EHR) can include a wealth of information on mothers and their children. These data could potentially enable studies on a number of important public health questions, including assessment of the uptake, effectiveness and safety of vaccines and drugs given in pregnancy, the effect of other in utero exposures on child outcomes, and investigation of the long-term sequelae of conditions of pregnancy. However, there are appreciable methodological challenges in identifying accurately the start and end of pregnancies and determining relative exposure timings. A major advance in this area has been achieved through a collaboration between the London School of Hygiene and Tropical Medicine and the Clinical Practice Research Datalink (CPRD), using the CPRDs large and highly-regarded UK database of anonymised primary care EHRs. The collaboration has resulted in the production of a pregnancy register, determining approximately 5.7 million pregnancies recorded in the CPRD database, and including the start and end dates of each pregnancy and related outcomes. Validation by comparison to other linked data sources has indicated that pregnancies are well captured within the Register. However, there are ~1 million pregnancies where no outcome has been determined. Further methodological work has been conducted to maximise the robustness of this research tool. We have identified 13 non- mutually exclusive scenarios to explain missing outcomes based on the algorithm's logic and the underlying data structure. Analysis has been conducted using an algorithmic approach to query the data and look for supporting evidence for each scenario. Evidence has been tabulated to give a clearer understanding of the impact of the algorithm rules on the identification of pregnancies and outcomes. This evidence will be used to improve the Pregnancy Register, reduce the occurrence of pregnancies without outcome and increase the usefulness of this resource.

ESTIMATING THE PREVALENCE OF AUTISM SPECTRUM DISORDER AMONG 0-3 YEAR OLD CHILDREN IN NEW YORK CITY Emily Lemieux, Allan Uribe (New York City Department of Health and Mental Hygiene)

Objective: The prevalence of Autism Spectrum Disorder (ASD) among children under three in New York City is unknown. We used the capture-recapture model to estimate the total number of children missing by evaluating the overlap between multiple, incomplete sources. Accurate prevalence estimates will help to ensure access to early intervention programs and treatment. Methods: We identified a total of 18,314 unique children with ASD between January 1st, 2005 and October 31st, 2015 using three sources: Medicaid claim records, the New York City Department of Health and Mental Hygiene's Early Intervention System, and the Statewide Planning and Research Cooperative System (SPARCS) composed of in and outpatient hospital visits. We then applied deterministic matching based on the first two letters of child's first and last names, last two letters of the child's last name, the child's date of birth, and the sex of the child. Once matched, the capture-recapture technique using a log-linear model was applied to estimate the total number of children citywide. The calculated AIC values were compared within each year to determine the best fit for the data, and confidence intervals were calculated using the bootstrapping technique. Results: There were an estimated 31,132 (95% CI: 29,412-31,323) children diagnosed with ASD before age three between January 1st, 2005 and October 31st, 2015. Yearly prevalence estimates were calculated. The prevalence estimate of ASD rose over the years, ranging from 7.41 (95% CI: 3.10-19.82) per 1,000 children in 2005 to 23.22 (95% CI: 21.80-23.63) per 1,000 children in 2014. Confidence in the estimates increased over time. Conclusions: The capture-recapture technique can provide a reliable ASD estimate in New York City in the absence of population representative data. This approach is limited by the quality of data available and the reliance on identification of all ASD cases from each data source.

USE OF NATURAL LANGUAGE PROCESSING IN ELECTRONIC MEDICAL RECORDS TO IDENTIFY PREGNANT WOMEN WITH SUICIDAL BEHAVIOR: TOWARDS A SOLUTION TO THE COMPLEX CLASSIFICATION PROBLEM Qiu-Yue Zhong, (Harvard)

Objective: Suicide, one of the leading cause of maternal deaths, may be prevented if prompt action and immediate interventions are taken to mitigate risk as part of prenatal care. We sought to develop algorithms to identify pregnant women with suicidal behavior using information extracted from clinical notes by natural language processing (NLP) in electronic medical records (EMRs). Methods: Using both codified data and NLP applied to unstructured clinical notes, we first screened pregnant women enrolled in Partners HealthCare for suicidal behavior. Psychiatrists and a trained researcher manually reviewed clinical charts to identify relevant features for suicidal behavior and to obtain gold-standard labels in training and validation datasets. Using the adaptive elastic net, we developed an algorithm to classify suicidal behavior. We then validated the algorithm in an independent validation dataset, and applied it to the dataset including women who screened positive for suicidal behavior to confirm the presence of with suicidal behavior. Results: From 275,843 women with at least one diagnostic code related to pregnancy or delivery in the Partners HealthCare EMRs, 9,331 women (3.38%) were screened positive for suicidal behavior by either codified data (N=196) or NLP (N=9,145). Using expert-curated features, our algorithm achieved an area under the receiver operating characteristic curve of 0.83. By setting the specificity level at 0.90, we obtained a sensitivity of 0.58, a positive predictive value (PPV) of 0.63, and a negative predictive value (NPV) of 0.88. The algorithm was used to identify 2,146 pregnant women with suicidal behavior among the 9,331 patients who screened positive for suicidal behavior. The estimated prevalence of suicidal behavior in Partners HealthCare EMRs was 777.98 per 100,000 pregnant women. Conclusions: Mining unstructured clinical notes using NLP resulted in a more than 10-fold increase in the number of pregnant women identified with suicidal behavior. Extracting information pertaining to suicidal behavior from clinical notes, not otherwise reflected in codified data, may be helpful in identifying pregnant women with suicidal behavior.

ASIAN/PACIFIC ISLANDERS EXPERIENCE HIGHER RISK FOR GESTATIONAL DIABETES THAN OTHER U.S. WOMEN EXPOSED TO VOLATILE ORGANIC COMPOUNDS IN AMBIENT AIR Andrew Williams, Carrie Nobles, Katherine Grantz, Cuilin Zhang, Seth Sherman, Pauline Mendola (Eunice Kennedy Shriver National Institute of Child Health and Human Development)

In the U.S., Asian/Pacific Islander communities experience high levels of air pollution. Exposure to high levels of volatile organic compounds (VOCs) impairs pancreatic β-cell function, leading to insulin resistance. Asian/Pacific Islanders may be predisposed to pancreatic β-cell dysfunction and have the highest prevalence of gestational diabetes mellitus (GDM) with rates twice those of Whites. The race-specific association between VOCs and GDM risk has not been studied. To examine this association, we analyzed singleton deliveries (n=220,065) from the Consortium on Safe Labor (2002-2008). Exposure to 14 VOCs was based on modified Community Multiscale Air Quality models. Logistic regression estimated odds ratios for GDM associated with high ($\geq$ 75th percentile) compared to low($<$ 75th percentile) ambient VOC exposure three-months preconception and during the first trimester of pregnancy by race/ethnicity. Models were adjusted for maternal demographic and clinical characteristics including pre-pregnancy body mass index. Robust standard errors accounted for multiple pregnancies of the same woman. Both preconception and first trimester exposure to high VOC levels were significantly associated with increased odds of GDM among both Whites and Asian/Pacific Islanders, but not among Black women and rarely for Hispanics. Significantly higher risks of GDM were observed for Asian/Pacific Islanders compared to Whites for most VOCs including benzene, n-hexane, xylenes and toluene. For example, preconception benzene exposure ($\geq$ 75th versus $<$ 75th percentile) was associated with a 29% (99% confidence interval [99% CI]: 12-47%) increased odds of GDM among Whites compared to a 45% (99% CI: 16-81%) increased odds of GDM among Asian/Pacific Islanders ($p<.01$). These novel findings highlight potential environmental health disparities regarding GDM risk. Increased focus on U.S. Asian/Pacific Islander communities is needed to better understand health disparities in these communities.

GENDERED RACISM, CONTEXTUALIZED STRESS, AND DEPRESSION IN PREGNANT, BLACK WOMEN Lasha Clarke, (Emory University)

Introduction: Chronic stress is known to be associated with depression. However, few studies have considered the unique impact of gender- and race-based stress on depression among pregnant, black women, already at disproportionate risk for adverse birth outcomes. This cross-sectional study tested the psychometric properties of a culturally-specific stress scale, and examined the association of pregnant, black women's contextualized stress with depressive symptomology. Methods: Pregnant, black women (n=295) receiving first trimester prenatal care completed scales to measure culturally-specific stress and depressive symptomology during their first visit for the prospective Emory University African American Microbiome in Pregnancy Study. Contextualized stress was measured by the 39-item version of the Jackson Hogue Phillips Contextualized Stress Measure (JHP-C), originally developed through community-based participatory research with black woman collaborators. Cronbach's alphas for the scale and its five contextual domains indicated good internal consistency (α=0.77 – 0.86). Depressive symptomology was defined as Edinburgh Depression Scale (EDS) score $\geq$ 10. Results: 28.5% of the sample had an EDS score $\geq$ 10. The JHP-C showed moderate concurrent validity with the EDS (r=0.49, p<.0001). In a multivariable model, the JHP-C and covariates accounted for approximately half of the variance in EDS scores (R2=48.3, p< .0001). Among the five JHP-C domains, burden was most correlated with depressive symptomology (r=0.56, p<.0001; multivariable R2=50.9, p<.0001). Conclusion: Stress rooted in black women's multidimensional identity is associated with depression, which can cause harm during pregnancy. To best understand and ameliorate black women's experiences with stress, researchers and practitioners should use stress measures that center black women's voices.

PLASMA LEVELS OF PROLACTIN AND PROGESTERONE IN ASSOCIATION WITH GESTATIONAL DIABETES RISK AND CARDIOMETABOLIC PROFILE IN A PROSPECTIVE MULTI-RACIAL PREGNANCY COHORT Mengying Li, Shristi Rawal, Stefanie Hinkle, Fasil Tekola-Ayele, Michael Tsai, Cuilin Zhang (NICHDEunice Kennedy Shriver National Institute of Child Health and Human Development)

Background: Prolactin and progesterone are implicated in the physiologic adaptation of glucose metabolism to pregnancy. However, it is unclear if they play a role in the development of gestational diabetes (GDM). Objectives: This study examines the prospective associations of prolactin and progesterone with GDM risk and cardiometabolic profile during pregnancy. Methods: This was a nested case-control study of 107 GDM cases and 214 matched controls without GDM from the NICHD Fetal Growth Studies-Singleton Cohort. GDM was ascertained by medical record review. Blood samples were drawn at gestational weeks (GW) 10–14, 15–26, 23–31 and 33–39. Odds ratios (OR) for GDM by quartiles (Q) of the hormones were estimated using conditional logistic regression adjusting for major risk factors of GDM including pre-pregnancy BMI. Associations between the hormones and cardiometabolic biomarkers (i.e., CRP, insulin, glucose, c-peptide and HOMA-IR) were estimated using Spearman's partial correlation. Results: Women who later developed GDM had significantly higher levels of prolactin than controls during both GW 10–14 (mean± SD: 56.9 ± 29.9 vs. 50.0 ± 28.7 ng/mL) and 15–26 (mean ± SD: 136.6 ± 64.5 vs. 124.0 ± 57.0 ng/mL). Moreover, prolactin levels at weeks 10–14 was positively and significantly associated with GDM risk (adjusted OR [95%CI] lowest vs. highest Q: 0.42 [0.19, 0.94], p-for-trend = 0.03). Similar associations were observed at GW 15–26. In addition, prolactin levels at GW 10–14 were positively associated with fasting insulin and insulin resistance. Progesterone levels were not significantly associated with GDM risk, but higher levels were inversely associated with fasting glucose, fasting insulin and insulin resistance. Conclusions: Prolactin levels in early and mid- pregnancy were significantly and positively associated with GDM risk, and might play a role in the development of GDM.

SEX HORMONE-BINDING GLOBULIN, CARDIOMETABOLIC BIOMARKERS AND GESTATIONAL DIABETES: A LONGITUDINAL PREGNANCY COHORT STUDY AND A META-ANALYSIS Mengying Li, Shristi Rawal, Stefanie Hinkle, Simin Liu, Fasil Tekola-Ayele, Cuilin Zhang (Eunice Kennedy Shriver National Institute of Child Health and Human Development)

Background: Sex hormone-binding globulin (SHBG) has been implicated in glucose metabolism and the development of type 2 diabetes. However, its role in glucose metabolism during pregnancy is unclear. Objectives: This study investigated the prospective associations of SHBG with cardiometabolic biomarkers during pregnancy and gestational diabetes (GDM) risk. Methods: We conducted a nested case-control study of 107 GDM cases and 214 matched controls without GDM in the NICHD Fetal Growth Studies-Singleton Cohort. GDM was ascertained by medical record review. Blood samples were drawn at 10–14, 15–26, 23–31 and 33–39 gestational weeks (GW). Prospective associations of SHBG with cardiometabolic biomarkers were estimated using Spearman's correlation coefficient adjusting for potential confounders. Difference in SHBG levels between GDM and non-GDM women was estimated in the present study cohort and a meta-analysis of existing prospective evidence. Odds ratios (OR) for GDM by SHBG quartiles were estimated using conditional logistic regression. Results: SHBG at GW 10–14 was significantly and inversely related to fasting glucose, fasting insulin, insulin resistance and HbA1c levels, and positively related to high-density lipoprotein and cholesterol levels at GW 15–26. Cases had lower SHBG levels compared to controls at GW 10–14 (mean± SD: 204.0 ± 97.6 vs. 220.9 ± 102.5 nmol/L) and 15–26 (305.6 ± 124.3 vs. 322.7 ± 105.1 nmol/L), yet the differences were not significant. Meta-analysis of 11 prospective studies, including ours, estimated SHBG levels to be 0.50 SD (95% CI: 0.36-0.65) lower among women with than without GDM. Conclusions: Higher SHBG levels in early pregnancy was associated with a favorable glucose metabolic profile among pregnant women. Synthesis of prospective studies supports an inverse association between SHBG levels and GDM risk.

ASSOCIATION OF SOCIAL SUPPORT AND ANTEPARTUM DEPRESSION AMONG PREGNANT WOMEN Lauren Friedman, (Harvard T.H. Chan School of Public Health)

Background: The absence of social support has been associated with health outcomes including poor mental health, increased chronic disease burden, and increased mortality. However, few investigators have evaluated the association between social support and antepartum depression. Objective: To examine the extent to which early pregnancy social support and sources of social support are associated with antepartum depression among women in Peru. Methods: A total of 2,062 pregnant women participated in structured interviews. Social support during early pregnancy was measured using the Social Support Questionnaire Short Form (SSQ-6). We evaluated the number of individuals that participants could turn to in different situations (Social Support Number Score; SSQN) and participants' satisfaction with social support they received (Social Support Satisfaction Score; SSQS). Consistent with previous studies, median SSQN and SSQS scores were used to characterize participants according to high and low levels of social support. SSQN scores were also evaluated for family and non-family support sources. Antepartum depression was assessed using the Patient Health Questionnaire-9 (PHQ-9). Multivariable logistic regression procedures were used to estimate adjusted ORs and 95% CIs. Results: Approximately 25% of women had antepartum depression. Among those with antepartum depression, 65.5% reported low SSQN, while 65.7% reported low SSQS. Women with low non-family SSQN were more likely to have depression; the association was not significant among women with low family SSQN. Women with high SSQN were 22% less likely to have antepartum depression (AOR: 0.78; 95%CI: 0.63-0.97). Similarly, pregnant women with high SSQS score were 45% less likely to have antepartum depression (AOR: 0.55; 95%CI: 0.45-0.68). Conclusion: Social support during early pregnancy is associated with a reduced risk of antepartum depression. Increased social support may improve maternal mental health during pregnancy.

CHILDHOOD ABUSE, INTIMATE PARTNER VIOLENCE, AND PLACENTAL ABRUPTION AMONG PERUVIAN WOMEN Susanna D. Mitro, Sixto E. Sanchez, Henry Palomino, Bizu Gelaye, Michelle A. Williams (Harvard T.H. Chan School of Public Health)

Experiencing childhood abuse (CA) or intimate partner violence (IPV) has been linked to numerous adverse pregnancy outcomes, and some evidence suggests greater than additive effects if experiencing both types of abuse. We examined whether history of CA and IPV during the current pregnancy are independently and jointly associated with the odds of placental abruption (PA). We recruited 662 PA cases and 665 full-term controls (without PA nor 3rd trimester bleeding) from 6 hospitals in Lima, Peru. Participants were interviewed after delivery. We used multivariate logistic regression to calculate odds ratios (OR), adjusting for maternal age, education, and parity. PA cases were more likely than controls to report major depression (18.3% vs 10.5%) and fair or poor self-rated pre-pregnancy health (20.2% vs 13.6%). Approximately 42% of both cases and controls reported a history of CA; 50% of cases and 49% of controls reported IPV during pregnancy. While history of any CA was not associated with PA, history of severe CA (>1 CA event; experienced by 25% of the population) was associated with 38% increased odds of PA (aOR=1.38; 95% confidence interval (CI):1.07-1.80) after adjusting for IPV. There was a small but statistically nonsignificant association between severe IPV (experienced by 20% of the population) and odds of PA (aOR=1.22; 95%CI: 0.92-1.62), adjusting for CA. Women who experienced both severe CA and severe IPV had 2.06-fold (95%CI:1.25-3.40) increased odds of PA compared to women who experienced no or rare abuse. Although the joint effect of CA and IPV was positive, it was statistically nonsignificant on the multiplicative scale (interaction aOR=1.48; 95%CI: 0.79-2.79) and additive scale (relative excess risk due to interaction (RERI)=0.70, 95%CI: -0.39-1.78). Our findings provide further evidence that public health efforts to prevent exposure to violence or mitigate its effects may improve maternal outcomes.

EVIDENCE OF WATERBIRTH SAFETY: A PROPENSITY SCORE ANALYSIS Marit Bovbjerg, (Oregon State University)

Background: Waterbirth remains controversial, despite observational evidence of safety, because women who choose waterbirth are different from those who do not; attempts at randomization have failed. Our objective was to assess waterbirth safety using propensity score (PS) methods. Method: Data come from a medical records-based registry of midwife-led community births in the US. The initial dataset contains 48,670 births; we created PS using 60+ demographic and pregnancy risk variables to predict waterbirth. The final dataset included 13,663 pregnancies per group, frequency matched within PS deciles. We then used logistic regression to assess the following outcomes: postpartum transfer to a hospital (maternal indication), maternal hospitalization in the first 6 weeks, hemorrhage >1000cc, any genital tract trauma, maternal infection, cord evulsion, low (<7) and very low (<4) 5-minute Apgar, neonatal transfer to a hospital, neonatal infection, neonatal hospitalization or NICU admission in the first 6 weeks, and neonatal death. Results: We found no evidence that waterbirth is harmful for women. Indeed, the only outcome that was statistically significant was hemorrhage; the waterbirth group had a decreased risk (Odds Ratio 0.79; 95% Confidence Interval 0.68 – 0.91). We observed an increased risk of cord evulsion (1.57; 1.09 – 2.25), though the absolute risk was <1%. No other neonatal outcomes were associated with waterbirth. Conclusions: Waterbirth is not harmful for women. Despite the increase in relative odds of cord evulsion, we observed no increase in longer-term neonatal morbidity or mortality, suggesting that the evulsions were managed appropriately without longer-term consequences. Given that the absolute risk of evulsion is also quite low, and that there are benefits for women associated with laboring in water, we conclude that low-risk pregnant women should not be prohibited from birthing in water, though providers must be prepared for possible evulsion events.

ARTIFICIAL SWEETENED BEVERAGES AND LIVER FUNCTION SCORES AMONG WOMEN WITH PRIOR GESTATIONAL DIABETES

Stefanie Hinkle, Shristi Rawal, Anne Ahrendt Bjerregaard, Thorhallur Halldorsson, Sjurdur Olsen, Mengying Li, Sylvia Ley, Jing Wu, Yeyi Zhu, Liwei Chen, Cuilin Zhang (NICHD)

Objective: Artificial sweetened beverages (ASB) have been purported as an alternative to sugar sweetened beverages, but the metabolic effects of ASBs are lacking. We aimed to examine associations of ASB intake and liver function among women with prior gestational diabetes (GDM) who are at high risk for liver dysfunction. Methods: We included 566 women from the Danish National Birth Cohort (1996-2002) with GDM at the index pregnancy who completed a clinical exam 9-16 years later for the Diabetes & Women's Health Study (2012-2014). Liver assays included alanine aminotransferase (ALT), aspartate aminotransferase (AST), and gamma-glutamyltransferase (GGT) measured in fasting blood collected at the clinical exam. Calculated liver function scores included fatty liver index (FLI), hepatic steatosis index (HSI), and non-alcoholic fatty liver disease-liver fat score (NAFLD-LFS). A food frequency questionnaire on past year habitual intake was completed at the clinical exam. We estimated adjusted relative risks [RR (95% CI)] for elevated liver scores by ASB quartiles (Q). To investigate reverse causality, we limited the analysis to 'metabolically healthier' women without obesity, prediabetes, diabetes, or elevated triglycerides at follow-up (n=211). Results: At follow-up, 43.5%, 54.6%, and 36.6% of women had elevated FLI (≥60), HSI (≥36), and NAFLD-LFS (>−0.64), respectively. Higher ASB intake was associated with increased risk for elevated FLI [RR=2.1 (1.6-2.9); p-trend<0.001], HSI [RR=2.0 (1.5-2.5); p-trend<0.001], and NAFLD-LFS [RR=1.6 (1.1-2.3); p-trend=0.11]. Among 'metabolically healthier' women, 9.5%, 12.9%, and 5.7% had elevated FLI, HSI, and NAFLD-LFS, respectively. Higher ASB intake was associated with elevated FLI [RR=9.7 (1.5-62.0); p-trend<0.001] and HSI [RR=5.1 (1.6-16.4); p-trend=0.008]. Conclusion: In women with prior GDM, ASB intake in the past year was associated with an increased risk for elevated liver scores reflecting abnormal liver function.

PERINATAL OUTCOMES IN WOMEN WITH AND WITHOUT SEVERE OBESITY: VARIATIONS AT THE HOSPITAL LEVEL
Frances Biel, Nicole Marshall, Alexander Butwick, Katy Kozhimannil, Jonathan Snowden (Oregon Health & Science University)

Obesity is associated with numerous adverse outcomes during pregnancy and birth, and obstetric interventions are also more common in women with obesity. Despite variation in obstetric procedures and adverse outcomes that exists among hospitals, little evidence documents whether variation in procedure utilization differs by obesity status and may contribute to BMI-related differences in outcomes. Here, we explore whether variation in obstetric procedure utilization differs between women with and without severe obesity at the hospital level. We hypothesize greater variation in women with severe obesity, relative to leaner women. We analyzed linked birth certificate/patient discharge data from California (2007-2012, n=1,691,211), studying term infants born to mothers without hypertension or diabetes. Our main exposure was maternal pre-pregnancy BMI (either without obesity [BMI < 30 kg/m2] or with severe obesity [≥35]); our secondary exposure was the birth hospital (288 hospitals). Outcomes—non-indicated labor induction, regional anesthesia utilization in non-operative vaginal deliveries, and low-risk cesarean—were examined as the hospital-specific proportion of births with each outcome in women with and without severe obesity. Outcome distributions did not differ at the hospital level for the first two outcomes. In contrast, the spread of hospital-specific low-risk cesarean frequency was greater for women with severe obesity, as compared to the distribution among women without severe obesity. These results indicate that although wide institutional variation in regional anesthesia use and non-indicated induction exists in hospitals in California, this variability does not differ by obesity status. The greater inter-hospital variability in low-risk cesarean among women with severe obesity warrants further attention. Is this degree of practice variation contributing to the noted higher rates of adverse outcomes among women with obesity?

MATERNAL BODY MASS INDEX, PREGNANCY-ONSET SNORING AND HYPERTENSIVE DISORDERS OF PREGNANCY; POTENTIAL PATHWAYS OF ASSOCIATIONS
Galit Dunietz, (University of Michigan)

Introduction Hypertensive disorders of pregnancy (HDP) are linked to maternal body mass index (BMI) and frequent snoring. However, pathways of associations between maternal BMI, pregnancy-onset snoring and HDP were only partially estimated. We examined and quantified the total and direct between pre-pregnancy BMI and incident HDP and their indirect pathway through pregnancy-onset snoring. Methods Third trimester pregnant women, without pre-pregnancy hypertension and/or snoring enrolled into this study from prenatal clinics of a large tertiary medical center. Sleep data were collected through a questionnaire. Demographic and pregnancy information was abstracted from medical charts. We used causal mediation analysis to estimate the direct association between pre-pregnancy maternal BMI and HDP, their indirect association through pregnancy-onset snoring, and their total association. The proportion of direct and indirect associations from the total association of pre-pregnancy BMI and HDP was also quantified. Results A total of 1,625 pregnant women enrolled, of which we excluded 169 and 123 women with chronic hypertension and/or chronic snoring, respectively. Maternal pre-pregnancy BMI was directly associated with a 1.4-fold incident HDP, adjusted for maternal characteristics. Pregnancy-onset snoring significantly mediated the association of pre-pregnancy BMI and incident HDP: adjusted OR=1.07 (95% CI 1.01, 1.14). The mediated pathway of pre-pregnancy BMI and incident HDP by pregnancy-onset snoring accounted for 16% of the total association for pre-pregnancy BMI. Conclusions Frequent, pregnancy-onset snoring mediates the association between pre-pregnancy BMI and incident HDP in women without pre-pregnancy snoring or hypertension. These findings demonstrate the relative contribution of pre-pregnancy BMI and frequent, pregnancy-onset snoring to incident HDP. Identification of these two pathways to incident HDP may have prenatal care implications for at-risk pregnant women.

PHYSICAL ACTIVITY IN PREGNANCY AND THE RISK OF CESAREAN DELIVERY AMONG HISPANIC WOMEN
Lindsey Russo, Megan Harvey, Penny Pekow, Lisa Chasan-Taber (University of Massachusetts Amherst)

Background: Rates of cesarean delivery in the United States (US) have continued to increase among Hispanics, the largest minority group in the US with the highest birth rates. Prior studies of the relationship between physical activity (PA) and cesarean delivery have been conflicting, limited by use of questionnaires not validated for pregnancy, and conducted primarily among non-Hispanic whites. Methods: We evaluated the association between PA and cesarean delivery among participants (n=1,313) in Proyecto Buena Salud, a prospective cohort study conducted in Massachusetts from 2006-2011. PA in pre, early, mid/late pregnancy was measured via the Pregnancy Physical Activity Questionnaire; meeting PA guidelines was defined as >150 minutes of moderate-intensity sports/exercise per week. Cesarean delivery was abstracted from medical records. Results: A total of 320 (24.4%) participants delivered via cesarean. In multivariable analyses, increasing levels of sedentary activity in mid/late pregnancy were associated with higher odds of cesarean (4th vs. 1st quartile OR=1.54, 95% CI 1.02-3.33, ptrend = 0.05) however there were no clear patterns between PA and cesarean. We then repeated the analysis excluding planned cesareans (n=126). Increasing levels of sedentary activity in pre, early, and mid/late pregnancy were associated with a 2-fold increased odds of cesarean (ptrend <0.05). High levels of moderate-intensity activity in prepregnancy (OR=0.61, 95% CI 0.38-0.99) and increasing levels of moderate-intensity PA in mid/late pregnancy (ptrend =0.03) were associated with reduction in odds of cesarean. High levels of household/caregiving activity in pre and mid/late pregnancy were associated with a 50% reduction in odds (ptrend<0.05). Meeting PA guidelines was not associated with unplanned cesarean. Conclusion: In this prospective cohort of Hispanic women, moderate-intensity and household/caregiving PA were associated with a reduction in the odds of unplanned cesarean delivery.

PRECONCEPTION URIC ACID IS ASSOCIATED WITH A DECREASE IN LIVE BIRTH, AN INCREASE IN PREGNANCY LOSS, AND AN INCREASE IN PRETERM BIRTH Matthew Connell, Keewan Kim, Torie Plowden, Lindsey Sjaarda, Neil Perkins, Carrie Nobles, Sunni Mumford, Enrique Schisterman (NIH)

Introduction: Uric acid is associated with poor obstetric outcomes, including pregnancy loss, preeclampsia, and preterm delivery, though most data comes from uric acid measured in the first trimester. Little is known about the effects of preconception uric acid levels on obstetric outcomes. The purpose of this analysis was to determine if preconception uric acid concentrations are associated with live birth, pregnancy loss or adverse maternal pregnancy outcomes. Methods: This was a prospective cohort of women enrolled in the EAGeR trial. Women were ages 18-40 with 1-2 prior pregnancy losses. Preconception uric acid was measured at baseline. A log-binomial regression model was used to investigate associations between uric acid and live birth, pregnancy loss, as well as adverse obstetric outcomes in a continuous model as well as by tertile. For pregnancy loss and obstetric outcomes, the analysis was restricted to pregnancy and reweighted. Models were adjusted for age, BMI, race, physical activity, alcohol, income, education, aspirin, vitamin use, CRP, triglycerides, alpha-tocopherol and HDL cholesterol. Results: In increasing tertiles of uric acid, the percentage of live birth decreased (Tertile 1 60.3%, Tertile 2 56.3%, Tertile 3 47.8%, P=0.0031) and the percentage of loss increased (Tertile 1 19.8%, Tertile 2 22.9%, Tertile 3 29.5%, P=0.0334). In our regression analysis, uric acid was associated with lower probability of live birth (relative risk 0.82, 95% CI 0.64, 1.05) and a higher risk of pregnancy loss (RR 1.85 95% CI .99, 3.47) in the continuous model. Uric acid was associated with preterm delivery in our continuous model (RR 5.99, 95% CI 1.47,15.76) and by tertiles (Tertile 3 RR 2.24 95% CI 1.13, 4.45), however there were few cases, so the confidence intervals are quite wide. Conclusions: In women ages 18-40 with a history of 1 to 2 pregnancy losses, uric acid is associated with a lower probability of live birth, a higher risk of pregnancy loss and preterm birth.

TRENDS IN COMPLIANCE WITH GESTATIONAL WEIGHT GAIN GUIDELINES, UNITED STATES, 2010-2016 Amy Branum, Nicholas Deputy, Andrea Sharma, (National Center for Health Statistics)

In 2009, the Institute of Medicine (IOM) revised guidelines for gestational weight gain (GWG), which are specific to prepregnancy body mass index (BMI). Prepregnancy BMI was added to the 2003 revision of the U.S. Standard Certificate of Live Birth (revised birth certificate), allowing assessment of trends and characteristics of GWG according to guidelines. We examined trends in compliance with GWG guidelines during 2010-2016 by select characteristics. We analyzed data on singleton, term (37-42 weeks) births from the 33 states and DC that adopted the revised birth certificate as of January 2010. GWG below, within, or above the BMI-specific IOM guidelines was classified as inadequate, adequate, or excess. We assessed trends in GWG by prepregnancy BMI (underweight, normal weight, overweight, obese), maternal age (<20, 20-29, 30-39, 40+ years), and maternal race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic). Trends are unadjusted for other characteristics. Significant differences between 2010 and 2016 were determined using z-tests. Overall, there was no change in the prevalence of adequate GWG between 2010 (31.9%) and 2016 (31.8%) but excess GWG decreased slightly from 48.0% to 47.4% (p<0.05). Excess GWG also decreased among underweight (24.5 to 23.3%), normal weight (38.8 to 37.3%), overweight (62.0 to 60.7%), and women with obesity (56.3 to 55.0%) (all p<0.05). Among women 20-29 years, excess GWG decreased from 49.1 to 48.1% (p<0.05). Trends in excess GWG were generally stable according to maternal race/ethnicity. Since the issuance of revised GWG guidelines, there have been some declines in excess GWG but this has not been consistent across prepregnancy BMI, maternal race/ethnicity or age groups, and several groups have shown no change. As of 2016, US natality data include prepregnancy BMI and GWG information for all states and can be used to continue monitoring GWG trends and explore differences by maternal and infant characteristics.

CARDIOVASCULAR-RELATED MORBIDITY AND MORTALITY IN WOMEN WITH A HISTORY OF PREGNANCY COMPLICATIONS: A SYSTEMATIC REVIEW Sonia M Grandi, Kristian B Filion, Sarah Yoon, Henok Ayele, Carla Doyle, Jennifer A Hutcheon, Graeme Smith, Joel Ray, Robert W Platt (McGill University)

Introduction: Studies have found that women with a history of pregnancy complications are identified, at or shortly after delivery, with risk factors for cardiovascular disease (CVD) and that these effects may persist long-term. However, clinical guidelines recommend post-partum follow-up only in women with a history of preeclampsia or preterm birth. We therefore performed a systematic review of observational studies to examine the association between pregnancy complications and the risk of subsequent CVD. Methods: We systematically searched PubMed, MEDLINE (via Ovid), EMBASE (via Ovid), CINAHL, and the Cochrane Library for studies investigating the association between pregnancy complications, including hypertensive disorders in pregnancy, gestational diabetes, low birth weight, placental abruption, preterm birth, small-for-gestational-age at birth, stillbirth, and pregnancy loss, and subsequent CVD. Studies were grouped by pregnancy complication and design to facilitate between study comparisons. Quality assessment was performed using the ROBINS-I tool. Results: Our literature search identified 13,969 publications, of which 84 were included in our review. Follow-up ranged from 0 to 55 years, and the sample sizes varied from 250 to 2,000,000 women. The overall evidence suggests that all pregnancy complications except pregnancy loss are associated with an increased risk of subsequent CVD in women (range: HR 1.1 to 14.5). The findings for pregnancy loss were heterogeneous across studies with a suggestion of no increased risk of CVD. The studies included in the review were found to be of varying quality largely due to insufficient adjustment for known confounders. Conclusions: Women with a history of the included pregnancy complications are at increased risk of subsequent CVD. The findings support the importance of continuous follow-up and risk-factor management in these women beyond the post-partum period.

IMPACT OF MATERNAL CHARACTERISTICS AND CESAREAN DELIVERY ON THE INCREASING TREND OF SEVERE MATERNAL MORBIDITY IN CALIFORNIA, 2008-2015 Stephanie Leonard, (Postdoctoral Fellow)

A trend of worsening health outcomes for pregnant women in the U.S. is frequently attributed to changes in maternal characteristics and cesarean delivery rates. In particular, the proportion of women delivering at advanced age, with pre-pregnancy obesity or comorbidities, or by cesarean delivery may have increased, contributing to a national prevalence of severe maternal morbidity that has more than doubled in the past 15 years. We aimed to fill an evidence gap by evaluating the contribution of trends in these risk factors to the trend of severe maternal morbidity in Californian deliveries from 2008-2015 (n = 3,421,536). Severe maternal morbidity was identified in delivery hospitalization records using an index developed by the CDC and its partners. We used multivariable log-binomial regression models with robust standard errors to test trends in severe maternal morbidity and the risk factors of interest. We then used model adjustment and simple substitution estimation to assess hypothetical risk factor interventions at the population level, calculating marginal predicted probabilities of severe maternal morbidity and population attributable risk percentages across delivery years. We found increasing trends of severe maternal morbidity, advanced maternal age, pre-pregnancy obesity, and pre-pregnancy comorbidity. Cesarean delivery had the strongest association with risk of severe maternal morbidity, but there was no trend in its prevalence. Additionally, the proportion of severe maternal morbidity estimated to be explained by the risk factors did not change over time. The population attributable risk percentage for cesarean delivery was 48% (95% CI: 46, 51) in 2008 and 45% (95% CI: 43, 48) in 2015. The findings do not support widely held views that maternal characteristics and cesarean deliveries have caused an increase in adverse delivery outcomes in women.

PRECONCEPTION CARDIOMETABOLIC MARKERS AND BIRTHWEIGHT AMONG U.S. HISPANIC/LATINA WOMEN IN THE HISPANIC COMMUNITY HEALTH STUDY/STUDY OF LATINOS (HCHS/SOL) Catherine Vladutiu, Daniela Sotres-Alvarez, Nicole Butera, Larissa Aviles-Santa, Marc Gellman, Carmen Isasi, Gregory Talavera, Alison Stuebe, Martha Daviglus, Unzila Nayeri, Anna Maria Siega-Riz, Linda Van Horn (HRSA/MCHB)

Associations between preconception cardiometabolic markers and birth outcomes have been noted, but data are scarce for Hispanics/Latinos. The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) is the largest community-based cohort study of U.S. Hispanic/Latino adults aged 18-74 years (n=16,415) with a baseline clinic examination (2008-2011), yearly telephone follow-up assessments, and a second clinic examination (2014-2017), including ascertainment of birth outcomes. Results are reported for the first 503 live singleton births after baseline and through October 2017 from 2409 women aged <45 years at baseline. Associations between preconception maternal cardiometabolic markers (metabolic syndrome [MetS] components, insulin, body mass index [BMI]) and infant birthweight were examined. Selected MetS components were defined using AHA/NHLBI criteria --abdominal obesity (waist circumference ≥88cm), elevated triglycerides (≥150 mg/dL), high blood pressure (systolic BP ≥130mmHg or diastolic BP ≥85mmHg), and elevated fasting glucose (≥100mg/dL). HDL cholesterol was modeled as a continuous measure. Complex survey linear regression models estimated the association between cardiometabolic markers and birthweight-for-gestational age z-score, adjusting for confounders. In adjusted models, abdominal obesity was associated with higher birthweight z-scores (β=0.5, 95% confidence interval, CI, 0.2, 0.8). A significant interaction with BMI was detected for elevated systolic BP (p<0.10). Among under/normal weight women (BMI<25 kg/m2), elevated systolic BP was associated with lower birthweight z-scores (β=-1.8, 95% CI -3.1, -0.4) whereas among overweight/obese women the association was not significant. No associations were observed for triglycerides, diastolic BP, HDL cholesterol, fasting glucose, or insulin. Results suggest that infant birthweight may be influenced by selected cardiometabolic risk factors before pregnancy, particularly among under/normal weight women.

A PROSPECTIVE AND LONGITUDINAL STUDY OF PLASMA PHOSPHOLIPID N-3 AND N-6 POLYUNSATURATED FATTY ACIDS IN RELATION TO RISK OF GESTATIONAL DIABETES Yeyi Zhu, Mengying Li, Shristi Rawal, Stefanie Hinkle, Jing Wu, Jagteshwar Grewal, Huixia Yang, Michael Tsai, Assiamira Ferrara, Cuilin Zhang (Kaiser Permanente Northern California Division of Research)

Objectives: Despite recommendations on dietary intakes of polyunsaturated fatty acids (PUFAs) for cardiometabolic health, data on n-3 and n-6 PUFAs in relation to diabetes risk remain debated. Further, data are lacking in pregnant women. We prospectively investigated individual plasma phospholipid n-3 and n-6 PUFAs throughout pregnancy in relation to risk of gestational diabetes (GDM). Methods: Within the NICHD Fetal Growth Studies-Singleton Cohort of 2,802 pregnancies, 107 GDM cases were ascertained by medical record review and matched to 214 non-GDM controls on age, race/ethnicity, and gestational week (GW) at blood collection. Individual plasma phospholipid n-3 and n-6 PUFAs concentrations were measured by gas chromatography at GW 10-14, 15-26, 23-31, and 33-39. Results: Overall, n-3 PUFAs decreased slightly and n-6 PUFAs did not change appreciably across gestation. Among n-3 PUFAs, docosapentaenoic acid (22:5n3) at GW 15-26 was significantly and inversely associated with subsequent risk of GDM [adjusted odds ratio comparing the highest vs. lowest quartile (aORQ4-Q1) = 0.29 (95% CI 0.10, 0.85), P-for-trend = 0.048]. Among n-6 PUFAs, gamma-linolenic acid (18:3n6) and dihomo-gamma-linolenic acid (20:3n6) at GW 10-14 were positively associated with risk of GDM [aORQ4-Q1 = 2.53 (1.12, 5.68) and 3.42 (1.37, 8.54), respectively, both P-for-trend <0.05] whereas docosatetraenoic acid (22:4n-6) at GW 15-26 was inversely related to risk of GDM [aORQ4-Q1 = 0.30 (0.11, 0.83), P-for-trend = 0.015]. Further, per standard deviation increase in PUFAs n-6/n-3 ratio at GW 15-26 was related to a 1.64-fold (1.09, 2.46) increased risk of GDM. Conclusions: Our novel findings highlight the potentially important differential roles of individual n-3 and n-6 PUFAs and the PUFAs n-6/n-3 ratio during early to mid-pregnancy for GDM development. Our findings may underlie distinct nutritional, metabolic, or physiological processes and inform potential prevention strategies.

PA093 S/T

PRE- AND EARLY PREGNANCY DEPRESSION AND RATE OF GESTATIONAL WEIGHT GAIN FROM MID TO LATE PREGNANCY Sylvia Badon, Monique Hedderson, Lyndsay Avalos (Kaiser Permanente Northern California)

Gestational weight gain (GWG) outside recommended ranges is associated with adverse perinatal outcomes. Women with depression before and during pregnancy may be at especially high risk for GWG outside recommendations, given associations of depression with both weight loss and weight gain outside of pregnancy. Using Kaiser Permanente Northern California's universal perinatal depression screening program, we identified 87,600 pregnancies from 2012 to 2016 screened for depression ≤20 weeks gestation using the Patient Health Questionnaire (PHQ-9). Depression was defined as a diagnosis, antidepressant dispensing, or PHQ-9 score ≥10 from 6 months before pregnancy to 20 weeks gestation. We created mutually exclusive joint exposure groups for pre- and early pregnancy (both pre- and early pregnancy depression=chronic depression; depression in early pregnancy only; depression in pre-pregnancy only; no pre- or early pregnancy depression). Rate of GWG from depression screening to delivery was categorized according to Institute of Medicine (IOM) recommendations. Early pregnancy depression was associated with 0.03 lbs/week greater GWG rate (95% confidence interval (CI) 0.02, 0.04) compared to no pre- or early pregnancy depression. Chronic depression and pre-pregnancy depression were associated with 27% (odds ratio (OR)=1.27; 95% CI: 1.16, 1.39) and 24% (OR=1.24; 95% CI: 1.10, 1.40) greater odds of GWG rate below the IOM recommendations compared to within the recommendations. Pre-pregnancy depression and early pregnancy depression were associated with 13% (OR=1.13; 95% CI: 1.05, 1.23) and 11% (OR=1.11; 95% CI: 1.04, 1.19) greater odds of GWG rate above the IOM recommendations compared to within the recommendations. Our findings suggest that women with pre-pregnancy or early pregnancy depression may require tailored prenatal counseling or intervention for appropriate GWG.

PA094 S/T

THE EFFECT OF SKIN-TO-SKIN CARE ON POSTPARTUM DEPRESSION AMONG MOTHERS OF PRETERM OR LOW BIRTH WEIGHT INFANTS: A SYSTEMATIC REVIEW Natalie Scime, Adam Gavarkovs, Kathleen Chaput (University of Calgary)

Background: Mothers of preterm or low birth weight (LBW) infants are at 2-3 times greater risk of postpartum depression (PPD) than mothers in the general population, which may be partially due to separation of the mother-infant dyad at birth and during hospitalization. Regular skin-to-skin (S2S) care between mothers and infants could potentially prevent PPD in this vulnerable population. Objective: To examine the effect of S2S on PPD among mothers of preterm or LBW infants through a systematic review. Method: We systematically searched 6 peer-reviewed databases for prospective studies of S2S interventions that took place in neonatal intensive care units, and included PPD as an outcome, published in English between 1979 and 2017. Multiple hand searching strategies were also used. Two reviewers independently performed data extraction and critical appraisal. Results: Forty-four articles were located through searching, and 8 studies detailing 7 interventions met inclusion criteria. Substantial heterogeneity was observed across studies. Intervention duration ranged from 1 week to >2 months, S2S sessions ranged from 15 minutes to 1 hour (or as per maternal preference), and S2S frequency ranged from thrice daily to thrice weekly. The latency period between birth and S2S initiation was largely unreported. Five different tools were used to measure PPD (mainly the Edinburgh Postnatal Depression Scale) and few studies reported follow-up beyond infant discharge; tools were frequently used as continuous measures rather than dichotomous measures with a validated cut-off score. Of the 4 moderate-quality studies, 3 reported a significant reduction in depressive symptoms among mothers in the S2S group compared to controls. Conclusion: Despite positive findings, studies differed markedly in terms of S2S dose, outcome measurement, and overall quality. Further well-designed, randomized studies are warranted to conclusively test the effectiveness of S2S on PPD prevention.

SUBSEQUENT PREGNANCY OUTCOMES FOLLOWING POSTPARTUM HAEMORRHAGE OR TRANSFUSION Jane Ford, Jillian Patterson, Deborah Randall, Tanya Nippita (Kolling Institute, University of Sydney)

Increasing rates of postpartum haemorrhage and obstetric transfusion mean that more women are entering subsequent pregnancies with a history of blood transfusion. Few studies have investigated subsequent pregnancy outcomes for these women. This study investigates subsequent pregnancy outcomes of women with a prior obstetric red cell transfusion, compared to women without a transfusion. All women with a first pregnancy resulting in a liveborn singleton infant of at least 20 weeks gestation delivering in hospitals in New South Wales, Australia, between 2003 and 2012 were included in the study, with followup for second births until June 2015. Linked hospital and birth data were used to identify women with a transfusion and/or postpartum haemorrhage in their first birth, time to second pregnancy and adverse birth outcomes (including transfusion, postpartum haemorrhage and severe morbidity measured by a validated composite indicator) in their subsequent birth. There were 358,384 singleton births to primiparous women, with 1.4% receiving an obstetric blood transfusion. Sixty-three percent of these women had at least one subsequent birth. The relative risk (RR) of requiring a transfusion in a second birth was 4.9 (95% CI 4.1,6.1) for women with a previous transfusion compared with women without. The risk (RR) of severe morbidity in a second birth was 4.1 times higher (95% CI 2.2,7.4) for those receiving a transfusion without haemorrhage in their first birth compared with women with neither haemorrhage nor transfusion. It is important to consider a woman's history of transfusion and/or haemorrhage as part of her obstetric history to ensure management in subsequent pregnancies (eg. antenatal surveillance, access to blood products) to reduce adverse outcome risk.

NON-ADHERENCE TO MAINTENANCE MEDICATIONS FOR WOMEN WITH INFLAMMATORY BOWEL DISEASE DIFFERS BY DRUG CLASS DURING PREGNANCY Sangmin Lee, (University of Calgary)

Background: Pregnant women with inflammatory bowel disease (IBD) and other chronic diseases often stop taking their medications, due to concerns about medication exposure during pregnancy.(1) However, little is known about whether adherence differs by drug class during pregnancy. Methods: Validated case definition was used to identify women with IBD before pregnancy from hospitalization, emergency room, and outpatient physician claims data in Alberta, between 2010-2016. Data on dispensed medications were obtained from the Pharmaceutical Information Network. Adherence to medication was defined by a prescription medical possession ratio (MPR) ≥0.8. Women who had 2 consecutive prescriptions (indicating a physician's intent to treat), and MPR ≥0.8 for a relevant class of maintenance IBD medications in the 1 year prior to pregnancy were included. Chi-square tests were conducted to examine if medication non-adherence during pregnancy differed by drug class. Results: Of the 370 women identified with IBD, 170 (45.9%) were adherent to maintenance medications in the year prior to pregnancy. During pregnancy, 50 (29.4%; 95% confidence interval (CI): 23.0%-36.8%) women, who demonstrated adherence in pre-conception period, discontinued or were not adherent to their medications. Adherence to medication during pregnancy differed significantly by drug class (p=0.004). Overall, 46.9% (95% CI: 33.1%-61.3%) of women taking thiopurines, 26.7% (95% CI: 16.7%-39.6%) of women taking 5-ASA, and 18.0% (95% CI: 10.1%-30.1%) of women taking biologic therapies were not adherent or discontinued their medications during pregnancy Conclusion Almost a third of women discontinued or were not adherent to IBD medications during pregnancy; however, differed by drug class. Examining patterns of medication adherence is an important first step in identifying areas for education and research on medication safety during pregnancy. (1) Mountifield RE. Journal of Crohn's & colitis. 2010;4(2):176-82.

PA098 S/T

BARIATRIC SURGERY AND ITS ASSOCIATION WITH MATERNAL AND CHILD MEDICAL OUTCOMES: A REAL WORLD DATA ANALYSIS Elizabeth Charron, (Clemson University)

Background: Bariatric surgery (BS) is the most effective treatment for obesity, yet there is a need to better understand health benefits and risks of BS on women and their offspring. We aimed to compare the most frequent medical diagnoses for women during pregnancy and for their offspring, among women who had BS before the index pregnancy and women who did not have BS. Methods: We conducted a retrospective cohort study using linked clinical data from two large hospitals in South Carolina. Women aged 15 to 45 years with at least one singleton live birth between January 2007 and April 2017 were included. A history of BS exposure before the index pregnancy was assessed using International Classification of Diseases, 9th and 10th Revisions, Clinical Modification (ICD-9-CM and ICD-10-CM) or Current Procedural Terminology codes. Medical diagnoses for women during pregnancy and at delivery, and for offspring up to two years of age, were classified by ICD-9-CM and ICD-10-CM diagnosis codes. Multivariable logistic regression analyses were used to estimate the odds ratio (OR) of medical diagnoses based on BS exposure status. Results: In the cohort of 21,405 women, only 65 (.30%) had BS before the index pregnancy. Women in the BS group were older, more likely to have type II diabetes, hypertension, and hyperlipidemia before pregnancy (all p<0.05). BS exposure was positively associated with antepartum diarrhea [OR=13.6, 95% confidence interval (CI) 6.53-28.4] in mothers and with neonatal candidiasis [OR=13.1, 95% CI 3.89-44.4], acute bronchiolitis (age 1-12 months) [OR=3.44, 95% CI 1.38-8.56], and croup (age 13-24 months) [OR=5.16, 95% CI 1.15-23.3] in children, after adjusting for maternal age, race, pre-existing hypertension and child age (for child outcomes). Conclusion: Our analysis using real-world data showed that having BS before pregnancy was associated with certain adverse outcomes during pregnancy and delivery for women, and their children through early childhood.

LOW BACK PAIN AMONG STUDENTS IN RELATION TO THE WEIGHT OF SCHOOL BAG

Abdullah Al-Taiar, Fatemah Akbar, Muneera AlBesharah, Dana Mohammad, Jumana Al-Baghli, Farah Bulbul, Bann Qadoura (Faculty of Medicine, Kuwait University)

Objectives: The association between the weight of school bag and Low Back Pain (LBP) among students remains under intense debate worldwide. This study aimed to estimate the prevalence of LBP among public high school students in Kuwait and to investigate the association between LBP and the weight of school bag. Methods: A cross-sectional study using multistage cluster sampling with probability proportional to size method was conducted on a total of 950 public high school students from all governorates. Data on LBP were collected through face-to-face interviews using a standardized questionnaire. The students' height and weight and the weight of their school bags were measured using appropriate weight and height scales. Logistic regression was used to investigate the association between the weight of school bags and LBP while adjusting for potential confounders. Results: The estimated lifetime, 6-month, and 1-month prevalence of LBP were 70.3%(95%CI:67.30–73.21%), 49.1%(95%CI: 45.83–52.28%), and 30.8%(95%CI:27.81%–33.78%) respectively, with significantly higher prevalence in females compared to males (p<0.001). The absolute weight of school bag was not significantly associated with LBP neither in univariate nor multivariate analysis. The relative weight of school bag (as a percentage of the body weight) was significantly associated with LBP in univariate analysis but not in multivariate analysis. The students' perception towards their bag weight, however, was found to be significantly associated with LBP throughout the analysis (p<0.001). Conclusion: LBP among high school students in Kuwait seems to be very common with a prevalence resembling that of high-income countries. Our data suggest that the students' perception on the weight of school bag is far more important than the actual weight. Current recommendations about the weight of school bags, which are not supported by evidence, should be revised to take into account the students' perception on the weight of school bag.

VITAMIN D STATUS AMONG ADOLESCENTS IN KUWAIT

Abdullah Al-Taiar, Abdur Rahman, Reem Al-Sabah, Lemia Shaban, Anwar Al-Harbi (Faculty of Medicine, Kuwait University)

Background and objectives: In Kuwait as in many Arab states in the gulf region, there are limited data on the prevalence of vitamin D deficiency among healthy adolescents. This study aimed to estimate the prevalence of vitamin D deficiency in a nationally representative sample of adolescents and investigate factors associated with vitamin D status. Methods: Cross-sectional study was conducted on 1416 adolescents who were randomly selected from middle schools in all governorates of Kuwait. Data were collected from parents and adolescents; while vitamin D was measured using liquid chromatography-tandem mass spectrometry (LC-MS/MS). Logistic regression was used to investigate the independent factors associated with vitamin D status. Results: The Prevalence of vitamin D deficiency was 1,150 (81.21%, 95%CI: 71.61-90.81) while severe deficiency was 559 (39.48%). Only 51 (3.60%) were vitamin D sufficient. Prevalence was significantly higher among females compared to males (91.69% vs. 70.32%; p<0.001). There was a significant inverse correlation between vitamin D and PTH (Spearman correlation=-0.35; p<0.001). In the final model, gender, age, governorate, parental education, body mass index, vitamin D supplement and number of times walking to school per week were all significantly related to vitamin D deficiency. Conclusion: High prevalence of vitamin D deficiency was noted among adolescents in Kuwait despite the abundant sunshine which may reflect strong sun avoidance behavior. Adequate outdoor daytime activities should be encouraged especially for females. We call for locally tailored guidelines for supplement in which females should have a higher amount of vitamin D supplement compared to males.

BRANCHED CHAIN AMINO ACIDS, ANDROGEN HORMONES, AND METABOLIC RISK ACROSS EARLY ADOLESCENCE: A PROSPECTIVE STUDY IN PROJECT VIVA

Wei Perng, Sheryl Rifas-Shiman, Marie-France Hivert, Jorge Chavarro, Emily Oken (Colorado School of Public Health)

Branched chain amino acids, androgen hormones, and metabolic risk across early adolescence: a prospective study in Project Viva Wei Perng,1,2 Sheryl L. Rifas-Shiman,3 Marie-France Hivert,3 Jorge Chavarro,4,5 Emily Oken,3,5 1 Department of Nutritional Sciences, Department of Epidemiology, University of Michigan School of Public Health, Ann Arbor, MI, USA 2 Department of Epidemiology, University of Michigan School of Public Health, Ann Arbor, MI, USA 3 Division of Chronic Disease Research Across the Lifecourse, Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA, USA. 4 Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA, USA 5 Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, MA, USA Objective: To examine associations of two obesity-related metabolite patterns with changes in metabolic biomarkers during early adolescence. Methods: Using multivariable linear regression, we examined associations of a branched chain amino acid (BCAA) and androgen hormone patterns with changes in glycemia (fasting glucose, insulin, HOMA-IR), adipokines (leptin, adiponectin), inflammation (C-reactive protein, interleukin-6), lipid profile, and blood pressure during~5 years follow-up among 213 children aged 6-10 years at baseline. We adjusted for baseline age, pubertal status, biomarker level, and BMI z-score; and age at follow-up. We also tested for interactions with sex and baseline BMI z-score. Results: Median age at baseline was 7.7 years; 8.8% were boys. In adjusted models, each 1 unit of the BCAA pattern corresponded with a 4.82 (95% CI: 0.92, 8.71) mg/dL decrease in fasting glucose in boys. In girls, the BCAA pattern was associated with an increase in triglycerides (4.17 [0.03, 8.32] mg/dL). The androgen pattern was associated with decreased leptin (-2.35 [-4.34, -0.35] ng/dL) and increased CRP (0.28 [0.03, 0.54] mg/dL) in girls. These relationships did not differ by baseline BMI z-score. Conclusions: The BCAA and androgen hormone metabolite patterns are related to changes in metabolic parameters in a sex-specific manner during early adolescence

RISK FACTORS FOR CHRONIC LUNG DISEASE AND ASTHMA DIFFER AMONG CHILDREN BORN EXTREMELY PRETERM

Wesley Jackson, (University of North Carolina at Chapel Hill)

Background: Prematurity is associated with the development of chronic lung disease (CLD; also known as bronchopulmonary dysplasia) when the infant is in the neonatal intensive care unit, and with asthma in childhood. The extent to which CLD conveys information about asthma is unknown. Risk factors for CLD might be the same as or different from those for asthma. Objective: The objectives of this study were to evaluate the hypothesis that CLD is a risk factor for childhood asthma, and the hypothesis that the risk factors for CLD are similar to the risk factors for asthma. Design/Methods: We collected data prospectively from 882 children born before the 28th week of gestation between 2002-2004 who returned for follow-up at 12 and 24 months and 10 years of age. We created time-oriented logistic regression models (TORMs) to compare risk factors for CLD and parent-reported asthma at 10 years of age. We performed additional modeling using a TORM to account for variables collected at 12 and 24 months and 10 years associated with childhood asthma. Results: CLD diagnosed during the neonatal period was associated with subsequent bronchodilator use at 12 months and 24 months (p <0.001), but not with an asthma diagnosis at 10 years (Odds Ratio 1.3; 95% confidence interval 0.98-1.8). While risk factors for CLD include lower gestational age (OR 2.7; 1.5-4.7) and fetal growth restriction (OR 2.3; 1.4-3.7) (Table 1), risk factors for asthma include public insurance (Medicaid) (OR 1.8; 1.1-2.8) and higher weight gain velocity during the first year (OR 1.5; 1.02-2.2) and between the 2nd and 10th year (OR 1.7; 1.2-2.4) (Table 2). Conclusions: Among children born extremely preterm, the diagnosis of CLD and its antecedents are not associated with childhood asthma at 10 years of age. Socioeconomic disadvantage was an important risk factor for asthma, but not for neonatal CLD.

PARENTAL OBESITY AND OFFSPRING FAILURES ON THE MODIFIED CHECKLIST FOR AUTISM IN TODDLERS (M-CHAT) AT AGES 18 AND 24 MONTHS Elise Heisler, (NIH)

Parental obesity may increase autism spectrum disorder (ASD) risk in offspring through epigenetic mechanisms. However, of the existing studies that consider maternal obesity in ASD development, few also consider paternal obesity. The Upstate KIDS Study, originally designed to assess the impact of infertility treatment on child development, prospectively followed children through age 36 months. The current analysis includes 4791 children (3905 singletons and 1066 unrelated twins). Mothers reported paternal weight and height at 4 months postpartum. Pre-pregnancy Body Mass Index (BMI) was collected from birth records. The reference group combined under- and normal-weight parents. The M-CHAT was used to screen ASD risk at 18 and 24 months. Multiple imputations were applied to complete missing data. Logistic regression was used to estimate the odds of M-CHAT fails at 18- and 24-months, and at either 18-/24-months, after adjusting for maternal race, age, education, marital status, insurance, pregnancy smoking and alcohol use, infant sex, and plurality. Of the 4971 infants, 349(7%), 243(5%) and 494(10%) failed the M-CHAT at months 18, 24, and ever, respectively. Parental BMI was not associated with M-CHAT failure at 18 months. Compared to the reference group at 24 months, children of obese (BMI>30 kg/m2) and extremely obese mothers (BMI>35) had no greater risk of failing (BMI>30: adjusted odds ratio=0.81; 95% confidence interval: 0.38-1.72; BMI>35: 1.06; 0.46, 2.45). Children of obese fathers had no greater risk of failing (1.13; 0.47-2.72). Although children of extremely obese fathers (BMI>35) had an elevated risk (1.71; 0.71-4.10), estimates were imprecise. Children of parents with both BMIs>35 had an increased risk of failing the M-CHAT (2.87, 0.69-11.97), but results were not significant. Our results suggest that offspring ASD risk is not associated with parental obesity. Inconclusive results may be due to the M-CHAT's disputed ability to detect ASD specifically.

INFLUENCE OF MATERNAL EARLY PREGNANCY SERUM THYROID HORMONES ON CORD SERUM THYROID HORMONES Noelle Kosarek, Yingying Xu, Andy Hoofnagle, Kimberly Yolton, Aimin Chen, Bruce Lanphear, Joseph Braun, Megan Romano (Dartmouth Geisel School of Medicine)

Maternal thyroid hormones play an integral role in fetal neurodevelopment and physical growth. The primary objective of the current study was to assess the influence of maternal thyroid hormones in early pregnancy on cord serum thyroid hormones. We also explored the association between cord serum thyroid hormone concentrations and child thyroid stimulating hormone (TSH) at age three years. TSH, free and total thyroxine (T4), and triiodothyronine (T3) were measured in maternal serum collected at ~16 weeks' gestation, cord serum, and child serum collected at age three years by immunoassay among participants in a prospective pregnancy and birth cohort, the Health Outcomes and Measures of the Environment (HOME) Study. We built multivariable linear regression models adjusting for maternal sociodemographic and perinatal factors collected by survey and medical record abstraction. These include maternal age, race, marital status, parity, body mass index, smoking status, household income, and mode of delivery. There were 151 newborns with mothers for whom thyroid hormone concentrations were available and 120 children for whom delivery thyroid hormone concentrations were available. We observed a 14% increase in cord TSH for each doubling of maternal TSH (95% confidence interval (CI): 4, 27). Maternal thyroid hormones were not associated with other cord serum thyroid hormones. For every 0.2 ng/dL increase in cord free T4, approximately a one standard deviation increase, an 11% decrease in child TSH was observed at age three years (95% CI:-20, -2). These findings may inform future directions in which maternal and cord serum thyroid hormone levels are used to predict child thyroid hormone levels at a later time point.

TOBACCO USE AND COMMUNICATION CHANNEL PREFERENCES AMONG APPALACHIAN YOUTH Delvon Mattingly, Lindsay Tompkins, Jayesh Rai, Clara Sears, Kandi Walker, Joy Hart (University of Louisville)

Introduction: Youth tobacco use rates in the Appalachian region exceed the US national average, and newer tobacco products, such as e-cigarettes, have grown in familiarity and use. Given that e-cigarettes and conventional tobacco are commonly used by these youth, further research is needed to better understand how youth receive and share product information by use patterns. Methods: Middle and high school students in rural Appalachia were surveyed (N=1049). The primary exposure in this analysis, tobacco use, was categorized as Never Users, E-cigarette Users, and Conventional Tobacco Users (e.g., cigarettes or smokeless). Descriptive characteristics were compared among the three use groups. Associations between tobacco use and receiving or sharing tobacco- ore-cigarette-related information via specific communication channels were assessed using multivariable logistic regression models adjusted for education. Results: Compared to Never Users, E-cigarette Users were more likely to receive tobacco information from family and friends (Odds Ratio (OR): 1.83, CI (95%): 1.327-2.511), public displays (OR: 1.58; CI: 1.156-2.161), and digital media (OR: 1.89; CI: 1.281-2.590), and were more likely to receive e-cigarette information via the same communication channels (OR: 3.55; CI: 2.567-4.906), (OR: 2.03; CI: 1.477-2.785), (OR: 2.52; CI: 1.827-3.463), respectively. E-cigarette Users (OR: 2.61; CI: 1.882-3.625) and Conventional Tobacco Users (OR: 1.83; CI: 1.212-2.772) were more likely to share tobacco information with family and friends compared to Never Users, and E-cigarette Users were more likely to share e-cigarette information with family and friends (OR: 5.55; CI: 3.927-7.832). Conclusions: Appalachian youth E-cigarette Users receive and share tobacco- and e-cigarette-related information via various communication channels. Thus, several channels many need to be utilized in health communication campaigns to reach youth.

ACUTE AIR POLLUTION EXPOSURE AND NICU ADMISSION: A CASE-CROSSOVER ANALYSIS Indulaxmi Seeni, (DIPHR, NIH, Epi branch)

Background: Neonatal intensive care unit (NICU) admission rates have been increasing over time. Air pollution has been associated with a variety of adverse pregnancy outcomes but the relationship between maternal exposure to air pollution during pregnancy and NICU admission has not been previously investigated. Methods: In the Consortium on Safe Labor (2002-08), 27,231 singletons were admitted to a NICU. Modified Community Multiscale Air Quality models estimated air pollutant exposures for 7 criteria air pollutants and 5 particulate matter constituents. Case-crossover analyses calculated odds ratios and 95% confidence intervals for interquartile range increases in pollutant exposure, comparing exposures during the week of delivery to control periods before and after delivery. Results: In models that adjusted for particulate matter<2.5 microns (PM2.5), exposure to constituents of PM2.5 the week prior to delivery was significantly associated with increased NICU admission risk. Odds of NICU admission were increased after exposure to elemental carbon (38%), ammonium ions (39%), nitrate compounds (16%), organic compounds (247%), and sulfate compounds (30%). Sulfur dioxide and nitrogen dioxide both were associated with 4% increased odds of NICU admission. Odds for NICU admission were also significantly increased by acute exposures (day of delivery and day prior to delivery) to carbon monoxide (3-4%), nitrogen dioxide (9-13%), nitrogen oxides (5-8%), particles<= 10 microns (2-3%), and sulfur dioxide (3-6%). No associations were observed for ozone. Conclusions: Acute exposures to PM2.5 constituents and several traffic related pollutants during the week prior to delivery as well as the day of delivery and the day prior to delivery, appear to increase the risk of NICU admissions. These novel associations suggest infants exposed in utero to common air pollutants require additional care during the newborn hospital admission.

PERSISTENT WHEEZE IN CHILDREN ASSOCIATED WITH INFERTILITY TREATMENT IN A POPULATION-BASED COHORT

Pauline Mendola, (NIH/NICHD)

Children conceived by infertility treatments may have an increased risk of wheeze but the current literature is inconsistent. The Upstate KIDS cohort (n=4,829) was established using New York State birth certificates (2008-2010). Mothers of singletons conceived with infertility treatment were recruited as were mothers who conceived spontaneously (1:3 ratio, frequency-matched on region). Mothers of twins were invited to participate regardless of mode of conception. Infertility treatment was based on maternal self-report and assisted reproductive technology (ART) treatments were verified by the Society for Assisted Reproductive Technology Clinic Outcome Reporting System. Mothers reported child wheeze at 4-6, 8, 12, 18, 24, 30 and 36 months of age. Generalized linear mixed models controlled for twins and estimated the risk of persistent child wheeze (any 2 reports) and wheeze at 12-months or older associated with infertility treatments and adjusted for maternal asthma, age, pre-pregnancy body mass index, race, education, marital and insurance status, smoking and drinking in pregnancy, diabetes and plurality. Weights accounted for the sampling framework. Persistent wheeze was more common among children conceived by any infertility treatment (odds ratio (OR)=1.60, 95% Confidence Interval (CI): 1.04-2.48), and in the subset with ovulation induction/intrauterine insemination (OI/IUI) compared with spontaneously conceived children (OR= 1.81, CI: 1.08-3.03). Wheeze in children 12 months or older was also increased among those conceived after OI/IUI (OR=1.70, CI: 1.10-2.66). ART was not significantly associated with wheeze. Maternal asthma consistently doubled or tripled wheeze risk but did not modify the infertility treatment relationship. Persistent wheeze or wheezing in toddlers may be more likely to indicate long-term respiratory problems and asthma risk. Persistent wheeze among children conceived by infertility treatment, particularly OI/IUI, merits further attention.

RISK OF FEBRILE SEIZURES AFTER IN-UTERO EXPOSURE TO MATERNAL INFLUENZA INFECTION AND VACCINATION: A REGISTRY-BASED STUDY FROM NORWAY Siri Eldevik Håberg, Laura Oakley, Sara Ghaderi, Per Magnus, Lill Trogstad, Camilla Stoltenberg, Kari Aaberg, Allen Wilcox (Norwegian Institute of Public Health)

Background: Pregnancy increases the risk of influenza-related morbidity and mortality, and many national vaccination programmes recommend influenza vaccination for pregnant women. In-utero exposure to several maternal infections has been linked to febrile seizures; effects of in-utero exposure to maternal influenza have rarely been investigated. Although previous studies have assessed pregnancy outcomes after influenza vaccination, child outcomes have received little attention. Methods: We used prospectively collected Norwegian national registry data to study whether maternal influenza infection or vaccination against pandemic influenza during pregnancy increased the risk of febrile seizures in the child. We linked data on births, immunisations, and primary and specialist care on all children born in Norway between October 2009 and December 2013 (N=254,347). Cox regression models were used to investigate if in-utero exposure to maternal influenza (seasonal and pandemic) or pandemic vaccination increased the risk of febrile seizures in early childhood. Results: A diagnosis of maternal influenza during pregnancy was associated with a 22% increased risk of febrile seizures in the child. The risk was highest (37% increase) for maternal pandemic influenza. In a trimester-stratified analysis, the risk was most pronounced for children exposed to maternal influenza in the second trimester. The risk of febrile seizures was not increased after maternal pandemic vaccination during pregnancy. Conclusions: Maternal influenza during pregnancy was associated with an increased risk of febrile seizures in the child. Maternal vaccination during pregnancy was not associated with febrile seizures.

Poster Session B

EARLY LIFE RISK FACTORS OF MOTOR, COGNITIVE, AND LANGUAGE DEVELOPMENT: A POOLED ANALYSIS OF STUDIES FROM LOW-AND MIDDLE-INCOME COUNTRIES Ayesha Sania, Christopher Sudfeld, Goodarz Danaei, Günther Fink, Dana McCoy, Zhaozhong Zhu, Mary Fawzi, Majid Ezzati, Wafaie Fawzi (Columbia University Medical Center)

Background: Exposure to risk and protective factors critically shape child development during the first years of life. While many risk factors have been identified, and studied in birth cohorts in high-income countries, little is known regarding their relative importance in low-and middle-income countries (LMIC). Methods: We retrieved data from 21 studies including 20,882 children across 13 LMICs, to assess the associations of exposure to 14 major risk factors with children's cognitive, motor and language development in early childhood. Linear regression models were used to assess standardized mean differences in child development by parental and child factors within each study. We then produced pooled estimates across studies using random effects meta-analyses. Findings: Children born to mothers with secondary schooling had 0.14 SD (95% Confidence Interval, CI: 0.05, 0.25) higher cognitive scores compared to children whose mothers had only primary education. Higher levels of paternal education were also independently associated with cognitive, motor, and language scores. Compared to full-term birth, preterm birth had a strong negative association with child development with 0.14 SD (95% CI: -0.24, -0.05) and 0.23 SD (-0.42, -0.03) reductions in cognition and motor development, respectively. Maternal short stature, anemia in infancy, and lack of access to clean water and sanitation also had significant negative associations with cognitive and motor development with effects ranging from -0.18 to -0.10 SDs. Conclusions: Differential parental, environmental, and nutritional factors contribute to disparities in child development across LMICs. Interventions targeting these factors from pre-pregnancy through childhood may improve health and development of children.

CORD AND EARLY CHILDHOOD PLASMA LEPTIN, FETAL AND INFANCY GROWTH PATTERN AND DEVELOPMENT OF AUTISM SPECTRUM DISORDER IN THE BOSTON BIRTH COHORT Ramkripa Raghavan, M. Daniele Fallin, Xiaobin Wang (Johns Hopkins Bloomberg School of Public Health)

Background: Emerging evidence suggests that leptin, a pro-inflammatory cytokine predominantly derived from adipose tissue, is altered in children with autism spectrum disorder (ASD); but this association has not been studied prospectively. Rapid growth during infancy and early childhood has been implicated in ASD, but the evidence is inconsistent. Methods: This prospective cohort study had 844 children including 49 ASD subjects. The study assessed the relationship between 1) cord and early childhood plasma leptin (measured prior to ASD diagnosis) and ASD; and 2) fetal growth and first year weight gain and ASD. The role of leptin mediating the association between 1st year weight gain and ASD was also explored. ASD was defined based on Electronic Medical Records. Results: Children with highest early childhood leptin (quartile 4), when compared to those with lowest levels (quartile 1), showed an increased risk of developing ASD (adjusted odds ratio (aOR): 8.50; 95% CI: 2.22, 32.57). Extremely rapid weight gain during 1st year was associated with a greater ASD risk, when compared to those children whose growth was on track. This association persisted after adjusting for confounders (aOR: 3.30; 95% CI: 1.46, 7.44). Early childhood leptin partially mediated 76.03% of the association between 1st year weight gain with ASD. No association with ASD was found for fetal growth and cord leptin. Sensitivity analyses using more stringent ASD case and control definitions yielded consistent findings. Discussion: This study suggests that 1st year weight gain and early childhood leptin may play a role in ASD. These findings, if further confirmed by other studies, provide a basis to further explore whether the combination of early life growth pattern and a biomarker such as leptin can predict ASD, or inform targets for prevention.

POSITIVE FIRST-TRIMESTER FMF ALGORITHM SCREENING: THE GREAT OBSTETRICAL SYNDROMES (GOS) STUDY Amelie Boutin, Suzanne Demers, Cedric Gasse, Yves Giguère, Amélie Tétu, Emmanuel Bujold (CHU de Quebec - Université Laval)

Objectives: Early identification of women at high-risk of major placenta-mediated complications of pregnancy can allow for the initiation of low-dose aspirin prophylaxis in the first-trimester of pregnancy. We aimed to explore pregnancy outcomes in women with a positive screening test for preeclampsia using the Fetal Medicine Foundation (FMF) algorithm. Methods: We conducted a prospective cohort study of Canadian pregnant women with singleton foetus recruited at 11-14 weeks gestation. Lethal anomalies and medical terminations of pregnancies were excluded. Maternal age, body mass index, methods of conception, personal history of PE, ethnicity, mean arterial blood pressure, PAPP-A, PlGF and mean uterine artery pulsatility index were submitted into the online FMF algorithm. PE, small for gestational age (SGA) <3rd centile and fetal death, were reported for women with a positive screening test for preterm PE ($\geq$1/70) and compared to women with a negative screening test (<1/70). Results: We included 6067 participants, among which 672 (11%) had a positive FMF screening test. The latter were at greater risk of PE (13.4% vs. 3.4%), preterm PE (3.7% vs. 0.3%), PE<34 weeks (1.4% vs. 0.09%), SGA<3rd centile (4.1% vs. 1.4%), preterm SGA<3rd centile (0.7% vs. 0.04%; p=0.0003), fetal death (0.6% vs. 0.3%; p=0.13), miscarriage at 14-20 weeks (0.9% vs. 0.3%; p=0.02), or any of the above complications (17.1% vs. 5.1%) when compared to women with a negative screening test (all with p<0.0001, except if otherwise specified). Among women with a positive test, 5.3% developed one of the severe complications (preterm PE, preterm SGA, fetal death) compared to 0.8% women with a negative screening test (p<0.0001). Conclusions: Women with positive FMF screening test for preterm PE in the first-trimester of pregnancy are at high-risk of severe placenta-mediated complications that are preventable with low-dose aspirin initiated in early gestation.

GENETIC VARIATIONS AND RISK OF PLACENTAL ABRUPTION: A GENOME-WIDE ASSOCIATION STUDY AND META-ANALYSIS OF GENOME-WIDE ASSOCIATION STUDIES Tsegaselassie Workalemahu, (National Institute of Child Health and Human Development & University of Washington)

Introduction: Accumulating epidemiological evidence points to strong genetic susceptibility to placental abruption (PA). However, characterization of genes associated with PA remains incomplete. We conducted a genome-wide association study (GWAS) of PA and a meta-analysis of GWAS. Methods: Participants of the Placental Abruption Genetic Epidemiology (PAGE) study, a population based case-control study of PA conducted in Lima, Peru, were genotyped using the Illumina HumanCore-24 BeadChip platform. Genotypes were imputed using the 1000 genomes reference panel, and >4.9 million SNPs that passed quality control were analyzed. We performed a GWAS in PAGE participants (507 PA cases and 1,090 controls) and a GWAS meta-analysis in 2,512 participants (959 PA cases and 1,553 controls) that included PAGE and the previously reported Peruvian Abruptio Placentae Epidemiology (PAPE) study. We fitted population stratification-adjusted logistic regression models and fixed-effects meta-analyses using inverse-variance weighting. Results: Independent loci (linkage-disequilibrium<0.80) suggestively associated with PA (P-value<5e-5) included rs4148646 and rs2074311 in ABCC8, rs7249210, rs7250184, rs7249100 and rs10401828 in ZNF28, rsl1133659 in CTNND2, and rs2074314 and rs35271178 near KCNJ11 in the PAGE GWAS. Similarly, independent loci suggestively associated with PA in the GWAS meta-analysis included rs76258369 near IRX1, and rs7094759 and rsl2264492 in ADAM12. Functional analyses of these genes showed trophoblast-like cell interaction, as well as networks involved in endocrine system disorders, cardiovascular diseases, and cellular function. Conclusions: We identified several genetic loci and related functions that may play a role in PA risk. Understanding genetic factors underlying pathophysiological mechanisms of PA may facilitate prevention and early diagnostic efforts.

S/T=Student/Trainee

TRENDS IN OPIOID USE DISORDER REPORTED AT DELIVERY HOSPITALIZATION, 1999-2014 Sarah Haight, (Centers for Disease Control and Prevention)

Introduction: The increasing number of pregnant women with opioid use disorder presents a significant public health concern given the adverse maternal outcomes (e.g. maternal mortality) and neonatal outcomes (e.g. neonatal abstinence syndrome) associated with opioid exposure. We update U.S. national trends and describe previously undocumented state-specific trends of opioid use disorder present at delivery hospitalization. Methods: Data from the Healthcare Cost and Utilization Project's State Inpatient Databases and Nationwide Inpatient Sample, 1999-2014, were analyzed. International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic and procedure codes were used to identify opioid use disorder diagnoses and delivery hospitalizations. We estimated national and state-specific prevalence rates of opioid use disorder during delivery hospitalization. We calculated linear trends across time and the average annual percentage point change of the prevalence rate (APC) nationally and among 28 states with at least 3 years of data. Results: Nationally, the prevalence rate per 1,000 delivery hospitalizations increased from 1.5 in 1999 to 6.5 in 2014 with an APC of 0.41% (p20 diagnoses per 1,000 delivery hospitalizations. During 1999-2014, the APC significantly increased in all states, with Maine, New Mexico, Vermont, and West Virginia APCs >2%. Conclusion: Opioid use disorder observed at delivery hospitalization has increased significantly nationally and in the 28 states with data. States with high prevalence of opioid use disorder during delivery hospitalization mirror those highly impacted by the opioid epidemic in the general population. These data indicate a continued need for national and state efforts to prevent and monitor opioid use disorders among reproductive age women.

S/T=Student/Trainee

ASSOCIATIONS OF PRENATAL EXPOSURE TO IMPAIRED GLUCOSE TOLERANCE WITH EATING IN THE ABSENCE OF HUNGER AND BODY COMPOSITION IN EARLY ADOLESCENCE Ivonne Derks, Marie-France Hivert, Sheryl Rifas-Shiman, Veronique Gingras, Jessica Young, Pauline Jansen, Emily Oken (Division of Chronic Disease Across the Lifecourse, Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston MA, USA)

Objective: Exposure to impaired gestational glucose tolerance has been shown to have sex-specific associations with offspring obesity risk, perhaps by affecting the development of appetite regulation. However, studies exploring this pathway are lacking. We examined the extent to which prenatal exposure to impaired glucose tolerance was associated with eating in the absence of hunger (EAH) in early adolescent offspring, and in turn, whether EAH was associated with body composition. Methods: We included data from 1097 adolescents participating in Project Viva, a pre-birth longitudinal cohort. We obtained results of 2-stage prenatal glycemic screening (50g glucose challenge test plus 100g oral glucose tolerance test) at 26-28 weeks gestation and categorized mothers as having normal glucose tolerance (NGT), isolated hyperglycemia (IH, n=92, 8.4%), impaired glucose tolerance (IGT, n=36, 3.3%), or gestational diabetes mellitus (GDM, n=52, 4.7%). At the median age of 13 years, offspring reported on two items of the Eating in the Absence of Hunger in Children and Adolescence questionnaire, we measured height and weight, and performed dual X-ray absorptiometry scans to assess fat- and fat free mass. We used multivariable linear regression analyses adjusted for sociodemographic and prenatal covariates, including maternal pre-pregnancy BMI. Results: On a 10-point scale, mean (SD) EAH score was 4.41 (1.43). In girls, prenatal exposure to IH and IGT was associated with more EAH compared with NGT (e.g. for IH: 0.56 points, 95%CI: 0.17, 0.96), whereas in boys, prenatal exposure to IGT was associated with less EAH (-0.81 points, 95%CI: -1.41, -0.21). We did not observe an association between exposure to GDM with EAH, nor did we observe associations between EAH and body composition. Conclusion: These findings suggest sex-specific associations of exposure to impaired gestational glucose tolerance in offspring appetite regulation, affecting early adolescent girls.

PRE-, PERINATAL AND PARENTAL DETERMINANTS OF BODY MASS INDEX TRAJECTORY MILESTONES Izzuddin Aris, Sheryl Rifas-Shiman, Ling-Jun Li, Ken Kleinman, Brent Coull, Marie-France Hivert, Michael Kramer, Emily Oken (Harvard Medical School)

Background: Body mass index (BMI) trajectory milestones (peak and rebound) during infancy and childhood predict later adiposity, but evidence remains scant regarding their prenatal determinants. We aimed to assess associations of pre-, perinatal and parental factors with age and magnitude at body mass index (BMI) peak and rebound. Methods: Among 1681 children with BMI data from birth to mid-childhood (median 92.5 months) in Project Viva, we fitted individual BMI trajectories using mixed-effect models with natural cubic spline functions, and estimated age and magnitude at peak in infancy and rebound in early childhood. We used stepwise multivariable regression to identify maternal, parental and child predictors of peak and rebound in the 1354 (80.5%) children with estimable trajectory milestones. Results: The mean (standard deviation, SD) of age at BMI peak was 8.4 (2.7) months and at rebound was 59.8 (19.6) months, while the mean (SD) of magnitude at peak was 18.0 (1.4) kg/m2 and at rebound was 15.9 (1.2) kg/m2. Girls had a later age at peak, earlier age at rebound, and lower magnitudes at peak and rebound than boys. Maternal transient hyperglycemia [vs normoglycemia: β 0.70 months (95%CI 0.21, 1.19)] and preeclampsia [vs normal blood pressure: 1.65 months (0.85, 2.44)] were associated with a later peak, while intermediate glucose intolerance [vs normoglycemia: -0.49kg/m2 (-0.89,-0.09)] was associated with a lower magnitude at peak. Higher maternal 1st-trimester weight gain, smoking during pregnancy, non-initiation of breastfeeding, parental obesity and college education predicted BMI rebound. Conclusion: We have identified modifiable prenatal and parental predictors of BMI peak in infancy and rebound in childhood. Early-life interventions that address these factors may be effective in changing BMI peak and rebound, and potentially in preventing later obesity.

SIMILARITY OF WEIGHT-FOR-LENGTH OR BODY MASS INDEX-FOR-AGE DURING THE FIRST TWO YEARS OF LIFE IN PREDICTING ADIPOSITY AND CARDIO-METABOLIC RISK AT EARLY ADOLESCENCE Izzuddin Aris, Sheryl Rifas-Shiman, Ling-Jun Li, Seungmi Yang, Ken Kleinman, Mandy Belfort, Jennifer Thompson, Marie-France Hivert, Richard Martin, Michael Kramer, Emily Oken (Harvard Medical School)

Background: Weight-for-length (WFL) is currently recommended for assessment of weight status in children <2 years, but body mass index (BMI) is recommended above age 2. The clinical implications of using WFL or BMI in children <2 years as predictors of future health outcomes however, remains understudied. Methods: In two cohorts, from United States (Project Viva; n=919) and Belarus (PROBIT; n=12,747), we studied children with weight and length measurements at 6, 12, 18, and 24 months, and outcomes at early adolescence (Project Viva: median 12.9 years; PROBIT: 11.5 years). We used multivariable linear regression, adjusting for demographic (e.g. maternal education level, smoking history) and clinical characteristics (e.g. maternal BMI, gestational age at delivery, infant sex and birthweight), to assess associations of being overweight at 6—24 months, using Centers for Disease Control and Prevention (CDC) WFL≥95th percentile and World Health Organization (WHO) WFL or BMI≥97.7th percentile, with cardiometabolic outcomes at early adolescence. Results: At 6—24 months, 22.4%, 17.4% and 17.5% of children in Project Viva, and 29.1%, 24.1% and 24.5% of children in PROBIT were ever overweight using CDC WFL, WHO WFL and BMI cutpoints respectively. In both cohorts, being ever overweight (vs. never overweight) during 6—24 months provided adjusted estimates for early adolescent fat-mass index (in kg/m2) that did not differ greatly across WFL and BMI cutpoints [Project Viva—CDC WFL: B 1.00 (95% CI 0.54,1.46); WHO WFL: 1.18 (0.67,1.69); WHO BMI: 1.42 (0.92,1.93); PROBIT— CDC WFL: 0.57 (0.48,0.65); WHO WFL: 0.60 (0.51,0.68); WHO BMI: 0.56 (0.47,0.65)]. Our findings were similar for insulin resistance and metabolic risk score, and for analyses repeated at each timepoint, or number of timepoints overweight during 6–24 months. Conclusions: Choice of WFL vs. BMI to define overweight in the first 2 years of life does not greatly affect the associations with cardio-metabolic outcomes at early adolescence.

POSITIVE ASSOCIATION BETWEEN MATERNAL WORK-FAMILY STRESS AND CHILD AGGRESSION AMONG ECONOMICALLY DISADVANTAGED URBAN MOTHERS Kathryn Smith, Cassandra Okechukwu, Bethany Hedt-Gauthier, Kirsten Davison, Marie McCormick (Harvard T.H. Chan School of Public Health)

Introduction. Work-family stress (WFS), a measure of one's ability to meet work and family demands, is an underexplored exposure potentially associated with externalizing behaviors in children. Informed by the ecological systems model, this study aims to determine (1) whether high maternal WFS experienced when child is 1 year is associated with child aggression when child is 3 years, (2) what aspect of WFS -timing or recurrence- may be most strongly associated with child aggression at age 9. Methods. Sample includes 843 mother-child pairs from the Fragile Families & Child Wellbeing study, a cohort of 4,898 children born in large U.S. cities, 1998-2000. WFS, measured with the adapted Emlen Scale of Work Flexibility was categorized as low (38% of sample), medium (54%), high (8%), based on data distribution. Child aggression scores were generated by summing 19 aggression-related items from the Child Behavioral Checklist. We used multivariable linear regression to examine associations between WFS when child was 1 year and aggression scores when child was 3 years, controlling for mother's age, race/ethnicity, education, marital status, income,# weeks worked per year,# of other children in household, and child low birthweight. Results. The study sample includes non-Hispanic Black (56%), non-Hispanic White (22%), Hispanic (19%), and Other (3%) mother-child pairs. 53% of mothers had a high school education or less and 38% reported a pre-tax total household income less than $20,000. The unadjusted model revealed that mothers with high WFS reported an average 2.62 higher aggression score for child (p=0.003) compared to mothers with low WFS. In the multivariable model, mothers with high WFS reported an average 2.26 higher aggression score for child (p=0.009) compared to mothers with low WFS. Next Step. Data will be modeled longitudinally using a multilevel framework to elucidate what aspect of WFS –timing or recurrence- may be most strongly associated with child aggression scores at age 9.

ASSOCIATIONS BETWEEN PLACENTAL MORPHOLOGY AND COGNITIVE ASSESSMENTS IN SINGLETONS AND DICHORIONIC TWINS

Alexa Freedman, Carol Hogue, Carmen Marsit, Augustine Rajakumar, Alicia Smith, Carolyn Drews-Botsch (Rollins School of Public Health, Emory University)

Background: The placenta is responsible for regulating fetal growth and development. Poor placental function may result in growth restriction, which is associated with adverse cognitive outcomes. The purpose of our study was to determine whether features of placental morphology are associated with cognitive development in children. Methods: We estimated associations between features of placental morphology and intelligence quotient (IQ) in childhood using linear regression. We evaluated associations separately in singletons and dichorionic twins. Placental and cognitive data on 514 singletons were obtained from the Small-for-Gestational-Age Study, conducted in 1986-1988. Data on 82 sets of twins were obtained from the Collaborative Perinatal Project, conducted in 1959-1966. Placental variables included thickness, surface area, difference in diameters, and abnormal umbilical cord insertion. The Weschler Preschool and Primary Scale of Intelligence – Revised was administered to singletons at age five and the Weschler Intelligence Scale for Children was administered to twins at age seven. Both assessments provide measures of full IQ, verbal IQ, and performance IQ. Results: There were no statistically significant associations between measures of placental morphology and IQ. However, magnitudes of the associations diverged between males and females. Among males, a 1 cm increase in thickness was associated with a 4.7-point increase in IQ (95% confidence interval [CI]: -0.7, 10.0), whereas the same association among females was -1.1 (95% CI: -5.8, 3.5). Similar relationships were observed among same-sex twins. Conclusions: Overall, placental morphology was not related to IQ. Differences in the magnitudes of the associations between males and females in both singletons and twins are consistent with reported sex-specific differences in placental development. Our results support the hypothesis that placentas of males may have less reserve capacity than placentas of females.

CORD AND EARLY CHILDHOOD PLASMA ADIPONECTIN LEVELS AND AUTISM RISK: A PROSPECTIVE BIRTH COHORT STUDY

Ramkripa Raghavan, M. Daniele Fallin, Xiaobin Wang (Johns Hopkins Bloomberg School of Public Health)

Background: Emerging research suggests that adiponectin, the most abundant anti-inflammatory adipokine, may be implicated in autism spectrum disorder (ASD); however, this has not been studied prospectively. Limited sample size, lack of adjustment of numerous confounders, and cross-sectional study designs have precluded elucidation of the role of adiponectin in the development of ASD. Methods: This study assessed the association between adiponectin measured at two time points: 1) cord; and 2) early childhood plasma adiponectin (prior to ASD diagnosis) and risk of developing ASD. The study included 847 mother-child pairs from the Boston Birth Cohort, of which 792 children were considered neurotypical and 55 received an ASD diagnosis. ASD was defined based on Electronic Medical Records. Results: The mean cord adiponectin was reduced among children later diagnosed with ASD (15.80 μg/mL vs. 11.37 μg/mL). Cord adiponectin levels were inversely associated with ASD risk (adjusted odds ratio (aOR): 0.51; 95% CI: 0.35, 0.75) and this was independent of preterm birth, early childhood adiponectin and other known ASD risk factors. Early childhood adiponectin was also associated with a lower risk of ASD (aOR: 0.54; 95% CI: 0.33, 0.90), but the association attenuated after further adjusting for cord adiponectin (aOR: 0.67; 95% CI: 0.34, 1.33). Sensitivity analyses using more stringent case and control definitions yielded consistent and stronger associations for both cord and early childhood adiponectin. Discussion: These data suggests role of cord adiponectin in ASD risk. Further research is required to elucidate whether cord and/or early childhood adiponectin is a potential early biomarker for ASD risk or whether it is a potential molecular target for developing novel interventions.

PRENATAL PHTHALATE EXPOSURE AND ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) IN PRESCHOOL-AGED CHILDREN IN THE NORWEGIAN MOTHER AND CHILD COHORT STUDY

Elizabeth M. Kamai, Gro D. Villanger, Rachel C. Nethery, Cathrine Thomsen, Amrit K. Sakhi, Samantha S. M. Drover, Pål Zeiner, Jane A. Hoppin, Gun Peggy Knudsen, Ted Reichborn-Kjennerud, Amy H. Herring, Heidi Aase, Stephanie M. Engel, (Gillings School of Global Public Health, University of North Carolina at Chapel Hill)

ADHD affects 5% of children globally. Research suggests an association between prenatal exposure to specific phthalates and ADHD-like symptoms. However, there have been no prospective epidemiologic studies of prenatal phthalate exposure and clinically diagnosed ADHD. We conducted a nested case-cohort study within the Norwegian Mother and Child Cohort (MoBa). The MoBa ADHD Sub-Study conducted on-site clinical assessments of children born between 2003-2008 who screened positive for ADHD-like symptoms at 36 months and a random sample of children without symptoms. We included 258 children who met clinical criteria for ADHD using the Preschool Age Psychiatric Assessment and randomly selected 547 controls from the population of 27,347 children eligible for the ADHD Sub-Study, frequency matched to cases on year of birth. 12 phthalate metabolites were measured in urine samples collected at 17 weeks gestation. We used logistic regression to calculate odds ratios (ORs) and examined continuous and quintile versions of log-transformed phthalate metabolites, adjusted for relevant covariates. We explored both single-and multi-phthalate models and phthalate-sex interaction. Di(2-ethylhexyl) phthalate ($\sum$DEHP) was associated with increased odds of ADHD (OR=1.29, 95% confidence interval [CI] 1.01, 1.65, per one log-unit increase in concentration). Children of mothers in the highest quintile of mono-benzyl phthalate (MBzP) had 1.54 times the odds of ADHD compared to those in the lowest quintile (95% CI 0.93, 2.55). Estimates attenuated in multi-phthalate models. There was no significant modification of associations by child sex. This is the first study to evaluate the relationship between prenatal phthalates and clinically diagnosed ADHD in children. Our results substantiate those of prior studies that have reported positive associations between $\sum$DEHP and ADHD-like symptoms. ADHD diagnosis in children ages 3-4 may be unstable; additional research with older children is warranted.

FEEDING DIFFICULTIES IN 20-MONTH-OLD CHILDREN WITH PRENATAL ALCOHOL EXPOSURE (PAE) COMPARED TO CHILDREN WITHOUT PAE

Laura Garrison, Carolyn Parshall, Sonnie Williams, Alyssa Ortega, Sandra Cano, Elizabeth Jimenez, Julia M. Stephen, Ludmila N. Bakhireva (University of New Mexico)

Recent research indicates that abnormal eating behaviors may be part of the mechanism underlying growth abnormalities in children with Fetal Alcohol Spectrum Disorders (FASD). Research in this area is in its formative stages, especially in preschool children with prenatal alcohol exposure (PAE). This pilot study compares parent-reported feeding behaviors in 20-month-old children with and without PAE recruited into the ongoing prospective ENRICH cohort in New Mexico, which focuses on moderate alcohol exposure (45) was compared among the groups using Fisher's exact test. Mean MCH score was significantly higher in the PAE group (37.6±12.9) compared to no-PAE (26.1±8.5; p=0.006) (medians: 34.5 vs. 25; IQR: 28-46.5 vs. 20-31). While all subjects in the no-PAE group scored within the normal range, 25% of PAE subjects scored in the abnormal range with significant parental concern for mealtime behaviors, gagging/vomiting responses to food, and growth. Findings suggest that feeding problems should be evaluated in young children with PAE, and may be identified as young as 20 months of age; this may present a previously unrecognized opportunity for early intervention.

FAMILY HISTORY OF NEUROLOGIC AND PSYCHIATRIC DISORDERS AND RISK OF AUTISM Sherlly Xie, Christina Dalman, Linnea Widman, Dheeraj Rai, Renee Gardner, Cecilia Magnusson, Håkan Karlsson, Craig Newschaffer, Brian Lee (Drexel University School of Public Health)

Background: Autism spectrum disorders (ASD) is a complex neurodevelopmental disorder that often coincide with familial aggregation of major psychiatric, neurodevelopmental and neurologic disorders. How these disorders on a family tree predicts risk of ASD remains unresolved for extended pedigrees. In this study, we examined family history of these disorders and risk of ASD with and without intellectual disability (ID) in first- to fourth-degree relatives. Methods: We used population register data from Sweden on pedigrees of 567,436 index persons born 1984-2009 in Stockholm County, Sweden (N ASD = 10,920) and logistic regression to quantify risk of ASD with and without ID in IPs with relatives affected by specific disorders. Results: We observed notable dose-response relationships by kinship between familial risk of ASD and neurodevelopmental disorders including ADHD and ID, and with psychiatric disorders including schizophrenia, depression, bipolar, and anxiety disorders. Family history of some neurologic disorders such as cerebral palsy and epilepsy were also linked to increased risk of ASD in index persons. ASD without ID was more highly associated with more disorders compared to ASD with ID. ASD with ID was linked to more neurologic disorders than ASD without ID. The high recurrence rate of ASD with and without ID makes each its own best indicator for familial risk; history of other disorders including ADHD, ID, personality disorder, OCD, schizophrenia, drug misuse and bipolar disorder in first- and second-degree relatives may also be useful in detecting higher familial load of ASD risk. Conclusions: ASD is an etiologically heterogeneous disorder with sizable familial risk that varies by intellectual ability. Mechanisms underlying this risk may be more complex and extensive than previously thought. Future etiologic searches on the heritable component of ASD risk may be benefitted by including extended family members.

MATERNAL THYROID HORMONE LEVELS IN MID GESTATION AND IQ SCORES IN PRESCHOOL-AGED CHILDREN: EFFECT MEASURE MODIFICATION BY CHILD SEX Samantha Drover, (UNC at Chapel Hill)

Maternal thyroid hormones are required for healthy fetal neurodevelopment. Clinical maternal thyroid disorders have been associated with intellectual deficits in children. However, it is unclear whether subclinical maternal thyroid hormone variation is associated with offspring IQ. In addition, some have suggested that child sex may influence mechanisms linking maternal thyroid hormones to offspring neurodevelopment, yet few studies have examined this. We investigated these questions using data from the Norwegian Mother and Child Birth Cohort (MoBa), a longitudinal population-based prospective birth cohort. Multiple maternal thyroid hormones were measured from plasma samples collected at approximately 17 weeks' gestation. Clinical psychologists assessed children's overall, verbal, and nonverbal IQ when children were approximately 3.5 years using subtests from the Stanford Binet Intelligence Scale (N = 342). We found minimal evidence for an association between multiple maternal thyroid hormone levels and offspring IQ, controlling for maternal age, parity, and smoking during pregnancy. However, there was some evidence of effect measure modification by child sex, such that higher maternal thyroid stimulating hormone (TSH) levels were associated with lower overall IQ among girls (βgirls = -0.77), but higher IQ among boys (βboys = 0.91 p interaction= 0.14). Higher thyroxine levels were associated with higher verbal IQ among girls (βgirls = 0.07), but lower verbal IQ among boys (βboys = -0.11, p interaction = 0.17). These preliminary results suggest that the influence of maternal thyroid hormones on fetal brain development may be differential by child sex. This is the first study to investigate effect measure modification of the association between maternal thyroid hormones and offspring IQ, which is an important step for characterizing the relationship between maternal thyroid function and fetal neurodevelopment.

PB011 S/T

MATERNAL TRICLOSAN AND TRICLOCARBAN EXPOSURE DURING PREGNANCY AND AUTISTIC TRAITS AT 36 MONTHS. Bo Park, (Johns Hopkins University School of Public Health)

Bo Park, Lisa Croen, M. Danielle Fallin, Irva Hertz-Picciotto, and Craig Newschaffer Intro: The male predominance of ASD is a well-recognized but poorly-understood phenomenon. Male sex hormones, such as testosterone, produced during pregnancy and in early childhood, act on the brain to produce permanent gender differences in structure and function, such as play behavior and have been suggested to contribute to the ASD related phenotype. Although there are few known environmental androgen agonists, triclosan (TCS) and triclocarban (TCC), phenols used as broad-spectrum antimicrobial agents in personal care products, have shown some androgen agonist properties in animal studies. Here we investigate the association between prenatal exposure to these chemicals and ASD-related phenotype in an ASD enriched risk pregnancy cohort Methods: Subjects were from the Early Autism Risk Longitudinal Investigation (EARLI) where mothers of an older child with an ASD diagnosis began follow-up during a subsequent pregnancy. EARLI families were recruited at four sites (Drexel PA; Johns Hopkins MD; UC Davis CA; and Northern CA Kaiser Permanente). Maternal prenatal urine samples were collected twice during pregnancy and phenols were measured via high-performance liquid chromatography–isotope dilution–tandem mass spectrometry. The average TCS level from both collections was used in all analyses and, because TCC is commonly not detectable with available technology, we dichotomized to those with and without detectable levels (73% <LOD). Total Social Responsiveness Scale (SRS) raw scores at 36 months captured ASD-related phenotype (higher scores indicating more impairment). 155 subjects with 36month SRS and urinary TCS/TCC measures were included in analysis. Linear regression models estimated associations between TCS and TCC exposure during pregnancy and SRS at 36 months. SRS, TCS, and creatinine values were log transformed in all analyses and all analyses adjusted for urinary creatinine level. Multivariable models also adjusted for maternal infection during pregnancy, sex, study site, maternal pre-pregnancy BMI, maternal education and maternal age. 36 month ASD diagnosis was a secondary outcome with 32 ASD cases, 74 non typical development and 65 typical development. Results: Creatinine-adjusted TCS level was negatively associated with a SRS score at 36 months (P=0.05); however, after adjustment covariates the

magnitude of the association was reduced and the effect was no longer statistically significant (p=0.33). Similarly, in unadjusted analyses, a detectable TCC level was also associated with a statistically significant decrease in total SRS raw score (p=0.02) but after adjustment this association was attenuated and did not retain statistical significance (p=0.14). Neither TCS or TCC was significantly associated with ASD diagnosis in the subsample. Conclusion: Prenatal exposure to antimicrobials (TCS and TCC) did not appear to increase ASD-related phenotype at 36months in this ASD-enriched risk cohort.

CURRENT CONTRACEPTIVE METHOD USE BY EXPECTED TIMING OF FUTURE BIRTHS AMONG WOMEN IN THE U.S., 2013-2015 Brittni Frederiksen, (Office of Population Affairs)

Background: Patterns in the use of current contraceptive methods by expected timing of future births, a key component of reproductive life planning, have not previously been examined in the U.S. Methods: Using data from 2013-2015 National Survey of Family Growth, we examined current use of the following method categories for U.S. women aged 15-44 who had ever had sex with a male, were not pregnant, not currently seeking pregnancy, and were not infecund (n=4,205): most or moderately effective methods (sterilization, contraceptive implants, intrauterine devices or systems [IUD/IUS], injectables, oral pills, patch, ring, or diaphragm), and long-acting reversible contraceptives (LARCs; contraceptive implants, IUD/IUS). Differences by expected timing of future births were assessed using predicted margins from logistic regression models, adjusted for age, marital status, and race/ethnicity. Results: Women expecting their next birth in 2-5 years, 5+ years, or never were more likely to use a most or moderately effective method vs. less effective methods compared with women expecting their next birth within 2 years (respectively, 48%, 57%, 68% vs. 36%, adjusted prevalence risk ratio [aPRR]=1.43, 95% CI: 1.14, 1.78; aPRR=1.79, 95% CI: 1.41, 2.27; aPRR=1.90, 95% CI: 1.55, 2.34). Women expecting their next birth in 2-5 years, 5+ years, or never were also more likely to use a LARC vs. non-LARC method compared with women expecting their next birth within 2 years (respectively, 12%, 12%, 12% vs. 9%, aPRR=1.51, 95% CI: 0.93, 2.45; aPRR=1.71, 95% CI: 1.06, 2.74; aPRR=1.40, 95% CI: 0.93, 2.09), although only the 5+ year comparison was statistically significant. Conclusion: Women who expect their first or next child to be born within the next 2 years are less likely to use most or moderately effective contraceptive methods. Discussing a woman's future pregnancy intentions during contraceptive counseling may be helpful in facilitating clients' contraceptive method selection.

DIFFERENCES IN PLASMA CONCENTRATIONS OF ENDOCRINE DISRUPTING CHEMICALS BY PREGNANCY TRYING INTENTIONS Melissa Smarr, (Emory University Rollins School of Public Health)

Pregnancy planning status and exposure to endocrine disrupting chemicals (EDCs) are independently associated with reproductive outcomes, but with little understanding of their relatedness for understanding whether women with planned pregnancies are more/less exposed than women with unplanned pregnancies. We compared first trimester plasma concentrations of 44 polychlorinated biphenyls (PCBs), 11 organochlorine pesticides (OCPs) and poly-and-perfluorinated alkyl substances (PFASs), 9 polybrominated diphenyl ethers (PBDE) congeners and 1 polybrominated biphenyl (PBB 153), among 2,282 racially/ethnically diverse pregnant women. Women reporting that they wanted to have a baby, were not using contraceptives and were trying at the time they became pregnant were considered planners; all others were considered non-planners. Plasma EDC concentrations were quantified using high-resolution gas chromatography/high resolution mass spectrometry and liquid chromatography/tandem mass spectrometry. Comparisons of women and their median (Md) and interquartile ranges (IQR) of lipid-adjusted EDC concentrations (ng/g, except PFASs, (ng/mL) by planning status were performed using ANOVA, Chi-Square and Wilcoxon-Mann-Whitney significance tests, respectively (two-sided p<0.05). Planners (n=1,228, 54%) were slightly older, leaner, predominantly Non-Hispanic White, and college educated women relative to non-planners. EDC specific patterns were observed by planning status (p<.0001): total PBDE plasma concentrations [Md ng/g (IQR)] were lower in planners 17.4; (7.68,36.3) than non-planners 23.5; (10.7,49.6), but the reverse was seen for total OCPs (4.77; 2.56,8.11) and 4.32; 2.43,7.49), respectively) and PCBs (31.6; 16.1,55.8) and 22.2; 9.98,43.2), respectively), and most PFASs. These findings were robust to women's self-identified race/ethnicity. If corroborated, these early findings support differing chemical class exposure profiles by pregnancy planning status with relevancy for weighing evidence.

RACIAL AND ETHNIC DIFFERENCES IN CUMULATIVE PREGNANCY RATES AND TIME-TO-PREGNANCY IN THE NICHD FETAL GROWTH STUDIES Melissa Smarr, (Emory University Rollins School of Public Health)

National Survey of Family Growth data have previously established higher infertility rates among Non-Hispanic black women compared with Non-Hispanic white and Hispanic women. Still, data are lacking regarding potential differences in time-to-pregnancy (TTP) distributions across race/ethnicity. We examined self-reported trying time among 1,217 racially/ethnically diverse pregnant women. Upon first trimester enrollment, women were queried regarding pregnancy intentions and trying time for the current pregnancy. Distributions of TTP and cumulative pregnancy were all estimated conditional on not being pregnant in the previous month. Comparisons of women by TTP were performed using ANOVA or Chi-Square tests for continuous or categorical variables, respectively. Cumulative pregnancy rates (%) for white, black, Hispanic and Asian women, respectively, differed at months 3: [69, 68, 66 and 73]; 6: [88, 83, 82 and 88]; and 12: [96, 97, 95 and 98], with Hispanic women consistently having lower rates. Conversely, the prevalence of women with self-reported TTP ≥12 months, was higher among black women (12.6%) compared with white (5.3%), Hispanic (11.4) and Asian women (7.0%). These findings were confirmed by examining conditional TTP distributions within each race/ethnicity; a 12 month TTP was highest among black women (77%) compared with white (33%), Hispanic (56%) and Asian (70%) women. Furthermore, differences were observed in factors associated with a longer trying time by race/ethnicity. A longer TTP was associated with higher maternal age among white (p=0.02) and Asian women (p=0.01); pre-gravid body mass index (BMI) < 25 among black women (p=0.02); having a college education among Hispanic women (p=0.01); and having private or managed care insurance among white women (p=0.02). Overall, race/ethnicity differences in TTP and cumulative pregnancy distributions need further exploration to identify factors (environmental, lifestyle) susceptible to public health intervention.

PRECONCEPTION PERCEIVED STRESS ALTERS REPRODUCTIVE HORMONES AND LEADS TO LONGER TIME TO PREGNANCY Karen Schliep, Sunni Mumford, Bob Silver, Brian Wilcox, Rose Radin, Neil Perkins, Noya Galai, Jihye Park, Keewan Kim, Lindsey Sjaarda, Torie Plowden, Enrique Schisterman (University of Utah Health)

Background: Women who experience pregnancy loss are especially prone to high stress, though the effects of stress on reproductive outcomes in this vulnerable population are unknown. Our objective was to assess relationships between perceived stress and hormones, anovulation, and time to pregnancy among women with prior loss. Methods: 1,214 women with 1-2 prior losses were followed for up to 6 cycles while attempting pregnancy and completed end-of-cycle stress assessments. For the first 2 cycles, women also collected daily urine and completed daily perceived stress assessments. We assessed anovulation via an algorithm based on human chorionic gonadotropin (hCG), pregnanediol-3-glucuronide (PdG), luteinizing hormone (LH), and fertility monitor readings. Pregnancy was determined via hCG. Adjusted weighted linear mixed models estimated the effect of prospective phase-varying (menses, follicular, peri-ovulatory, and luteal) perceived stress quartiles on estrone-1-glucuronide (E1G), PdG, follicle stimulating hormone, and LH concentrations. Marginal structural models were used to appropriately account for time-varying confounding by hormones and lifestyle factors affected by prior stress levels. Poisson and Cox regression estimated the effect of cycle-varying stress quartiles on anovulation and fecundability. Models were adjusted for age, race, BMI, parity, and time-varying caffeine, alcohol, smoking, intercourse frequency, and pelvic pain/cramping. Results: Women in the highest versus lowest stress quartile had lower E1G and PdG concentrations over the menstrual cycle, a marginally increased risk of anovulation (aRR=1.28, 95% CI: 1.00, 1.63), and a longer time to pregnancy (aFOR=0.65, 95% CI 0.46, 0.92). Conclusion: Preconception perceived stress appears to adversely affect sex steroid synthesis and time to pregnancy. Mechanisms likely include the effects of stress on ovulatory function; but additional mechanisms, potentially during implantation, may also exist.

AVAILABILITY OF SERVICES RELATED TO ACHIEVING PREGNANCY IN U.S. PUBLICLY FUNDED FAMILY PLANNING CLINICS Ana Carolina Loyola Briceno, (Office of Population Affairs)

Background: National recommendations state that quality family planning services should include: helping clients who want to become pregnant, providing basic infertility services (BIS), and providing preconception health services to improve health outcomes for women and men. We studied the distribution of services related to achieving pregnancy offered at publicly funded family planning clinics in the United States. Methods: A nationally representative sample of publicly funded clinics were surveyed from 2013-2014 (N=1615). Clinic administrators were asked about services offered at their clinic. Services related to achieving pregnancy included: BIS, reproductive life assessment, preconception health services (body mass index [BMI], sexually transmitted infection [STI] and cervical cancer screening), natural family planning (NFP), prenatal care, and infertility treatment. The percentage of clinics offering these services was estimated by Title X funding status; unadjusted prevalence ratios (PR) and p-values were calculated, accounting for survey design. Results: Title X clinics were more likely to offer the following services compared to non-Title X clinics: reproductive life assessment (76% vs. 35%), BMI screening for women (85% vs. 79%), STI and cervical cancer screenings (PR ranged from 1.23 to 1.58), and NFP (83% vs. 74%). Title X clinics were less likely to offer prenatal care (37% vs. 66%) and infertility treatment (11% vs. 22%), and were just as likely as non-Title X clinics to offer BIS (for men and women, separately), and BMI screening for men. Conclusion: The availability of services related to achieving pregnancy at publicly funded family planning clinics differs by Title X funding status, perhaps due to differences in populations served and services traditionally sought. Offering these services at all publicly funded family planning clinics can help people achieve their desired number and spacing of children, and lead to improved health outcomes.

SELF-REPORTED INFERTILITY AND METABOLIC AND CARDIOVASCULAR DYSFUNCTIONS AMONG US WOMEN Jessica Gleason, Edmond Shenassa, Marie Thoma (University of Maryland)

Infertility is increasingly a public health issue, with emerging links to health conditions including cancer, diabetes, and cardiovascular disease. Existing literature on infertility mainly focuses on known causes, such as polycystic ovarian syndrome and endometriosis, which likely excludes a substantial number of women, for whom there is no known cause or formal diagnosis. In this study we examine the association between self-reported infertility (i.e., ever experiencing inability to conceive after 12 months of trying to become pregnant) and metabolic syndrome and cardiovascular events among US women, aged 20-59 (National Health and Nutrition Examination Survey 2013-2014). After controlling for both demographic and lifestyle factors in logistic regression, compared to women who have never experienced infertility, women who reported ever infertility were 1.52 times (99% CI 1.52, 1.52) more likely to report symptoms of metabolic syndrome and 1.69 times (99% CI 1.68, 1.70) more likely to have ever had a cardiovascular event, defined as congestive heart failure, coronary heart disease, heart attack, or stroke. Furthermore, women with self-reported infertility were 50% more likely to report a cardiovascular event after controlling for metabolic syndrome (OR=1.50; 99% CI 1.49, 1.50). Our results indicate that the experience of infertility at any point in a woman's reproductive window is associated with subclinical as well as clinical cardiovascular dysfunction in the general population. While we are unable to explore the biologic mechanisms underlying these associations, the fact that the associations remain strong and significant after controlling for a variety of factors may suggest the existence of common biologic pathways between infertility, metabolic syndrome, and cardiovascular events.

FAT-SOLUBLE MICRONUTRIENTS AND ANOVULATION AMONG WOMEN ATTEMPTING PREGNANCY Keewan Kim, Enrique Schisterman, Robert Silver, Lindsey Sjaarda, Neil Perkins, Lindsay Levine, Sunni Mumford (NICHD)

Background: Antioxidant micronutrients may improve fecundability. However, it is unclear whether the impact is on ovulation or implantation. Thus, we investigated associations between micronutrients and anovulation among women attempting pregnancy. Methods: This was a prospective cohort study of 1,228 women attempting pregnancy, aged 18-40 years, with 1-2 previous pregnancy losses, enrolled in the EAGeR trial. Women were followed for 6 menstrual cycles and through pregnancy if they conceived. Anovulation was defined by fertility monitors (lack of a peak reading or luteinizing hormone concentrations <2.5 times the average of the previous 5 days), and augmented for the first 2 cycles with urinary luteal progesterone metabolite measurements (<5 μg/mL). We measured serum concentrations (μg/dL) of zeaxanthin, cryptoxanthin, lycopene, α-carotene,β-carotene, α-tocopherol, and γ-tocopherol from 1,207 women at baseline. We used weighted log-binomial regression with robust error variance to estimate relative risks (RR) and 95% confidence intervals (CI). Models were adjusted for age, BMI, race, smoking, physical activity, education, income, vitamin supplement use, treatment group, total cholesterol, and other micronutrients. Results: Concentrations of micronutrients were lower in women who had at least 1 anovulatory cycle (n=332) compared to none (n=849) during 6 cycles of study follow-up, except tocopherols. After adjustment for potential confounding factors, micronutrients were not associated with anovulation (β-carotene RR 0.98, 95% CI 0.88, 1.08; γ-tocopherol RR 1.02, 95% CI 0.99, 1.04, per unit increase in micronutrients). Conclusions: Serum micronutrient concentrations were not associated with risk of anovulation among women attempting pregnancy. These data suggest that the potential role of micronutrients on fecundability does not likely work through ovulatory function but through other mechanisms.

LIVE BIRTHS RATE FOLLOWING DOUBLE VERSUS SINGLE INTRAUTERINE INSEMINATIONS; RESULTS OF A POPULATION BASED COHORT Tamar Wainstock, Maya Tabachnik, Ruslan Sergienko, Tuvya Baevsky, Israel Yoles (Ben Gurion University of the Negev)

Objective: Intrauterine insemination (IUI), a simple procedure to treat moderate subfertility, is usually performed 24-36 hours post ovulation triggering. This procedure is often repeated in consecutive days (double insemination) aiming to improve pregnancy rates. This study compared incidence of live births following single versus (vs.) double IUI in a large population-based dataset. Materials and methods: This is a retrospective study, which included all women undergoing either single or double IUI between the years 1997-2017 in the Clalit Health Services (Central district), the largest Health Maintenance Organization in Israel. Treatment outcomes, Body mass index (BMI) and demographic characteristics were compared between the two study groups. Propensity scoring analysis was performed to address the possible association between background characteristics and the treatment group. Multivariable Generalized Estimation Equation (GEE) binary logistic models were performed to study the association between the treatment and live birth incidence, while adjusting for confounding variables and maternal recurrent treatment cycles. Results: A total of 20,103 IUI cycles were performed during the study period, 8,347 (41.5%) were single and the remaining were double (11756, 58.5%). Live birth rates were 11.6% and 11.3%, in the single vs. the double IUIs (odds ratio (OR)=0.97; 95%CI 0.87-1.06). In the GEE model, there was an association between double vs. single treatments and odds of live birth (adjusted OR=1.17; 95%CI 1.05-1.30), while adjusting for maternal age and BMI and the propensity score. Among women with BMI ≥30, the differences between the single and double treatments were more subtle (adjusted OR=1.45; 95%CI 1.15-1.83). Conclusion: In this large population based cohort, double vs. single IUI procedure was associated with an increased live birth rates, and should be considered as the first line of treatment for moderate subfertility, especially in women with BMI≥30.

PHYTOESTROGEN INTAKE AND FECUNDABILITY IN A NORTH AMERICAN COHORT OF PREGNANCY PLANNERS
Amelia Wesselink, (Boston University School of Public Health)

Phytoestrogens are plant-derived compounds that have estrogenic and antiestrogenic effects, which may influence hormonal activity and reproduction. We examined the association between intake of isoflavones, a class of phytoestrogens found in soy products, with fecundability in a web-based preconception cohort of female pregnancy planners from the U.S. and Canada. Eligible women were age 21-45 years, in a stable relationship with a male partner, and attempting to conceive spontaneously. Participants completed a baseline questionnaire on demographic, behavioral, and reproductive factors, and a food frequency questionnaire, which we used to estimate intake of five isoflavones. We measured fecundability using data from bi-monthly follow-up questionnaires that ascertained pregnancy status. Women were followed until pregnancy, initiation of fertility treatment, loss to follow-up, or completion of 12 menstrual cycles, whichever came first. We restricted our analysis to 2,969 females who had been attempting to conceive for ≤6 menstrual cycles at study entry. We used proportional probabilities regression models to estimate fecundability ratios (FR) and 95% confidence intervals (CI). The mean energy-adjusted intake of isoflavones was 1.83 mg/day (range=0.08-52.97). Isoflavone intake was not substantially associated with fecundability: FRs for 0.75-0.99, 1-1.99, 2-4.99, and ≥5 compared with <0.75 mg/day were 1.13 (95% CI: 0.99-1.29), 1.05 (95% CI: 0.94-1.18), 1.02 (95% CI: 0.88-1.17), and 1.10 (95% CI: 0.91-1.34), respectively. FRs were slightly greater among women with body mass index <25 kg/m2 (FR for ≥5 vs. <0.75 mg/day=1.18, 95% CI: 0.92-1.51) and women aged ≥30 years (FR for ≥5 vs. <0.75 mg/day=1.21, 95% CI: 0.94-1.57). No substantial associations were observed between each individual isoflavone and fecundability. Our results indicate little association between isoflavone intake and fecundability.

GLUCOSE, INSULIN AND TIME TO PREGNANCY (TTP)
Tiffany Holland, Matthew Connell, Stefanie Hinkle, Keewan Kim, Sunni Mumford, Rose Radin, Lindsey Sjaarda, Mark White, Brian Wilcox, Enrique Schisterman (NICHD/NIH)

Introduction: Impaired glucose metabolism has been associated with a longer time to pregnancy (TTP) in women with polycystic ovarian syndrome, diabetes, and metabolic syndrome, yet its association with fertility in healthy women is less clear. Thus, we examined the associations of fasting glucose and insulin with anovulation and TTP in healthy, fertile women with no metabolic impairment. Methods: Of the 1,228 women enrolled in from the Effects of Aspirin in Gestation in Reproduction (EAGeR) study, we restricted our analysis to 173 who were fasting at the time of blood draw at their baseline visit. Women were followed for up to 6 menstrual cycles. Anovulation was assessed using fertility monitors, luteinizing hormone concentrations, and urinary luteal phase pregnanediol glucuronide levels. Levels of glucose, insulin, glucose-to-insulin ratio, and homeostasis model assessment of insulin resistance (HOMA-IR) were divided into tertiles. Discrete Cox proportional hazards models were used for TTP and generalized linear mixed models were used for anovulation with models weighted for the number of contributed cycles. Models were adjusted for age, body mass index, high sensitive C-reactive protein, high density lipoprotein and low density lipoprotein. Results: We found an association between anovulation and insulin (relative risk [RR] 1.91, 95% confidence interval [CI] 1.01, 3.60) and glucose-to-insulin ratio (RR 0.51, 95% CI 0.28, 0.96), comparing the highest tertile to the lowest tertile. However, these associations were attenuated when adjusted for confounders (insulin RR 0.97, 95% CI 0.41, 2.30; glucose-to-insulin ratio RR 0.87, 95% CI 0.40, 1.91). No associations were observed for TTP. Conclusion: Though our data indicate a potential, weak association between insulin and anovulation, insulin does not seem to affect fecundability in healthy women with normal metabolism. These findings warrant future study in a larger sample of healthy women.

PB022 S/T

THE ASSOCIATION BETWEEN MENSTRUAL CYCLE CHARACTERISTICS AND FERRIMAN-GALLWEY SCORE
Hannah Mathew, Sydney Willis, Elizabeth Hatch, Lauren Wise, Shurthi Mahalingaiah (Boston Medical Center)

Menstrual irregularity and hirsutism represent potential signs of androgen excess. These symptoms are seen in women with polycystic ovary syndrome, who are at increased risk of infertility. We evaluated the association between menstrual characteristics—including cycle regularity, cycle length, bleed length, and heaviness of flow—and hirsutism, as measured by the modified Ferriman-Gallwey (mFG) score in Pregnancy Online Study (PRESTO), a North American web-based preconception cohort. Women were excluded if they reported hormone-obscured menstrual patterns. Eligible women (n=2,171) were aged 21-45 years, in a stable relationship with a male partner, and had ≤12 months of pregnancy attempt time at enrollment. At baseline, women self-reported demographic, lifestyle, medical, and reproductive data, including typical menstrual cycle patterns in the last two years. Using the mFG, women reported body hair quantity in 9 different locations, from which a summary mFG score was calculated. A generalized linear model estimated prevalence ratios (PR) and 95% confidence intervals (CI) for having a high baseline mFG score (≥8 compared with 35 days vs. <28 days, respectively; 1.26 (CI: 0.76-2.10), 1.40 (CI: 0.84-2.33), and 1.85 (CI: 1.08-3.17) for bleed length of 3-4 days, 5-6 days, or ≥7 days vs. <3 days, respectively; and 0.95 (CI: 0.75-1.21), 1.23 (CI: 1.03-1.48), and 1.39 (CI: 1.04-1.85) for light, moderately heavy, or heavy menstrual bleed vs. moderate menstrual bleed, respectively. Potential limitations include a cross sectional design and measurement error in self-reported mFG scale. In this cohort study, we observed an association between menstrual cycle characteristics—including cycle regularity, cycle length, and bleed length and heaviness of flow—and mFG scores indicative of clinical hirsutism.

PB023

PRETERM BIRTH AND SELECTION IN UTERO AMONG MALES FOLLOWING THE NOVEMBER 2015 PARIS ATTACKS Tim Bruckner, Elodie Lebreton, Natalie Perrone, Beatrice Blondel (UC Irvine)

On November 13, 2015, coordinated terrorist attacks swept through Paris. This large stressor, like the 9/11 terrorist attacks in the US, may have perturbed the health of pregnant women. We test the hypothesis that these unexpected attacks preceded an increase in the risk of preterm parturition among live born males as well as excess male loss in utero. We focused on males given previous findings of elevated male frailty following population stressors. We applied interrupted time-series (ARIMA) methods to 70 monthly birth cohorts in the Paris region (n=1,049,057). Strengths of the dataset include gestational age estimates on 99.6% of live births in Paris. The population-based nature of the register also permits external validity of results to the Parisian region. We inspected a concurrent response as well as lags of up to four months (i.e., Nov 2015, Dec 2015, Jan 2016, Feb 2016, Mar 2016) to ensure capturing any delayed associations. We find an elevated incidence of preterm birth among males in November 2015 and January 2016 (coefficient for Nov 2015 = .006, 95% confidence interval [CI]: .0002, .012; coef. for January 2016 = .010, 95% CI: .004, .016), which equates to an 11% increase above expected levels in the count of preterm births. Females, by contrast, show no change in preterm. In addition, the sex ratio fell below expected values in December 2015, January 2016 and February 2016 (coefficient for Dec 2015 = -.032, 95% CI: -.063, -.0001; coef. for Jan 2016 = -.034, 95% CI: -.064, -.003; coef. for Feb 2016 = -.032, 95% CI: -.063, -.002). Results remain robust to alternative specifications and control for outliers. Falsification tests using female births further support perinatal responses only among males, which rules out the threat that time-varying confounders shared across both sexes drive our findings. We infer support for the hypothesis that, among males, the November 2015 Paris attacks accelerated parturition and increased the risk of fetal loss.

PHYSICAL EXERTION IMMEDIATELY PRIOR TO PLACENTAL ABRUPTION: A CASE-CROSSOVER STUDY Harpreet Chahal, Bizu Gelaye, Elizabeth Mostofsky, Sixto Sanchez, Murray Mittleman, Malcolm Maclure, Percy Pacora, Jose Torres, Roberto Romero, Cande Ananth, Michelle Williams (Harvard T.H. Chan School Of Public Health; University of Toronto)

While there is consistent evidence that episodes of physical exertion are associated with an immediately higher risk of acute ischemic vascular events, the risk of placental abruption immediately following episodes of physical exertion has not been studied. In a multicenter case-crossover study, we interviewed 663 women with placental abruption at 6 Peruvian hospitals between January 2013 and August 2015. We asked women about physical exertion in the hour before symptom onset and compared this to their frequency of physical exertion over the prior week. Compared to times with light or no exertion, the risk of placental abruption was 7.8 (95% confidence interval (CI): 5.5, 11.0) times greater in the hour following moderate or heavy physical exertion. The instantaneous incidence rate ratio (RR) of placental abruption within an hour of moderate or heavy physical exertion was lower for women who habitually engaged in moderate or heavy physical activity more than 3 times per week in the year before pregnancy (RR=3.0, 95% CI: 1.6, 5.9) compared to more sedentary women (RR=17.3, 95% CI: 11.3, 26.7; P-homogeneity < 0.001) and the RR was higher among women with preeclampsia/eclampsia (RR=13.6, 95% CI: 7.0, 26.2) than among women without (RR=6.7, 95% CI: 4.4, 10.0; P-homogeneity=0.07).

PB025

25-HYDROXYVITAMIN D (25OHD) AND FIRST TRIMESTER CROWN-RUMP LENGTH (CRL) IN A PROSPECTIVE COHORT STUDY Anne Marie Jukic, Allen Wilcox, Patrick Bradshaw, Robert McConnaughey, Donna Baird, Clarice Weinberg, Anne Steiner (Yale School of Public Health)

Lower vitamin D levels have been associated with reduced birth weight, but it is not known how early in pregnancy vitamin D might affect fetal growth. We used data from a prospective time to pregnancy study, Time to Conceive, to examine the association between 25OHD and crown-rump length (CRL) at 7-9 weeks gestation. Participants enrolled early in their pregnancy attempt and CRL was measured with vaginal ultrasound. 25OHD was measured in baseline blood spots and early pregnancy serum using liquid chromatography-tandem mass-spectrometry. Ovulation was identified with ovulation predictor kits, cervical mucus monitoring or basal body temperature. Gestational age was based on ovulation. To account for missing data on gestational age (due to missing ovulation days), we modeled the joint distribution of CRL and gestational age in a Fully Bayesian framework, with a log-normal model for CRL, and a Weibull model for gestational age (conditional on covariates). Baseline 25OHD was measured in 294 pregnancies and early pregnancy 25OHD was measured in 142 pregnancies. The two measures were highly correlated (r=0.8) with moderate agreement (weighted kappa=0.6 (0.5, 0.7)). Baseline continuous 25OHD was not associated with CRL, for a 10 ng/ml increase the estimated percent change in CRL was 1% (95% Credible interval (Crl): -6, 4%). However, pregnancies with a 25OHD of 40ng/ml, percent change (Crl): -9% (-26, 4%)). Early pregnancy continuous 25OHD was not associated with CRL, for a 10ng/ml increase the estimated percent change was 3% (Crl: -10, 19%). However, compared with a 25OHD of at least 30ng/ml, an early pregnancy 25OHD of <20ng/ml was associated with a 5% (CrI:-7, 35%) shorter CRL. Neither baseline nor early pregnancy 25OHD were strongly associated with first trimester CRL. Low baseline 25OHD (<30ng/ml) and low early pregnancy 25OHD (<20ng/ml) were associated with small decrements in first-trimester CRL.

PB026 S/T

PRENATAL MATERNAL ANTIBIOTIC USE AND CORD BLOOD DNA METHYLATION AT BIRTH Golareh Agha, Andres Cardenas, Sheryl Rifas-Shiman, Heather Burris, Augusto Litonjua, Dawn DeMeo, Marie-France Hivert, Emily Oken, Andrea Baccarelli (Columbia University Mailman School of Public Health)

Antibiotic use during pregnancy or early infant life has been associated with subsequent growth and adiposity. The mechanisms by which antibiotic use during pregnancy may exert long-term effects are not known. Epigenetic mechanisms, which orchestrate fetal growth and development, can be affected by maternal exposures during pregnancy, and there is evidence that antibiotics affect short-chain fatty acids that are involved in epigenetic control of specific gene expression. We investigated the association of any antibiotic use during pregnancy with cord blood DNA methylation among 478 mother-child pairs from the Project Viva pre-birth cohort. We obtained antibiotic prescriptions from electronic medical records, and at birth measured cord blood DNA methylation at 394,460 Cytosine-phosphate-Guanine (CpG) sites using the Infinium HumanMethylation450K array. We excluded participants with gestational age <34 weeks, and adjusted models for maternal race/ethnicity, age, smoking, mode of delivery, pre-pregnancy BMI, education, parity, as well as child sex and estimated cord blood cell type proportions. Among the 478 mothers, 29% were non-white, 66% college graduates, 11% smoked during pregnancy, and mean (SD) age was 32.1 (5.4) years. When comparing those with any prenatal antibiotic use (n=127) vs. no use (n=351), genome-wide regional analyses using the bumphunter method identified a region of six CpGs (family-wide error rate p-value=0.023) with lower DNA methylation (ranging from 4.5% to 6.7%). These six CpGs, located in chromosome 1, map to the PM20D1 gene, which encodes a secreted enzyme with potential roles in adiposity and weight-loss. In CpG-by-CpG analyses, we did not identify any individual site reaching our multiple testing-adjusted statistical significance level. We identified a differentially methylated region in cord blood that was associated with antibiotic use during pregnancy, suggesting that antibiotics may exert an effect on epigenetic regulation in early life.

S/T=Student/Trainee

PHYSICAL EXERTION IMMEDIATELY PRIOR TO EARLY PRETERM DELIVERY: A CASE-CROSSOVER STUDY Harpreet Chahal, Bizu Gelaye, Elizabeth Mostofsky, Sixto Sanchez, Juan Mere, Francisco Mercado, Percy Pacora, Michelle Williams (Harvard T.H. Chan School of Public Health; University of Toronto)

Background: Investigation of the effects of physical exertion on preterm deliveries has yielded mixed results; observational studies on occupational exertion have more consistently documented increased risks, while studies of leisure time activities generally document reduced risks of preterm delivery. The aim of the present study was to explore the association between episodes of physical exertion and the transient risk of early preterm delivery. Methods: We conducted a case-crossover study of 722 women interviewed during hospital stay for early preterm delivery, defined as delivery before 34 weeks gestational age. Interviews took place between March 2013 and December 2015 in seven Peruvian hospitals. Eligible participants were identified by reviewing admissions logbooks for the emergency room, labor and delivery, and surgery. Results: The relative risk (RR) of early preterm delivery was 5.8-fold higher (95% confidence interval [CI]: $3.2 - 7.9$) in the hour following moderate or heavy physical exertion (exertion causing deep breathing or panting, overheating, and sweating respectively) compared to periods of lower exertion or rest, and returned to baseline in the hours thereafter. Women who reported engaging in moderate or heavy physical exertion more than 3 times per week in the year before pregnancy experienced a 4.1-fold increased risk (95% CI: 2.8, 6.0) with each bout of moderate or heavy physical exertion, as compared with a 15.3-fold risk (95% CI: 9.1, 25.8) among more sedentary women (P-homogeneity < 0.01). Moderate or heavy physical exertion was more strongly associated with delivery preceded by premature rupture of membranes (RR=8.4, 95% CI: $5.6 - 12.6$) as compared with spontaneous early preterm delivery (RR=3.5, 95% CI: $2.1 - 5.9$, P-homogeneity < 0.01). Conclusions: Within 1 hour of episodes of moderate or heavy physical exertion, there is an increased risk of early preterm delivery, particularly among women with sedentary behavior.

POOR BIRTH OUTCOMES AMONG ABORIGINAL WESTERN AUSTRALIANS AND SMOKING, ALCOHOL, AND SUBSTANCE MISUSE Alison Gibberd, Judy Simpson, Jocelyn Jones, Robyn Williams, Fiona Stanley, Sandra Eades (The University of Sydney)

The average birthweight of Aboriginal infants in Western Australia (WA) is 200g less than non-Aboriginal infants and they are 2-3 times more likely to be preterm, stillborn, or die neonatally. They are also more likely to be exposed in utero to maternal smoking, alcohol misuse, drug misuse, and assault against their mother, due to factors such as intergenerational trauma and poverty. Given the high prevalence of these risks, we aimed to estimate the proportion of small for gestational age (SGA) births, preterm births, and perinatal deaths of Western Australian Aboriginal infants that were attributable to these risk factors from 1998-2010. We used linked birth, hospital, mental health, and death records of all Aboriginal singletons and their parents. Using logistic regression with a generalized estimating equation approach to account for clustering by mother, associations between birth outcomes and the four risk factors of interest were estimated after adjusting for maternal age, height and health. Using coefficients from these models, we estimated adjusted population attributable fractions (PAFs). Of 28,119 births, 16% of infants were SGA, 13% were preterm and 2% died perinatally. 51% of infants were exposed to maternal smoking, alcohol misuse, drug misuse, and/or assault, and 37% [95% CI: 35%, 40%] of SGA births, 16% [95% CI: 14%, 19%] of preterm births and 20% [95% CI: 12%, 28%] of perinatal deaths were attributable to these factors, predominantly smoking. The PAFs for alcohol misuse (for example, for SGA, 3% [95% CI: 2%, 3%]) are likely to be underestimates as it is difficult to identify alcohol misuse using administrative data. While smoking rates have dropped considerably, reduction measures have been less successful among Aboriginal women than non-Aboriginal women. Significant improvements in perinatal health are possible with identification and support of effective risk reduction approaches for Aboriginal women, as well as their communities and families.

LOW BIRTHWEIGHTS AMONG ABORIGINAL INFANTS: IS THERE ANY EVIDENCE OF FETAL PROGRAMMING? Alison Gibberd, Judy Simpson, Bridgette McNamara, Sandra Eades (The University of Sydney)

Australian Aboriginal infants have had high rates of low birthweight (BW) for generations. BWs of parents and offspring are correlated due to the transmission of genetic and environmental factors. The correlation may also be due to fetal programming, where a fetus' response to a hostile uterine environment affects her adult health and the environment she provides for her fetuses. If so, Aboriginal people would be disproportionately affected, with high rates of low BW, malnutrition, poor health, and substance misuse. We used linked birth, hospital, and mental health records of Aboriginal singletons born 1998 to 2011 in Western Australia (WA) whose mother linked to a WA birth record from 1980 onwards, and their parents' records. 17% of 12,865 births were small for gestational age (SGA). Using Poisson regression with a generalised estimating equation approach, infants with SGA mothers were 62% more likely to be SGA. The risk was 44% higher for infants with SGA fathers. Using linear regression for offspring BW z-score, the coefficient for maternal BW z-score was 0.16 (95% CI: 0.14, 0.20), compared to 0.13 (95% CI: 0.11, 0.16) for paternal BW z-score. The slightly higher coefficient for maternal z-score (difference: 0.03 (95% CI: -0.01, 0.07)) provides only limited support for the hypothesis of fetal programming of the mother, particularly when issues such as non-paternity are considered. Other associations with offspring BW were more important, including smoking during pregnancy (-0.38 (95% CI: -0.44, -0.33)). We then restricted the sample to infants with cousins with the same maternal grandparents (fixed-effects model). The mother-offspring association in BW was fully attenuated, suggesting transmission of maternal genetic and environmental factors alone can explain the association. These results indicate fetal programming has a limited role in the persistently high rates of low BW among Aboriginal infants compared to risk factors in the current pregnancy.

ELEVATED MATERNAL AWAKENING SALIVARY CORTISOL LEVELS AND ADVERSE PERINATAL OUTCOMES: A NESTED CASE-CONTROL STUDY Nel Roeleveld, Richelle Vlenterie, Judith Prins, Marleen van Gelder (Radboud university medical center, Nijmegen, The Netherlands)

Background: Maternal hypersecretion of cortisol during pregnancy has been hypothesized as the intermediate process between symptoms of stress and depression during pregnancy and adverse perinatal outcomes. Therefore, we examined the associations between fetal exposure to elevated cortisol levels during pregnancy and selected perinatal outcomes in a nested case-control study. Methods: This study was embedded in the PRegnancy and Infant DEvelopment (PRIDE) Study, an ongoing prospective cohort study primarily using web-based questionnaires. From the children born in 2012-2016, we selected all cases with preterm birth (n=73), low birth weight (n=54), small-for-gestational-age (n=65), and Apgar score 75th percentile, 12.29 ng/ml) and the selected outcomes corrected for confounders. Results: We did not observe associations between elevated cortisol levels and preterm birth (OR 0.99, 95%CI 0.51-1.92), low birth weight (OR 1.25, 95%CI 0.38-4.13), and small-for-gestational-age (OR 1.22, 95%CI 0.62-2.40). However, elevated cortisol levels were associated with a low Apgar score (OR 2.59, 95%CI 1.03-6.50), especially when the saliva samples were collected in gestational weeks 20-22 (OR 5.60, 95%CI 1.61-19.51). Conclusion: Despite several limitations, this study clearly showed no indications for associations between elevated maternal cortisol levels in mid-pregnancy and adverse perinatal outcomes, except for an increased risk of low Apgar scores at 5 minutes after birth.

MATERNAL OBESITY, RACE/ETHNICITY, AND RISK OF PRETERM BIRTH: A LARGE POPULATION-BASED STUDY Buyun Liu, (University of Iowa)

Objectives: To examine the association between pre-pregnancy body mass index (BMI) and preterm birth. Methods: This study used the US nationwide birth certificate data including 19,946,986 deliveries from the National Vital Statistics System (NVSS) 2011-2016. Preterm birth was defined as gestational age less than 37 weeks. Gestational age was further grouped into moderately (32-36 weeks), very (28-31 weeks), or extremely (<27 weeks) preterm birth. Pre-pregnancy BMI (kg/m2) was used to characterize women as underweight (<18.5), normal weight (18.5-24.9), overweight (25.0-29.9), obese I (30.0-34.9), obese II (35.0-39.9), or obese III (≥40.0). We used logistic regression models to estimate the odds ratio (OR) of preterm birth and 95% confidence intervals (CI). Maternal age, race/ethnicity, parity, education, smoking during pregnancy, previous history of preterm birth, material status, and infant sex were adjusted. Results: Compared with normal weight, the adjusted OR of preterm birth was 1.26 (95% CI, 1.25-1.27) for underweight, 0.99 (0.99-1.00) for overweight, 1.03 (1.03-1.04) for obese I, 1.06 (1.06-1.07) for obese II, 1.11 (1.10-1.12) for obese III. The adjusted OR of preterm birth, comparing obese women with non-obese women, was 1.32 (1.30-1.34) for extremely preterm birth, 1.13 (1.12-1.14) for very preterm birth, and 1.04 (1.03-1.04) for moderate preterm birth. In stratified analysis by age, pre-pregnancy obesity was adversely associated with preterm birth among women younger than 25 years, while among women 25 years or older, pre-pregnancy obesity was positively associated with preterm birth. In stratified analysis by race/ethnicity, pre-pregnancy obesity was positively associated with preterm birth among Hispanics and non-Hispanic Whites, but inversely associated with preterm birth among non-Hispanic Blacks. Conclusion: Maternal obesity was associated with increased risk of preterm birth, especially among women 25 years or older, Hispanics, and non-Hispanic Whites.

DIETARY PATTERNS BEFORE AND DURING PREGNANCY AND BIRTH WEIGHT: A SYSTEMATIC REVIEW Ramkripa Raghavan, Carol Dreibelbis, Brittany James, Yat Ping Wong, Barbara Abrams, Alison Gernand, Kathleen Rasmussen, Anna Maria Siega-Riz, Jamie Stang, Kellie Casavale, Joanne Spahn, Eve Stoody (Panum Group)

Objectives: To conduct a systematic review on the association between dietary patterns before and during pregnancy and infant birth weight. Methods: Nine databases were searched from Jan 1980 to Jan 2017 for relevant peer-reviewed articles. Articles were dual screened using a priori inclusion and exclusion criteria, data were extracted, and risk of bias was assessed. The data were qualitatively synthesized, a conclusion statement was drafted, the evidence was graded, and research recommendations were identified. Results: Of the 9,103 articles identified, 21 met the inclusion criteria (2 randomized control trials and 19 cohort studies). Sample size ranged from 12 to 66,597 subjects. The mean birth weight across studies was >3,000 g, indicating that babies were born at a healthy weight, overall. Study findings on dietary patterns during pregnancy and birth weight were highly inconsistent. Only about half of the studies (n=11) observed an association, with limited consistency in how dietary patterns were generated and the direction of effect. Across studies, the methods used were heterogeneous (e.g., only a third of studies (n=7) used an outcome measure standardized for gestational age and sex, while 9 studies examined crude birth weight, alone) and low-income and minority women were underrepresented. Only one study examined dietary patterns before pregnancy, specifically. Conclusions: The ability to draw a conclusion on dietary patterns during pregnancy and birth weight outcomes was restricted by 1) inconsistency in study findings; 2) inadequate adjustment of birth weight for gestational age and sex; 3) variation in study design and dietary assessment methodology; 4) preclusion of pre-pregnancy weight as an effect modifier; and 5) lack of adjustment of key confounding factors. Future research should clarify these inconsistent findings. In regards to dietary patterns before pregnancy, insufficient evidence exists to estimate the association with birth weight outcomes.

MATERNAL FIXED EFFECTS AND THE ASSOCIATION BETWEEN CHANGES IN NEIGHBORHOOD DEPRIVATION AND PERINATAL OUTCOMES Cristin McArdle, Glenn Copeland, Nigel Paneth, Sue Grady, Zhehui Luo, Claire Margerison-Zilko (Michigan State University)

Evidence suggests a persistent relationship between neighborhood poverty and adverse perinatal outcomes, particularly pre-term birth (PTB; birth <37 weeks) and small for gestational age (SGA; <10th percentile). Disentangling effects of neighborhood poverty from individual characteristics of mothers living in poor neighborhoods remains a challenge due to unmeasured confounding and selection into neighborhoods. To address this, we utilized geocoded maternally-linked longitudinal natality data to compare perinatal outcomes of the same mother under different poverty exposures. We included mothers (N= 589,024) with successive singleton births (N=1,431,926) in Michigan from 1989-2012. Neighborhood (i.e., census tract) poverty was estimated using linear interpolation of decennial census data (1990, 2000, 2010) from Geolytics' Neighborhood Change Database. Mothers were classified as movers (N= 366,548; 62.23%) or non-movers (N= 222,476; 37.77%) based on census tract geocode. Maternal characteristics at the first birth differed significantly with movers (vs. non-movers) being younger (23.30% vs. 26.90%, p<0.01), larger percentage African-American (22.96% vs. 10.66%, p<0.01), more likely to have only a high school education (22.59% vs. 8.92%, p<0.01), and more likely to report smoking during pregnancy (16.15% vs. 10.40%, p<0.01). Movers overall were also more likely to experience PTB (9.67% vs. 8.82%, p<0.01), and SGA (11.25% vs. 8.82%, p<0.01). Our findings suggest mothers who move between successive births differ substantially from those who do not move; our next steps will use a fixed effects analysis to compare the effect of neighborhood poverty on PTB and SGA using moving mothers as their own controls, analogous to a case-crossover design. We will restrict the analytic sample to movers who are discordant on PTB (N=69,180; 18.87%) and SGA (N=73,445; 20.04%) as they are individuals who experience a change in neighborhood poverty and perinatal outcome.

PERICONCEPTIONAL STRESSORS AND SOCIAL SUPPORT AND RISK FOR ADVERSE BIRTH OUTCOMES Kari Weber, Suzan Carmichael, Wei Yang, Sarah Tinker, Gary Shaw (Stanford University)

Background: A few studies have suggested that psychosocial stress during pregnancy may increase risk for preterm birth and low birth weight. To extend those observations, we analyzed various life stressors separately and cumulatively as risk factors for preterm birth, low birth weight, and small-for-gestational-age (SGA). Methods: Data are from the National Birth Defects Prevention Study, a population-based, multi-center case-control study. Analyses were restricted to 4395 mothers of liveborn infants without birth defects (controls), delivering between January 2006 and December 2011. They completed a standardized, computer-assisted telephone interview within 24 months after delivery, including 7 questions on stress and 3 on social support experienced during the 3 months before pregnancy to the 3rd month of pregnancy. Cumulative stress (0-7) and support (0-3) indices were calculated. Preterm birth was divided into "early" (<32 weeks) or "late" (32-36 weeks), and compared to "term" (≥37 weeks). Birthweight was divided into "very low" (<1500 g), "low" (1500 – 2499 g) and "normal" (≥2500 g). SGA was defined as 5 stressors (RR: 3.5, 95% CI: 1.1-11.4 and RR: 4.7, 95% CI: 1.7-13.2, respectively). Conclusion: Our results add to evidence that cumulative stressors may be associated with risk for selected adverse birth outcomes.

S/T=Student/Trainee

RELATIVE DIFFERENCES IN FETAL GROWTH WITHIN DICHORIONIC TWIN PAIRS DURING PREGNANCY Melissa Amyx, Paul Albert, Alaina Bever, Stefanie Hinkle, John Owen, William Grobman, Roger Newman, Edward Chien, Rob Gore-Langton, Germaine M. Buck Louis, Katherine Grantz (NICHD)

In addition to traditional measures of fetal growth biometry, growth in twin pregnancies is assessed by inter-twin discordance. While birthweight discordance outcomes are well studied, inter-twin differences in estimated fetal weight (EFW %diff) across pregnancy and differences by clinical characteristics are less studied. For 141 women with dichorionic twin pregnancies (NICHD Fetal Growth Studies, no anomaly, known birth outcome) enrolled at 8-13 weeks (wks) and followed ≤6 visits, a linear mixed model of EFW %diff (dependent variable=[EFWlarger-EFWsmaller/EFWlarger*100]) by gestational age (GA) was fit (Model [M] 1), with sensitivity analysis limiting to uncomplicated pregnancies (M2; n=35). Interaction terms (GA*variable) were added separately to assess variables' impact on EFW %diff-GA association. Final models, adjusted for covariates including infant sex, retained significant interactions (p<0.1; M3, clinical factors: body mass index [BMI; obese ≥30, overweight 25-29.9, normal <25], assisted reproductive technology type [ART; in vitro fertilization [IVF], intrauterine insemination, medication, donor egg/embryo, none]; M4, pregnancy outcome: delivery GA [<32, ≥32wks]). Mean EFW %diff increased with GA (M1: β=.17 gram/wk, 95% confidence interval [CI] .10, .24; 18wks: 6.6%, 95%CI 5.9, 7.4; 35wks: 9.6%, 95%CI 8.5, 10.6), with similar increases in uncomplicated pregnancies (M2: β=.23, 95%CI .11, .36; 18wks: 5.9%, 95%CI 4.5, 7.3; 35wks: 9.8%, 95%CI 8.2, 11.5). In M3, EFW %diff increased 0.32%/wk (95%CI .19, .44), an association dampened in obese women (βinteraction[int]=-.30, 95%CI -.46,-.13) and with IVF (βint=-.30, 95%CI -.47,-.14); EFW %diff was greater in nullipara versus multipara (2/+; β=2.5, 95%CI .08, 4.9). In M4, the GA-EFW %diff association was augmented in deliveries <32wks GA (βint=.62, 95%CI .14, 1.2). Additional research is needed to understand biologic mechanisms of the impact of BMI and ART type on EFW %diff and if observed differences are pathologic.

CUMULATIVE EFFECTS OF MATERNAL HEAVY METALS, PSYCHOSOCIAL STRESS, AND SOCIODEMOGRAPHICS ON SMALL FOR GESTATIONAL AGE INFANTS IN A SAMPLE OF HEALTHY PREGNANT WOMEN Leah Zilversmit Pao, Emily Harville (Tulane School of Public Health and Tropical Medicine)

Background: Heavy metals, psychosocial stress, and negative sociodemographics are exposures commonly studied as separate risk factors for birth outcomes, yet often co-occur. This studies analyzes how cumulative risk of maternal chemical and nonchemical stressors may contribute to small for gestational age (SGA). Methods: Participants were pregnant women enrolled in the Fetal Growth Study and followed until having a singleton livebirth (N=2,562). SGA was calculated using fetal growth curves by sex of infant. Maternal blood lead, mercury, and cadmium, and Cohen's Perceived Stress and Edinburgh Postnatal Depression Scales, were collected. Exposures were grouped into 3 domains: metals, psychosocial stress, and sociodemographics. Exposures were dichotomized: heavy metals and psychosocial stress scores in the top tertile, education ≤high school, and annual income <$30,000. Exposures were summed within domains, and overall cumulative risk was created by summing the 3 domains. Logistic regression modeling SGA included 3 domains and race/ethnicity, adjusting for pregnancy weight gain, parity, marital status, and age. The adjusted effect of overall cumulative risk and race/ethnicity on SGA was additionally modeled. Results: Sociodemographics was the only exposure associated with SGA in unadjusted models ([odds ratio] OR: 1.46, 95% [confidence interval] CI: 1.12, 1.91). In adjusted models, none of the 3 cumulative variables were significant, while in the overall cumulative model the overall index was associated with SGA (OR: 1.17, 95% CI: 1.03, 1.33). African-American women had greater odds of having a SGA infant (OR: 1.77, 95% CI: 1.07, 2.96) compared to white women. Conclusions: Metals, psychosocial stress, and sociodemographics contribute cumulatively to SGA. Methods should be employed to understand the complex relationships between multiple exposures and birth outcomes.

PB037

EVIDENCE OF CHRONIC HPA DYSREGULATION IN MOTHERS DELIVERING PRETERM: A NESTED CASE-CONTROL STUDY Bizu Gelaye, Clemens Kirschbaum, Qiu-Yue Zhong, Sixto Sanchez, Marta Rondon, Karestan Koenen, Michelle Williams (Harvard T.H. Chan School of Public Health)

Objectives: The role of chronic hypothalamic-pituitary-adrenal axis (HPA) dysregulation in the pathogenesis of preterm birth (PTB) remains unclear. We explored this relationship in a cohort of pregnant women attending prenatal clinics in Peru. Methods: A total of 137 participants (40 PTB cases and 97 term controls) were interviewed and invited to provide a hair sample from the posterior vertex position of the scalp (mean=13 weeks gestation). Strands of hair were cut into three 3cm segments with the first 3cm segment closest to the scalp (proximal) representing the first trimester, and the next two 3cm segments (i.e, the intermediate and distal segments) representing 0-3 and 3-6 month preconception periods, respectively. Hair cortisol concentration (HCC) determined using luminescence immunoassay, were natural-log transformed, and case-control differences were assessed using bi-variate and multivariable linear regression procedures. Results: Maternal HCC were 14% (p=0.11), 10% (p=0.22) and 14% (p=0.08) lower for 3-6 months pre-conception, 0-3 months pre-conception, and first trimester, respectively, among PTB cases as compared with controls. Overall, combined pre-conception and first-trimester HCC was 13% lower among cases as compared with controls (p-value=0.01). After adjusting for putative confounders, a 1-unit increase in HCC was associated with a 55% reduced odds of PTB (aOR=0.45; 95%CI: 0.17-1.17). Corresponding odds for PTB were 0.53 (95%CI: 0.19-1.48) and 0.39 (95% I: 0.13-1.13), respectively, for 1-unit increase in HCC in the scalp-intermediate and scalp-distal segments representing HCC concentrations in 0-3 months pre-conception and first trimester. Conclusions: Women who deliver preterm, as compared with those who deliver at term, have lower preconception and first-trimester HCC. Our findings suggest that HPA axis activation, integral to the adaptive stress-response system, may be chronically dysregulated in women at increased risk of delivering preterm.

PB038

BROMINATED FLAME RETARDANTS IN PLACENTAL TISSUES: ASSOCIATIONS WITH GESTATIONAL AGE AND BIRTHWEIGHT Kate Hoffman, Heather Stapleton (Duke University)

Brominated flame retardants (BFRs) are endocrine disruptors that are known to accumulate in the placenta. Our past work demonstrates that BFR levels in placenta are only moderately correlated with those in maternal serum (i.e., the traditional exposure biomarker). Data suggest possible relationships between BFRs in maternal serum and adverse birth outcomes, but results have been inconsistent. We evaluate relationships between BFRs concentrations measured in placenta, a potentially more biologically relevant measure of exposure to the developing fetus, and birth outcomes (i.e., birthweight and gestational age). Pregnant women (n=102) from Durham, NC were recruited 2010-2011. Women provided serum samples during the 3rd trimester and provided extensive demographic, health and lifestyle information. At the time of delivery, placenta samples were collected using a standardized protocol. Serum and placenta samples were analyzed for polybrominated diphenyl ethers (PBDEs) and 2,4,6-tribromophenol (2,4,6-TBP) and birth outcome data were abstracted from medical records. We statistically evaluated associations between BFRs (serum and placenta) and continuous measures of birth outcomes while adjusting for relevant covariates. BFRs were detected in every placenta and were commonly detected in serum. Despite no differences in maternal serum concentrations, placentas associated with male infants had bigger concentrations of several BFRs. Placenta BFRs were associated with lower birthweight and shorter gestation, particularly for females. Baby girls with the highest levels BDE-153 exposure, for example, were born 1.5 weeks earlier on average (95% confidence interval: -2.6, -0.3) than those with low levels of BDE-153 in placenta. Associations between serum BFRs and birth outcomes followed a similar pattern but were generally weaker. Cumulatively, our results suggest the placenta may provide a more biologically relevant exposure metric for early-life BFR exposure than maternal serum.

EARLY CHILDHOOD RESPIRATORY MORBIDITY AND HEALTH SERVICES UTILIZATION IN CHILDREN BORN PRETERM Jesus Serrano-Lomelin, Radha Chari, Susan Crawford, Anne Hicks, David W. Johnson, Alvaro Osornio-Vargas, Maria Ospina (University of Alberta)

Background: Respiratory diseases in childhood may be influenced by alterations in the duration of gestation. Evaluations of the relationship between preterm birth (PTB) and respiratory disease have been inconclusive and mainly focused on the development of asthma. These studies have not investigated whether PTB leads to differential patterns of risk for the development of other respiratory diseases in childhood. This study evaluates the association between PTB and the risk of hospital admissions and emergency department (ED) visits for respiratory conditions in early childhood. Methods: A population-based retrospective cohort study of all singleton live births (≥20 weeks of gestation) was assembled using administrative health data from Alberta between 2005 and 2015. PTB was defined as live birth with gestation period < 37 weeks. The number of hospital admissions and ED visits during the first 5 years of life per child were analyzed for the following respiratory conditions: acute upper respiratory infections (AURI), acute lower respiratory infections (ALRI), wheezing disorders, and influenza and pneumonia (IP). Adjusted odds ratios (adjOR) were calculated in logistic regression (0=no event, 1=one or more events) using area-level socioeconomic status, maternal age, total antepartum risk score, Apgar score at 5 min., parity and sex as covariates. Results: The cohort contained 206,994 infants of whom 9.1% (n = 18,968) were born preterm. PTB increased the odds of hospital admissions for ALRI (OR=1.9, 95%CI:1.7-2.0), wheezing disorders (OR=1.7, 95%CI:1.5-1.9), IP (OR=1.6, 95%CI:1.5-1.8), AURI (OR=1.5, 95%CI:1.3-1.7). Similarly, PTB increased the odds of ED visits for wheezing disorders (OR=1.4, 95%CI:1.3-1.5), IP (OR=1.3, 95%CI:1.2-1.4), ALRI (OR=1.3, 95%CI:1.2-1.4), and AURI (OR=1.1, 95%CI:1.0-1.1). Conclusions: Preterm birth is an important risk factor for increased respiratory disorders in early childhood and consequent health service use.

ALTERATIONS IN FETAL GROWTH AND THE USE OF HEALTH SERVICES FOR RESPIRATORY DISEASES IN EARLY CHILDHOOD Jesus Serrano-Lomelin, Radha Chari, Susan Crawford, Anne Hicks, David W. Johnson, Alvaro Osornio-Vargas, Maria Ospina (University of Alberta)

Background: Alterations in fetal growth such as small and large for gestational age (SGA, LGA) may have long-term consequences on respiratory health. The risk of health services use for respiratory conditions in infants born SGA or LGA is a current knowledge gap in Canada. This study evaluates the association between SGA and LGA and the risk of hospital admissions and emergency department (ED) visits for respiratory conditions in early childhood. Methods: Population-based retrospective cohort study of all singleton live births that occurred in Alberta from 2005 to 2010. SGA and LGA were defined as birthweight below 10th and above the 90th percentile, respectively, based on a population-based Canadian reference. We extracted the number of hospital admissions and ED visits in the first 5 years of life per child for acute upper respiratory infections (AURI), acute lower respiratory infections (ALRI), wheezing disorders, bronchopulmonary dysplasia (BPD), and influenza and pneumonia (IP). Adjusted odds ratios were calculated in logistic regression (0=no event, 1=one or more events) using area-level socioeconomic status, maternal age, total antepartum risk score, 5-min Apgar score, parity, and sex as covariates. Results: The cohort contained 206,994 infants of whom 8.5% (n = 17,676) were born SGA and 9.4% (n = 19,630) were LGA. SGA increased the odds of hospital admissions for BPD (OR=1.80, 95%CI:1.03-3.15) but decreased the odds of ED visits for ALRI (OR=0.93, 95%CI:0.89-0.98), and AURI (OR=0.90, 95%CI:0.88-0.94). LGA increased the odds of hospital admissions for ALRI (OR=1.11, 95%CI:1.01-1.21), decreased the odds for BPD (OR=0.22, 95%CI:0.05-0.88); and increased the odds of ED visits for ALRI (OR=1.08, 95%CI:1.03-1.13) and AURI (OR=1.14, 95%CI:1.11-1.18). Wheezing disorders and IP were not associated with SGA or LGA. Conclusions: Alterations in fetal growth are associated with increased hospital and ED admissions in early childhood. The patterns differ for SGA and LGA.

THE ASSOCIATION BETWEEN MATERNAL SMOKING AND GESTATIONAL HYPERTENSION BY THE TIMING OF EXPOSURE Xi Wang, Nora Lee, Igor Burstyn (Drexel University)

Background: Although maternal smoking during pregnancy causes a variety of adverse outcomes, it is also associated with a reduction in the risk of hypertensive disorders in pregnancy. However, a limited number of investigations reported mixed results on the effects of smoking before pregnancy and during different stages of pregnancy on hypertensive disorders. Objectives: The objective of this study was to examine whether the association between maternal smoking and gestational hypertension (GH) varies by the timing of the exposure. Study Design: We used the 2015 US birth records to select 3,319,223 live singleton births with $\geq$21 weeks of gestational age at delivery. Data on maternal smoking included whether and how many cigarettes per day the mother reported to have smoked in the 3 months before pregnancy and in the 1st, 2nd, and 3rd trimesters separately. We estimated the adjusted risk ratios (aRRs) and 95% confidence interval (CI) via Poisson regression with robust variance estimator. Results: Women who smoked before and during pregnancy had a reduced risk for GH than non-smokers (aRR 0.92, 95% CI 0.90-0.94). In contrast, women who apparently quit just before the start of pregnancy had higher risk than non-smokers (aRR 1.02, 95% CI 1.00-1.05). When the trimester-specific effects were examined, only women who smoked before pregnancy and in all three trimesters had reduced risk for GH. Smoking mothers who quit just before the start of the 3rd trimester had an increased risk for GH compared to non-smokers (aRR 1.08, 95% CI 1.02-1.16). Conclusion: In our analysis, only persistent smokers (smoked before pregnancy and in all three trimesters) have reduced risk of GH compared to non-smokers, while smokers who reported to have quit before pregnancy were at an increased risk. Our results offer new insights into the importance of timing of smoking in pregnancy on risk of GH, and challenges the notion that any smoking during pregnancy has an apparent protective effect.

PRECONCEPTION BLOOD PRESSURE LEVELS AND VASCULAR-RELATED PREGNANCY COMPLICATIONS Carrie Nobles, (National Institutes of Health, NICHD)

Introduction: Although vascular-related pregnancy complications are associated with long-term maternal cardiovascular risk, whether subclinical risk factors prior to pregnancy are important predictors of these complications is not well studied. We investigated preconception blood pressure and blood pressure trajectories in relation to preeclampsia, gestational age (GA) at birth and birthweight in the EAGeR trial which randomized women to low dose aspirin prior to pregnancy. Methods: Of 1228 women enrolled, analyses included 595 with a live birth >23 weeks' gestation. Mean arterial pressure (MAP) was derived from systolic and diastolic blood pressure measured preconception at enrollment and at regular prenatal care visits. Pregnancy outcomes were abstracted from medical records and modeled with robust Poisson or linear regression. Blood pressure trajectories from preconception through pregnancy were identified with finite mixture models. Models were weighted for probability of live birth and adjusted for treatment arm, age, body mass index, race/ethnicity, marital status, smoking and parity. Results: Sixty-one (10.3%) participants had preeclampsia, mean GA at delivery was 38.8 (standard deviation [SD] 1.6) weeks and mean birthweight 3336 (SD 500) grams. Preconception MAP was associated with a 75% greater risk of preeclampsia (95% confidence interval [CI] 1.33, 2.17), 1.3 day shorter gestation (95% CI -2.3, -0.1) and 50.0 gram lower birthweight (95% CI -100.0, 0.1) for each 10mmHg. Consistently high versus consistently moderate MAP from preconception through 20 weeks' gestation was associated with 2.9 times the risk of preeclampsia (95% CI 1.63, 5.17), a 3.8 day shorter gestation (95% CI -6.5, -1.0) and a 119.3 gram lower birthweight (95% CI -237.9, -0.7). Conclusion: Subclinical preconception blood pressure is associated with vascular-related pregnancy complications, and warrants further investigation as a potential intervention point to improve pregnancy outcomes.

EFFECT OF MATERNAL SMOKING DURING PREGNANCY ON TRAJECTORIES OF MATERNAL GESTATIONAL BLOOD PRESSURE Kohta Suzuki, (Aichi Medical University)

Although it was suggested that maternal smoking during pregnancy might be a preventive factor of pregnancy induced hypertension in the US, this association is still controversial in Japan. In every prenatal check-up, maternal blood pressure is measured to detect pregnancy induced hypertension in Japan. Therefore, this study aimed to describe trajectories of maternal blood pressure during pregnancy by maternal smoking status using multilevel analysis. We obtained 10525 prenatal check-up data including systolic blood pressure (SBP) and diastolic blood pressure (DBP)from 1021 women from three hospitals in Yamanashi prefecture. Of these, 494 (48.4%) were primipara. Mean maternal age at delivery was 31.1 years. SBP and DBP from the first prenatal check-up were used as primary outcomes. Mean change of SBP and DBP during pregnancy was 3.8 mmHg and 3.5 mmHg, respectively. Multilevel analysis (random intercepts and slopes model) was conducted to determine the estimates of slopes of outcomes in each gestational period by maternal smoking status during pregnancy. In addition, same analyses were conducted grouped by maternal pregestational weight status (underweight, normal weight and overweight). Among all pregnant women, there was no significant effect of maternal smoking during pregnancy on SBP and DBP. Moreover, no significant effects of interaction on SBP and DBP were seen between gestational duration and maternal smoking during pregnancy. However, there was weak evidence that maternal smoking during pregnancy was likely to increase SBP during pregnancy in the model among overweight women (p=0.08) although there was no significant effect of maternal smoking during pregnancy on trajectories of SBP and DBP in other models. In conclusion, although there was a limitation of small sample size in these analyses, there was no significant effect of maternal smoking during pregnancy on decreasing gestational blood pressure and there might be racial difference of this association.

PROTEOMIC AND LIPIDOMIC SIGNATURES IN GESTATIONAL DIABETES MELLITUS AND PREECLAMPSIA Brandie DePaoli Taylor, (Texas A&M University)

Preeclampsia (PE) and gestational diabetes mellitus (GDM) are common pregnancy disorders associated with adverse maternal and fetal outcomes. The pathogenesis of both syndromes remain to be completely elucidated. Proteomic and lipidomic analyses are promising platforms to gain insight into pathogenesis. This study included a random sample of stored plasma from 50 women with PE, 50 women with GDM and 100 healthy controls in the Peribank repository. All specimens were taken at the time of admissions to labor and delivery and were from singleton pregnancies without chronic health conditions. Proteomic and lipidomic samples were characterized using a novel multidimensional platform, coupling liquid chromatography, ion mobility spectrometry, and mass spectrometry. Median centering based on rank invariant peptides (RIP 0.15) was used for protein normalization. Proteins and lipids were statistically evaluated with Analysis of Variance (ANOVA) with a Dunnett test (quantitative differences) correction and a Bonferroni-corrected g-test (qualitative presence and absence differences) to compare GDM and PE samples to control samples. We found 51 and 161 significantly higher proteins in GDM and PE and 126 and 147 significantly lower in GDM and PE patients, respectively. For lipid species there were 16 and 41 significantly higher in GDM and PE patients and 24 and 51 significantly lower in GDM and PE patients, respectively. Phosphatidylethanolamine plasmalogen species (link growth factor receptors to intracellular pathways controlling cell survival and proliferation) were uniformly higher in the GDM samples, but uniformly lower in PE samples. We found several unique proteins and lipids for GDM and PE, but were limited to third trimester sampling. Future studies may consider utilizing proteomics and lipidomics earlier in pregnancy to gain insight into the pathogenesis of these common pregnancy disorders.

THE UTILITY OF PREGNANCY COMPLICATION HISTORY FOR 10-YEAR CARDIOVASCULAR DISEASE RISK PREDICTION IN MIDDLE-AGED WOMEN Simon Timpka, Abigail Fraser, Tommy Schyman, Jennifer J. Stuart, Bjørn Olav Åsvold, Ingrid Mogren, Paul W. Franks, Janet W. Rich-Edwards (Lund University, Malmö, Sweden)

Women with a history of hypertensive disorders of pregnancy (HDP; preeclampsia and gestational hypertension) or delivering low birth weight offspring (LBW; <2,500 g) have twice the risk of cardiovascular disease (CVD). We aimed to study the extent to which history of these pregnancy complications improves CVD risk prediction above and beyond conventional predictors. Parous women attended standardized clinical visits in Sweden. Data were linked to registries of deliveries and CVD. Participants were followed for a first CVD event within ten years from age 50 (n=7,552) and/or 60 years (n=5,360) and the predictive value of each pregnancy complication above and beyond conventional predictors was investigated. History of LBW offspring was associated with increased risk of CVD when added to conventional predictors in women 50 years of age (Hazard ratio 1.68, 95% Confidence interval (CI): 1.19, 2.37) but not at age 60 (age interaction p=0.04). However, at age 50 years CVD prediction was not further improved by information on LBW offspring, except that a greater proportion of the women who developed CVD were assigned to a higher risk category (categorical net reclassification improvement (NRI) for events 0.038, 95% CI: 0.003, 0.074). History of HDP was not associated with CVD when adjusted for reference model predictors. In conclusion, a history of pregnancy complications can identify women with increased risk of CVD midlife. However, considered with conventional risk factors, history of HDP or having delivered LBW offspring did not meaningfully improve 10-year CVD risk prediction in women age 50 years or older.

STROKE AND CEREBROVASCULAR DISEASE IN PREGNANCY: INCIDENCE, TEMPORAL TRENDS, AND RISK FACTORS IN CANADA Shiliang Liu, (Public Health Agency of Canada)

Shiliang Liu MB, PhD, Wee-Shian Chan MD, MSc, Joel Ray MD, MSc, Michael S. Kramer MD, K.S. Joseph MD, PhD for the Canadian Perinatal Surveillance System (Public Health Agency of Canada) Background: Despite the high burden of disability and death due to stroke in pregnancy, few studies have examined their epidemiology and etiology. We quantified the incidence, temporal trends, regional variations, case fatality rates and associated risk factors of maternal stroke and cerebrovascular disease in Canada, in the context of universal access to healthcare. Methods: All ante-, peri- and postpartum hospitalizations in Canada except Quebec were obtained from the Canadian Institute of Health Information database, 2003-2016. Temporal trends and regional variations were assessed, and risk factors for any stroke, and for specific stroke subtypes, were quantified using logistic regression. Associations are expressed as adjusted odds ratios (AORs) and 95% confidence intervals (CI). Results: 524 stroke cases were identified among 3,907,262 deliveries (incidence rate 13.4 per 100,000 deliveries). The majority of all strokes were hemorrhagic (307 cases [58.6%]), occurred in the postpartum period (270 cases [51.5%]), and the overall case fatality rate was 7.4%. Stroke incidence rose from 10.5 per 100,000 in 2003 to 22.3 per 100,000 deliveries in 2016 (p = 0.001). Risk factors for stroke included maternal age ≥ 40 years (AOR 1.7, 95% CI 1.1-2.6), eclampsia (AOR 65.9, 95% CI 43.6-99.6), maternal congenital heart disease (AOR 38.1, 95% CI 22.1-65.8), as well as connective tissue disorders, migraines, sepsis and severe postpartum hemorrhage. Conclusions: The rising incidence of stroke in pregnancy, especially postpartum, suggests a need for improved prevention and management of maternal hypertensive disorders of pregnancy, before, during and after hospital discharge for childbirth.

THE PUBLIC HEALTH IMPACT OF OVERWEIGHT AND OBESITY BY RACE/ETHNICITY ON THE RISK OF CESAREAN DELIVERY IN NEW YORK CITY Kimberly Glazer, David Savitz (Brown University)

Objective: Associations between race/ethnicity and body mass index (BMI), and between elevated BMI and risk of cesarean delivery (CD), are well-established. The influence of maternal BMI on CD risk among racial and ethnic groups has not been examined, however, taking into account both differences in overweight/obesity prevalence and potential variation in the strength of the BMI-CD association. Methods: We studied birth and hospital discharge records for 210,762 singleton births to nulliparous women in New York City from 2008-2013. We calculated adjusted risk ratios (aRR), risk differences (aRD), and population attributable fractions (PAF) for associations between prepregnancy BMI and primary CD. Measures of association were stratified by race/ethnicity and examined for obstetric trajectories defined by the presence of spontaneous labor, labor induction, or prelabor CD. Results: There was a positive dose-response association between BMI class and CD risk for all racial/ethnic groups, with the strongest risk gradient among non-Hispanic white women (compared to normal weight white women, aRR [95% confidence interval (CI)] ranged from 1.36 [1.31-1.41] for overweight to 2.23 [2.03-2.46] for class III obesity, and aRD [95% CI] from 0.09 [0.08-0.10] for overweight to 0.33 [0.28-0.39] for class III obesity). When accounting for overweight/obesity prevalence using the PAF [95% CI], the proportion of CD risk attributable to elevated BMI was 6.8% [6.3-7.4%] among Asian, 10.8% [10.4-11.4%] among white, 14.8% [13.9-15.6%] among Hispanic, and 16.7% [15.7-18.0%] among black women; PAFs followed the same pattern across labor and delivery trajectories. Conclusions: Overweight and obesity contribute proportionally more to CD incidence among black and Hispanic women due to higher prevalence despite a steeper gradient of risk among white women. Results point to upstream prevention and preconception weight-loss intervention to mitigate racial disparities in adverse perinatal outcomes.

RACIAL MICROAGGRESSIONS AND RECEIPT OF PRENATAL CARE IN AFRICAN AMERICAN WOMEN: DOES SKIN TONE INFLUENCE THE RELATIONSHIP? Jaime C. Slaughter-Acey, Devon Sneed, Nora L Lee, Dawn P Misra (Drexel University)

Literature posits racial discrimination is a barrier to minorities utilizing health care. We examined the relationship between perceived experiences of racial microaggressions and prenatal care (PNC) utilization in African-American (AA) women. We also examined whether women's skin tone moderated the relationship. Interview and medical record data stem from the Life-course Influences on Fetal Environment Study, a cohort of 1410 AA women residing in Metropolitan Detroit, MI. The Daily Life Experiences of Racism and Bother (DLE-B) scale was used to assess women's perceived experiences of racial microaggressions; the 20-item DLE-B measured both the frequency of occurrence and how much each item bothered the individual. Logistic regression was used to examine the association between the DLE-B and receipt of PNC and effect modification by self-reported skin tone. Models were adjusted for maternal age, current city of residence, marital status, education attainment, employment status, parity, and chronic medical history. 17.8% of women received no PNC; a DLE-B score> the median (71; range: 20-720) was associated with a lack of any PNC (adjusted odds ratio [aOR]=1.3; 95%CI: 1.0-1.8). This association was moderated by self-reported skin tone (interaction P=0.06). Skin tone-stratified models demonstrated that a higher DLE-B score was associated with a lack of any PNC among very light/light brown AA women (aOR=1.7, 95%CI:0.9-2.9) and among dark/very dark brown AA women (aOR=2.2, 95%CI:1.1-4.3). No significant association was found among medium brown AA women. Similar patterns were found for PNC initiation and PNC adequacy. Results suggest that lived experiences in the form of racial microaggressions—episodic daily race-related events embodied within subtle, "seemingly harmless," innate degradations and putdowns—may influence AA women's utilization of PNC. Findings have implications related to the engagement of AA women in systems of health care and perinatal health programs.

MATERNAL AND NEONATAL MORTALITY AND SEVERE MORBIDITY ASSOCIATED WITH OPIOID USE IN PREGNANCY RESULTING IN NEONATAL ABSTINENCE SYNDROME. Sarka Lisonkova, (University of British Columbia)

Background: Opioid use has increased recently, however, severe adverse effects on pregnancy outcomes are understudied. We examined maternal and neonatal mortality and severe morbidity associated with opioid use in pregnancy resulting in neonatal abstinence syndrome (NAS). Methods: All singleton hospital live births in Canada (excluding Quebec), 2005/06-2015/16, were included (N=2,881,789). NAS, neonatal and maternal morbidity were identified by ICD-10-CA codes for diagnoses and medical procedures obtained from delivery hospitalization data. Mortality was defined as death before discharge, severe neonatal morbidity included intraventricular haemorrhage, periventricular leukomalacia, retinopathy of prematurity, necrotizing enterocolitis, sepsis, convulsions, bronchopulmonary dysplasia, and respiratory distress syndrome. Severe maternal morbidity included medical conditions identified by the Canadian Perinatal Surveillance System. Logistic regression was used to obtain adjusted odd ratios (AOR) and 95% confidence intervals (CI), adjusted for maternal age, pre-pregnancy co-morbidity, rural/urban residence, infant's sex, year of birth, and socio-economic status. Results: The incidence of NAS was 0.35%, and increased from 0.20% in 2005/06 to 0.51% in 2015/16. Neonatal mortality was 0.12% vs 0.19% among infants with and without NAS; the rates of neonatal mortality/severe morbidity were 6.36% vs 1.73%, respectively (AOR=3.63, CI: 3.34-3.94). Maternal mortality was 1.99 vs 0.31 per 10,000 women in NAS group vs women without NAS (AOR=6.53, CI: 1.59-26.74); the rates of maternal mortality/severe morbidity were 3.10% vs 1.35%, respectively (AOR=2.21, CI: 1.97-2.49). Conclusion: The incidence of NAS increased in Canada between 2005/06 and 2015/16. NAS was associated with elevated risks of severe neonatal morbidity, maternal death and severe maternal morbidity. These results are important with respect to optimizing maternal and infant care.

EFFECTS OF GENERAL VERSUS NEURAXIAL ANAESTHESIA ON NEONATAL OUTCOMES AFTER CAESAREAN SECTION: A SYSTEMATIC REVIEW AND META-ANALYSIS Manal Sheikh, Krista Wollny, Amy Metcalfe (University of Calgary)

Background. Caesarean Section (CS) is one of the most common inpatient surgical procedures performed internationally. Either general anaesthesia or neuraxial anaesthesia (spinal, epidural, combined spinal-epidural) is used for surgical pain management; however, the impact of these on neonatal outcomes is unknown. This systematic review examined the anaesthetic safety literature to investigate the effects of anaesthetic methods on neonatal outcomes after CS. Methods. MEDLINE, EMBASE, CINAHL, and Cochrane EBM were searched for English-language randomized controlled trials using a protocol and search strategy developed a priori. All screening and data extraction were all done independently and in duplicate. Data were analyzed using random effects meta-analysis. Results. From the 5,312 studies included in abstract screening, 29 studies met all inclusion criteria and 27 (n=2,812 CS) able to be included in the meta-analysis. Statistical differences for APGAR scores at 1 and 5 minutes were found (Odds Ratio (OR):-0.52(95% CI:-0.87,-0.17) and OR:-0.21(95%CI:-0.36,-0.06), respectively), showing spinal anaesthesia's protective effect over general anaesthesia. In contrast, umbilical arterial pH values showed general anaesthesia's protective effect compared to combined spinal-epidural anaesthesia (OR:0.03 (95%CI:0.02,0.04). There were no statistically significant differences in pooled umbilical arterial pH, epidural APGAR scores at 1 and 5 minutes, epidural umbilical arterial pH or spinal umbilical arterial pH outcomes. Conclusions. Both anaesthetic methods are safe for neonates and there are few meaningful differences in neonatal outcomes based on the type of anaesthesia used. The differences in umbilical arterial pH values could provide anticipatory clinical guidance to manage fetuses at risk of acidosis.

S/T=Student/Trainee

EXPOSURES TO AIR POLLUTION AND RISK OF ACUTE PLACENTAL ABRUPTION: A CASE-CROSSOVER STUDY OF BIRTHS IN NEW YORK CITY

Cande Ananth, (Columbia University, NY)

Background: Despite the elusive etiology, triggers that precede placental abruption by just a few days prior to delivery may be of importance to understand the underpinnings of this acute obstetrical complication. We examine if air pollution exposures immediately preceding delivery are associated with acute abruption. Methods: We employed a bi-directional, time-stratified, case-crossover design of births diagnosed with abruption in New York City, 2008-2014. We examined ambient fine particles (PM2.5), and nitrogen dioxide (NO2). We fit distributed lag models based on conditional logistic regression to evaluate individual, and cumulative-lag exposures over lags 0-7 days before abruption, adjusted for temperature and relative humidity (similar lags as the main exposures). Results: We identified 1190 abruption cases. Increased odds of abruption were observed for exposure to PM2.5 (per 10 g/m3) on lag day 4 (odds ratio [OR] 1.21, 95% confidence interval [CI] 1.01-1.46), and lag day 5 (OR 1.17, 95% CI 1.03-1.33), with a trend suggestive of increased odds on lag day 3 (OR 1.19, 95% CI 0.98-1.43). Similarly, the odds of abruption was increased with exposure to NO2 (per 5 ppb) on lag day 3, and lag day 4 (OR 1.19, 95% CI 1.02-1.39), and lag day 5 (OR 1.16, 95% CI 1.05-1.27), and a trend toward increased odds on lag day 3 (OR 1.16, 95% CI 0.98-1.37). Exposures to PM2.5, and NO2 at other lags, or cumulative exposures, were not associated with acute abruption. Conclusions: Results from this case-crossover study showed evidence of an association between short-term ambient air pollution exposures and increased acute abruption risk. Since air pollution is a growing public health concern, efforts to understand the source and patterns of pollutants, and policies designed to curb such exposures will have beneficial and lasting impact on human health globally.

BREASTFEEDING PRACTICES AND POSTPARTUM WEIGHT RETENTION AT 1 YEAR AMONG A COHORT OF US MOTHERS

Olubunmi Orekoya, Jihong Liu, Nansi Boghossian, Linda Hazlett, Sarah Rothenberg, Bo Cai (Metropolitan Hospital Center)

Introduction: Our objective was to investigate the association between breastfeeding practices (intensity and duration) and postpartum weight retention. Methods: Data came from the Infant Feeding Practices Study (IFPS) II. A total of 1287 women with self-reported breastfeeding information, prepregnancy and postpartum weight were included. Multivariable linear regression models were used to examine postpartum weight at 12 months, and generalized estimating equations for repeated measurements were used to examine postpartum weight at 6, 9, and 12 months in association with breastfeeding practices after adjusting for known confounders. Results: On average, women retained 2.8 lbs. at 12 months postpartum. Compared with high breastfeeding intensity (>80% of milk feedings were breastmilk), low (<20%) and medium breastfeeding intensity (20-80%) were associated with higher postpartum weight retention (β=3.6 lbs., 95% CI: 1.5, 5.6; β=2.8 lbs., 95% CI: 1.0, 5.1, respectively). When stratified by prepregnancy BMI, this association remained significant among normal weight women. Also, 1-week increase in breastfeeding duration was associated with a 0.08 lbs. reduction in weight retention at 12 months postpartum (95% CI: -0.10, -0.03). This association remained significant only among normal-weight women (β= -0.09 lbs., 95% CI: -0.14, -0.05). In the longitudinal analysis, low and medium breastfeeding intensity were associated with higher postpartum weight retention over time (β=3.3 lbs., 95% CI: 1.4, 5.4; β=2.0 lbs., 95% CI: 0.5, 4.0, respectively) compared with high breastfeeding intensity. Conclusions: High breastfeeding intensity and duration was associated with lower postpartum weight retention at 12 months and during the first year after delivery. Encouraging women to breastfeed in combination with healthy lifestyle behavior may help reduce postpartum weight retention.

PHYSICAL ACTIVITY AND PREGNANCY OUTCOMES IN WOMEN WITH PRIOR PREGNANCY LOSS

Lindsey M. Russo, Brian W. Whitcomb, Joshua R. Freeman, Sunni L. Mumford, Lindsey A. Sjaarda, Neil J. Perkins, Karen C. Schliep, Jagteshwar Grewal, Robert M. Silver, Enrique F. Schisterman (University of Massachusetts Amherst)

Data regarding the relationship between physical activity (PA) and pregnancy loss are conflicting. Some studies have observed no relationship while others suggest an increased risk of very early losses with high physical strain, potentially through mechanisms such as elevated body temperature and energy availability. We examined the relation of PA with pregnancy outcomes among women ages 18–40 with a human chorionic gonadotropin (hCG)-detected pregnancy in the Effects of Aspirin in Gestation and Reproduction (EAGeR) trial, which included women with 1 or 2 prior losses. The International Physical Activity Questionnaire (IPAQ) short form assessed baseline hours/week of activity (vigorous, moderate, and walking); intensity scores and reported duration were used to determine Metabolic Task Equivalent (MET)-hours/week. Systematic urine hCG tests and ultrasound identified chemical losses, clinical losses, and live births. Risk ratios (RR) and 95% confidence intervals (CI) were estimated using log-binomial regression, adjusting for age and waist-hip ratio. Among 785 women with hCG-detected pregnancies, there were 55 chemical losses and 133 clinical losses. The overall median level of physical activity was 27.9 MET-hours/week. Compared to the first tertile of baseline PA (median= 7.7 MET-hours/week), the RR for chemical loss was 2.06 (95% CI: 1.03, 4.14) in the second tertile (median= 27.8 MET-hours/week) and was 1.92 (95% CI: 0.94, 3.90) in the third (median= 95.7 MET-hours/week). No associations were observed between MET-hours/week and clinical loss or live birth. Models adjusting for BMI instead of waist-hip ratio yielded similar results, as did models using inverse probability of pregnancy weighting to address potential selection bias. These results suggest a relationship between PA and very early pregnancy loss/implantation failure in women with a history of prior losses, though caution is warranted due to potential limitations such as unmeasured confounding.

EFFECT OF HOSPITAL LABOR AFTER CESAREAN (LAC) VOLUME ON OUTCOMES IN WOMEN ATTEMPTING LAC IN CALIFORNIA

Mekhala Dissanayake, (Oregon Health and Science University)

Objective: To determine if hospital volume of LAC, stratified by overall hospital birth volume, is associated with increased vaginal birth after cesarean (VBAC) success and associated outcomes. Methods: Retrospective cohort study of n=40,406 term, singleton births of women who experienced LAC in California from 2007-2010. Multivariable logistic regressions of infant and maternal outcomes were stratified by tertiles of overall hospital birth volume. The main exposure compared high (≥ median) LAC-volume hospitals for the given tertile to low (< median) LAC-volume hospitals (referent), adjusting for maternal and hospital characteristics. Results: In no stratum of hospital birth volume did we observe an association between high LAC volume and: VBAC success, uterine rupture, severe perineal lacerations, extended length of stay, 5-minute apgar score <7, or neonatal death. In the lowest tertile of overall hospital birth volume, the adjusted Odds Ratio (aOR) for post-partum hemorrhage (PPH) comparing high LAC volume hospitals to low LAC volume hospitals was 1.77 (95% confidence interval [CI] 1.09-2.86). An association between high LAC volume and PPH was also observed in the other tertiles of hospital birth volume (tertile 2: aOR 2.52 (95% CI: 1.68-3.79); tertile 3: aOR 1.74 (95% CI: 1.10-2.75)). Results were inconsistent for other outcomes (e.g., asphyxia—we observed an effect in the highest tertile only, aOR, 6.00; 95% CI, 1.07-33.67). Conclusion: Our results suggest that across all strata of overall hospital birth volume, higher LAC volume was not associated with more VBAC success. However, a lack of consistent associations with adverse outcomes (except PPH) suggests that hospitals that offer LAC to more women, regardless of overall birth volume, are still offering LAC to appropriate candidates. The potential exception of post-partum hemorrhage is concerning; more research is required to elucidate the association between higher LAC volume and increased PPH.

ASSOCIATION OF ANTIDEPRESSANT CONTINUATION IN PREGNANCY WITH MATERNAL GESTATIONAL WEIGHT GAIN, GESTATIONAL DIABETES AND INFANT BIRTHWEIGHT. Paige D. Wartko, Noel S. Weiss, Daniel A. Enquobahrie, Beth A. Mueller, K.C. Gary Chan, Alyssa Stephenson-Famy, Sascha Dublin (University of Washington)

Every year, ~300,000 pregnant women in the US use antidepressants. In non-pregnant women, antidepressant use is associated with weight gain and development of diabetes. The association of weight gain in pregnancy with antidepressant use has not been studied. Although there is some evidence for higher risk of gestational diabetes (GDM) and smaller birthweight associated with prenatal antidepressant use, most studies failed to account for maternal mental health, likely leading to confounding by indication. We conducted a retrospective cohort study of singleton, live births in Kaiser Permanente Washington from 2001–2014 to women with an antidepressant prescription fill in the 6 months before pregnancy. We assessed the association of having an antidepressant fill during pregnancy (n=1599), compared with not having an antidepressant fill during pregnancy (n=1211), with gestational weight gain, GDM, birthweight, and small and large for gestational age, as ascertained from electronic health plan databases and linked Washington state birth records. Generalized estimating equations were used to calculate mean differences (MD), relative risks (RR) and 95% confidence intervals (CI), adjusted for demographics, health indicators, other medication use, mental health care utilization and psychiatric diagnoses. Antidepressant use in pregnancy was not associated with gestational weight gain, GDM or small or large for gestational age. Birthweight was slightly lower among infants born to women who continued antidepressants in pregnancy (MD -70.3 g, 95% CI -110.2 – -30.4). Large for gestational age was 17% lower in antidepressant continuers, but the association was statistically nonsignificant (95% CI 0.67–1.04). Overall, there was little to no evidence of an association between continued antidepressant use in pregnancy and the perinatal outcomes studied. Previously reported associations of antidepressant use with GDM and smaller birthweight may have been due to confounding by indication.

RISK OF PRETERM BIRTH AMONG WOMEN LIVING IN DEPRIVED NEIGHBOURHOODS DIFFERS BY WOMEN'S DEPRESSION AND ANXIETY STATUS Kamala Adhikari Dahal, Scott Patten, Tyler Williamson, Alka Patel, Shahirose Premji, Suzanne Tough, Nicole Letourneau, Gerald Giesbrecht, Amy Metcalfe (University of Calgary)

Objective This study examined whether anxiety, depression, or comorbid anxiety and depression during pregnancy modifies the relationship between neighborhood SES and PTB. Methods Individual-level data from two prospective cohort studies in Alberta Canada (All Our Families and Alberta Pregnancy Outcome and Nutrition (n=5,538)) were linked to neighborhood SES data measured by the Pampalon deprivation index. Depression was defined as an Edinburgh Postnatal Depression Scale (EPDS) score of ≥10, anxiety was defined as an EPDS anxiety-subscale score of ≥6, and comorbid anxiety and depression was defined as meeting both anxiety and depression definitions. Multilevel logistic regression models were developed including confounding variables (parity and ethnicity) and the interaction-term of neighborhood-deprivation with anxiety and/or depression. Results The rates of PTB in the least and most deprived-neighborhoods were 7.5% and 10.6%, respectively. However, the PTB rate in the most deprived-neighborhoods differed by anxiety and depression status: the rate was 9.5% (95% confidence interval (CI): 6.8, 13.3) for women without depression or anxiety, 14.7% (95% CI: 6.0, 31.9) for anxious women, 16.2% (95% CI: 10.0, 24.9) for depressed women, and 6.9% (95% CI: 3.1, 14.7) for women with comorbid anxiety and depression. The presence of anxiety, depression, and comorbid anxiety and depression increased the risk of PTB by 1.4, 2.4, and 1.9 times, respectively (p-value for interaction: 0.07, 0.03, and 0.04, respectively) for women living in the most deprived-neighborhoods. Conclusions Study findings suggest that anxiety and depression associated with the challenges of deprivation may extend stress-response activation, resulting in increased risk of PTB. This understanding may guide identification of high-risk women for PTB and allocation of resources to develop interventions for early identification and management of anxiety and depression, and ultimately the reduction of PTB, in vulnerable populations.

VARIATIONS IN SURGICAL COMPLICATIONS AFTER CAESAREAN SECTION IN THE UNITED STATES Manal Sheikh, Gregory Nelson, Stephen Wood, Amy Metcalfe (University of Calgary)

Background: Caesarean Section (CS) is the most common inpatient surgery performed internationally. Although CS is typically performed to prevent adverse maternal and fetal outcomes, there is still a risk of surgical complications; however, the magnitude of this risk remains unclear. This study examined maternal risk factors associated with surgical complications after CS in the United States. Methods: Data were obtained from the 2012-2014 Nationwide/National Inpatient Sample, a de-identified database containing a random sample of 20% of hospital discharges in the United States. Surgical complications (e.g. return to the operating room or postpartum haemorrhage) can be due to external factors such as pre-existing comorbidities. The overall rate of surgical complications across risk factors was calculated through bivariate analysis using chi-square tests. Logistic regression modelling examined the association between maternal risk factors (e.g. race, diabetes, median household income) and surgical errors during CS. Results: Among 640,699 CS hospitalizations, 9.0%(95%CI:9.0-9.0%) had a complication after CS. Complications from infections were the most common complication post-CS (1.6%;95%CI:1.5-1.6%). Several maternal risk factors (e.g. race) were found to be significant risk factors for surgical complications after CS (p-values<0.001). Adjusting for risk factors, women with Medicaid had higher odds of developing a surgical complication following CS compared to those with private insurance (OR=1.3;95%CI:1.2-1.3). However, women admitted on the weekend had high odds of developing a surgical complication following CS than women admitted during weekdays (OR:1.2;95%CI:1.2-1.2). Conclusions: Variations in the incidence of surgical complications following CS has not been reported previously. This study has the potential to identify specific areas for targeted quality improvement activities to reduce the incidence of adverse maternal events following CS.

VARIATIONS IN SURGICAL ERRORS DURING CAESAREAN SECTION IN THE UNITED STATES Manal Sheikh, Stephen Wood, Gregory Nelson, Amy Metcalfe (University of Calgary)

Background: Caesarean Section (CS) is the most common inpatient surgery performed internationally. Although CS is typically performed to prevent adverse maternal and fetal outcomes, there is still a risk of surgical errors; however, the magnitude of this risk remains unclear. This study examined maternal risk factors associated with surgical errors during CS in the United States. Methods: Data were obtained from the 2012-2014 Nationwide/National Inpatient Sample, a de-identified database containing a random sample of 20% of hospital discharges in the United States. Surgical errors (e.g. foreign body retained in the body cavity or mismatched blood availability) can be the result of human error. The overall rate of surgical errors across risk factors was calculated through bivariate analysis using chi-square tests. Logistic regression modelling examined the association between maternal risk factors (e.g. race, payer information, median household income) and surgical errors during CS. Results: Among 640,699 CS hospitalizations, 1.1% (95%CI:1.1-1.1%) had a surgical error during CS. Blood vessel injuries were the most common surgical error (0.4% 95%CI:0.4-0.4%) encountered during CS. Several maternal risk factors (e.g. race) were found to be significant risk factors for surgical errors during CS (p-values75th percentile of all incomes showed lower odds of a surgical error during CS compared to households with a median income <$40,000 or <25th percentile (OR:0.9;(95%CI:0.8-0.9)). Conclusions: The variations in surgical errors during CS in this study has not been reported previously. This study has the potential to identify specific quality improvement activities to target to reduce the incidence of adverse maternal events during CS.

INFLUENZA VACCINATION AND INFANT VACCINE EDUCATION PREFERENCES BY MATERNAL DEMOGRAPHIC CHARACTERISTICS

Erika Fuchs, Jacqueline Hirth, Fangjian Guo, V. Gnaukita Brown, Leslie Cofie, Abbey Berenson (University of Texas Medical Branch)

Background: Previous research has shown disparities in prenatal and childhood vaccination. Greater understanding about cultural considerations when providing vaccines and vaccine education to pregnant women in minority groups is needed. The aim of this study was to examine the infant vaccination education preferences of pregnant women by ethnicity, nativity, and language. Methods: Pregnant women ≤50 years old attending a participating low-income reproductive health clinic were eligible to participate in an in-person health and behavior questionnaire available in English and Spanish. Participants (N=335) were recruited from June 14-July 21, 2017. Differences in infant vaccination education preferences between participants by demographic characteristics were examined using chi-squared tests in Stata SE Version 15.1 with α=0.05. Results: Half (53.4%) of participants reported having had an influenza vaccination in the last year. Those who received an influenza vaccination in the last year were more likely to identify as Hispanic (56.4% vs 42.2%), to primarily speak Spanish (62.4% vs 43.2%), and to have been born outside of the US (60.0% vs 44.2%). Ethnicity, nativity, primary language, and influenza vaccine receipt were not associated with willingness to discuss infant vaccination prenatally or preference for the type of nurse who delivers vaccine education. Those born outside of the US were more likely to prefer to get information about infant vaccines at the baby's first visit than those born in the US (30.2% vs 16.0%), yet women in both groups were most likely to prefer receiving infant vaccine education before delivery (42.7% vs 47.3%). Conclusion: This study shows few demographic differences in preferences regarding vaccine education. Small differences by nativity may indicate cultural differences and needs further exploration.

THE ASSOCIATION BETWEEN ANOGENITAL DISTANCE, REPRODUCTIVE AND GENERAL HEALTH IN ADULT FEMALES

Tamar Wainstock, Israel Yoles, Asnat Walfisch (Ben Gurion University of the Negev)

Background: Early life exposures have been associated with health throughout life. Human and animal studies have found an association between prenatal androgen exposure and the anogenital distance (AGD). We aimed to study the association between AGD, reproductive and general health in adults women. Methods: This prospective historical cohort took place at Soroka University Medical Center (SUMC), the single medical center in the region, where AGD was measured in 300 parturients during the years 2000-2001. In the year 2017, hospital records of all study participants were abstracted, including all hospital encounters at SUMC, demographic and background health characteristics. All medical diagnoses were grouped to major categories, including cardio-vascular, endo-metabolic morbidities, reproductive organs morbidities or malignancies, etc. The associations between AGD and the risks for the grouped morbidities were evaluated in the univariable level and multivariable logistic models, which adjusted for confounding variables. Results: Study participants were 43.12±5.37 years old (range: 32-58); 151 (50.3%) were Jewish and 149 (49.7%) were Bedouins. AGD was normally distributed with mean 40.3mm (±10.7mm). While there were no associations between AGD and most major morbidities related hospital encounters (cardio-vascular: 16.5% vs. 16.8% among below vs. above mean AGD, respectively; and endo-metabolic: 25.9% vs. 29.0% among below vs. above mean AGD, respectively), women with below vs. above mean AGD were more likely to have reproductive organs morbidities or malignancies (39.9% vs. 27.1%, age and ethnicity adjusted odds ratio= 1.82; 95%CI 1.08-3.06). Conclusions: Women with below vs. above mean anogenital distance, were with increased risk for reproductive organs morbidities or malignancies. Our findings support the early life origin of these morbidities, and suggest AGD measurements may be used for detection of women at high risk for these conditions.

JAPANESE ENCEPHALITIS VACCINATION IN PREGNANCY AMONG US ACTIVE DUTY MILITARY WOMEN

Zeina Khodr, Anna Bukowinski, Richard Chang, Gia Gumbs, Susan Farrish, Ava Marie Conlin (HJF / Naval Health Research Center)

Japanese encephalitis (JE) is a flavivirus transmitted through mosquito bites and endemic to regions in Asia and the Western Pacific. JE vaccination (3-dose series ≤2011, 2-dose series ≥2009) is an inactivated vaccine required among US service members deployed to and stationed in regions endemic to JE. The current JE vaccination formulation used in the United States has been shown to be safe in pregnancy through animal models, but epidemiologic studies are lacking. We conducted a descriptive analysis to determine the prevalence of JE vaccination in pregnancy among active duty military mothers. The study population included 163,596 pregnancies to military mothers that ended in live deliveries and occurred from 2003–2014. Pregnancies were captured by the Department of Defense Birth and Infant Health Research program and linked to immunization records. Women who received JE vaccination in pregnancy were compared with those who did not. Descriptive analyses compared characteristics between vaccinated and unvaccinated mothers. There were 446 mothers vaccinated in pregnancy: 415 in the first trimester and 31 in the second/third trimester. Half (231 of 415) received their initial dose in pregnancy. Also, 69 (of 415) received >1 vaccine in pregnancy. Of the mothers who received multiple JE vaccinations in pregnancy, only 1 received a dose from both the 3- and 2-dose formulations. Most mothers were vaccinated with the 3-dose (69.1%) versus 2-dose (30.9%) formulation. Vaccinated mothers were more likely to be younger, unmarried, in the Marines, of enlisted rank, and in an occupation other than health care or combat. These mothers were also more likely to have received other non-recommended vaccines in pregnancy. Understanding the characteristics of women who receive the JE vaccination in pregnancy may help guide future policy. Given the increasing number of military women, vaccine safety in pregnancy is a priority for protecting military families.

YELLOW FEVER VACCINATION IN RELATION TO PREGNANCY AMONG US ACTIVE DUTY MILITARY WOMEN

Anna Bukowinski, Zeina Khodr, Richard Chang, Gia Gumbs, Ava Marie Conlin, Susan Farrish (HJF / Naval Health Research Center)

Yellow fever (YF) is a zoonotic infection, endemic to parts of Africa and South America, with 50% fatality rates among symptomatic cases. US service members deployed/stationed in regions endemic to YF require vaccination against this potentially fatal infection. YF vaccination is precautionary in pregnancy, as it may lead to adverse pregnancy and birth outcomes, and inadvertent vaccination may occur among women unaware of their pregnancy status. We conducted a descriptive analysis of the occurrence of YF vaccination preconceptionally/in pregnancy among active duty military mothers. The study population included 163,596 pregnancies ending in live deliveries to military mothers from 2003–2014. Pregnancies were captured by the Department of Defense Birth and Infant Health Research program and linked to vaccine records. Descriptive analyses compared women who received YF vaccine 28 days prior to their last menstrual period (LMP)—since this vaccine is live attenuated—through date of delivery with those who did not receive the vaccine preconceptionally/in pregnancy. Out of the 163,596 mothers, 1,195 were vaccinated preconceptionally/in pregnancy: 467 in the 28 days prior to LMP, 625 in the first trimester, and 103 in the second/third trimester. Most (861 of 1,195) received their initial dose in pregnancy; 29 (of 1,195) received >1 vaccine in pregnancy. Vaccinated mothers were more likely to be younger, unmarried, of enlisted rank, and in a combat role (but not health care occupation). These mothers were also more likely to receive other vaccines in pregnancy, including hepatitis A. Army mothers accounted for most YF vaccinations preconceptionally/in pregnancies from 2003–2005, which shifted to Navy mothers from 2006–2014. Understanding the characteristics of women who receive YF vaccination preconceptionally/in pregnancy may help guide future policy. Given the increasing number of military women, vaccine safety in pregnancy is a priority for protecting military families.

PREVALENCE AND FREQUENCY OF CANNABIS USE AMONG PREGNANT WOMEN IN A LARGE HEALTH CARE SYSTEM IN WASHINGTON STATE

Paige D. Wartko, Sascha Dublin, Linda Kiel, John Ewing, Ladia Albertson-Junkans, Clarissa Hsu, Gwen Lapham (University of Washington)

Despite national guidelines recommending against cannabis use in pregnancy, there is evidence that use may be increasing as public opinion shifts and legal access expands. In a state with medically-legal cannabis, use in pregnant women increased from 4% to 7% in recent years. There has been minimal research conducted regarding cannabis use among pregnant women in Washington state, where recreational use was legalized in 2012. We examined prevalence and frequency of cannabis use in pregnancy, as well as characteristics associated with use, in Washington state from 2015-2017. Electronic health records (EHR) from a large integrated healthcare delivery system were used to identify women age 21–45 who completed a routine screening questionnaire asking about cannabis use at a primary care visit. Using the EHR, we identified women who were pregnant at the time of the questionnaire and obtained information about mental health and substance use disorders, prescription medication fills, and demographic characteristics. Among 30,956 women who completed the questionnaire, 907 were pregnant. 14% (95% confidence interval (CI) 11–16%) of pregnant women reported past-year cannabis use, with 3% (95% CI 2–5%) reporting daily use, 2% (95% CI 1–4%) reporting weekly use, 2% (95% CI 1–3%) reporting monthly use, and 6% (95% CI 5–8%) reporting less than monthly use. Women who reported using cannabis were significantly more likely than non-users to have depression (34 vs. 24%), anxiety (40 vs. 30%), unhealthy alcohol use (46 vs. 11%), and to use antidepressant medication (20 vs. 12%) or tobacco (19 vs. 4%). Among pregnant women enrolled in a large integrated healthcare delivery system in Washington state, past-year cannabis use was commonly reported and was associated with mental health conditions and other substance and medication use. Against current recommendations, a substantial portion of women in a state with legal recreational cannabis are using during pregnancy.

TRENDS IN CESAREAN DELIVERY ON THE US-MEXICO BORDER, 2000-2015

Jill McDonald, Anup Amatya, Charlotte Gard, Jesus Sigala (New Mexico State University)

Background. Cesarean delivery rates among Hispanics on the US-Mexico border were higher than rates among US Hispanics in 2009. Our aim was to describe the disparity in cesarean delivery rates and trends among border Hispanics by comparing their rates with rates for non-Hispanic whites in border counties and with both Hispanics and non-Hispanic whites in nonborder counties of the four border states. Methods. We used data from 16,500,652 birth certificates to calculate percentages of cesarean deliveries (CD) and low-risk nulliparous (LRC-N), primary (LRC-P), and repeat (LRC-R) CDs during 2000-2015. We stratified rates by ethnicity and border-nonborder status into four populations. We calculated 95% confidence intervals around rates and used regular and piecewise linear regression to determine the best fits for trends. Results. Border Hispanic rates were highest every year on all cesarean measures. In 2015 they were CD (38.3%), LRC-N (31.4%), LRC-P (21.1%), and LRC-R (94.6%). Nonborder Hispanic rates were lowest for all but LRC-R. In 2015 they were CD (30.8%), LRC-N (24.4%), LRC-P (15.0%), and LRC-R (90.5%). Rates for all four population groups rose steadily during 2000-2009. Unlike rates for other populations, border Hispanic rates did not decline post-2009 because of unchanging rates for LRC-R. Most of the border Hispanic excess can be attributed to higher CD rates in Texas. Conclusions. The gap between high border Hispanic and other Hispanic CD rates has not closed since 2009. This continuing disparity warrants further analysis using individual as well as hospital, environmental and other contextual factors to help target prevention measures.

RISK FACTORS ASSOCIATED WITH PREGNANCY-RELATED AND PREGNANCY ASSOCIATED BUT NOT-PREGNANCY-RELATED DEATHS IN MARYLAND, 2010 – 2015.

Lawrence Reid, Kate Schneider, Lee Woods (Maryland Department of Health)

Background: Maternal mortality is an important indicator of health care quality. Our study examined the risk factors associated with pregnancy-related (PR) and pregnancy associated but not related (PA-NPR) deaths in Maryland. Methods: Maryland Mortality Review Committee case data was linked to community indicators. Six-year rates of PR and PA-NPR deaths per 100,000 live births during 2010-2015 were computed and two-proportion z tests were used to evaluate crude risk factor differences. Results: There were 95 PR deaths at a rate of 22 deaths per 100,000 live births. Rates of PR deaths were highest among Black non-Hispanic (NH) women, women >35 years old, with 12 years of education, and who were not married. The leading causes of PR deaths were hemorrhage (18%) and homicide (14%). Obese women had PR death rates (43) four times higher than women with a normal body mass index (10). Among Medicaid insured, Black NH women (40) had PR death rates eight times higher than White NH (5) women. The rate of PR deaths was higher among women from areas with a larger share of female headed households and in hospitals with a larger share of Medicaid insured births. There were 133 PA-NPR deaths with a rate of 30 deaths per 100,000 live births. Rates were highest among White NH women, women with 12 years of education, who were not married. The leading causes of PA-NPR deaths were unintentional overdose (32%), most were opioid related, and non-cardiovascular medical conditions (20%). Smokers had a PA-NPR death rate (116) that was 10 times higher than non-smokers (11). The PA-NPR death rate among those with private insurance was five times higher for White NH women (42) compared to Black NH women (8). The PA-NPR death rate in relatively high-poverty areas (45) was nearly double the rate in lower poverty areas (23). Conclusion: Improving socioeconomic conditions that lead to poor diets and drug use may have the greatest impact on PR and PA-NPR deaths, respectively.

TRENDS IN POSTPARTUM READMISSION IN THE UNITED STATES, 2010-2014

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Background: Postpartum readmission is an important measure of quality of care, yet recent evidence indicates 30-day readmission rates were increasing. In this study, we examine trends in postpartum readmission within 7, 30 and 42 days and charges between 2010 and 2014. Methods: We examined data from the Nationwide Readmission Databases (NRD), a nationally representative survey of discharges that includes data from approximately 35 million discharges (weighted) from 18-22 states annually. Postpartum women were identified using International Classification of Diseases, 9th Revision (Clinical Modification) diagnosis and procedure codes and All Patients Refined Diagnosis Related Groups (APR-DRG). Eligible patients included women 18-50 years who delivered in the first 11 months of the year who were not missing length of stay data. Readmission rates were estimated using SAS survey procedures to adjust for the complex survey design. Results: Rates of postpartum readmissions (7-, 30- and 42-day) decreased approximately 5% across the study period. Rates of 7-day readmission decreased from 1.26 to 1.20% while 30- and 42-day rates decreased from 2.17 to 2.07% and 2.37 to 2.25%, respectively. The mean charges for nearest readmission within 42-days increased from $22,869 in 2010 to $28,182 in 2013 and were lower in 2014 ($27,616). Similarly, the estimated total charges increased from 655 million in 2010 to 748 million dollars in 2013. Again, total charges in 2014 were lower ($722 million). Conclusion: In contrast with studies conducted between 2004 and 2011, the rates of postpartum readmission decreased between 2010 and 2014. Charges increased between 2010 and 2013 and decreased in 2014. Future studies should examine whether decreasing charges were associated expansion of health insurance coverage as a result of implementation of the Affordable Care Act.

FOOD INSECURITY DURING PREGNANCY AND POSTPARTUM IS ASSOCIATED WITH POSTPARTUM STRESS IN KENYAN WOMEN

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Background: Chronic stress is associated with a range of poor health outcomes. We hypothesized that food insecurity (FI) increases the risk of chronic stress in postpartum Kenyan women and evaluated this association with both hair cortisol concentrations (HCC), an emerging biomarker of chronic stress, and perceived stress. Methods: From 08/2014-04/2016, 371 pregnant women were enrolled between 12-30 weeks gestation into a cohort study in western Kenya and followed through 9 months postpartum. Individual FI in the prior month was measured at all visits. The Perceived Stress Scale (range 0-40) was administered at enrollment, 6 weeks and 9 months postpartum. Hair was collected only at 9 months postpartum and assayed to measure HCC reflecting adrenal activation in the prior 3 months. Subgroups with shared patterns of FI from baseline through 6 months postpartum were identified with group-based trajectory modeling. We used linear regression to evaluate the associations between FI trajectories and: 1) log transformed HCC, and 2) perceived stress at 9 months postpartum. Covariates were pre-specified using a directed acyclic graph. Results: Women with HCC results (n=203) were included in the analysis. Mean age was 25 (standard deviation [SD] 5). Two trajectories were identified: 1) chronic FI (moderate-severe FI at most visits; 58% of women); and 2) mild/no FI (at most visits). At 9 months postpartum, mean log HCC was 2.0 pg/mg (SD 1.0) and mean perceived stress was 17.4 (SD 4.5). Those with chronic FI had marginally elevated HCC (28% higher, 95% confidence interval [CI]: -5, 73) and higher perceived stress (3.3 points, 95% CI: 2.0, 4.5) compared to those with mild/no FI, after adjusting for confounders. Conclusion: Chronic FI was associated with marginally elevated HCC and significantly higher perceived stress in postpartum Kenyan women. Interventions to mitigate FI could prevent excess stress and stress-associated poor health outcomes.

DOES THE RELATIONSHIP BETWEEN SHORT INTERPREGNANCY INTERVAL AND ADVERSE PREGNANCY OUTCOMES VARY BY MATERNAL AGE?

Laura Schummers, Sonia Hernandez-Diaz, Jennifer Hutcheon, Paige Williams, Michele Hacker, Tyler VanderWeele, Wendy Norman (Harvard T. H. Chan School of Public Health)

Interpregnancy intervals <12 months are associated with higher risks of adverse outcomes. Relationships between interpregnancy interval and outcomes may vary by maternal age due to differences in pregnancy intention or biological interaction between interpregnancy interval (delivery to conception) and age, though variability by age is not well understood. We analyzed all pregnancies in British Columbia from 2004-2014 to women with ≥2 singletons, restricted to those following a live birth. We evaluated maternal mortality/severe morbidity (ventilation, ICU admission, organ failure, death); adverse fetal-infant composite (stillbirth, infant death, <3rd% birth weight for sex and gestational age, delivery <28 weeks, major anomaly); and spontaneous and indicated preterm delivery. We used logistic regression and postestimation calculations of absolute risks according to interpregnancy interval (modeled with restricted cubic splines), stratified by maternal age at pre-interval birth: <25, 25-35, and ≥35. We compared predicted risks at 3- and 18-month intervals for each age group using risk differences (RD), and examined 95% confidence intervals for overlapping across age groups. Our study included 144,449 interpregnancy intervals to 101,408 women. Risk of maternal mortality/severe morbidity was only increased in women ≥35 (RD 0.6% [95%CI 0.2,1.5] compared with 0.1% [0.0,0.2] in women 25-35. Adverse fetal-infant risk was slightly higher at short intervals, with no differences by age (RD in women 25-35: 0.8% [0.4,1.3]; RD in ≥35: 0.3% [-0.5,1.3]). Increase in spontaneous preterm delivery risk was largest at short intervals in women 25-35 (RD 2.7% [2.2,3.2] vs 1.3% [0.6,2.2] in women ≥35). Indicated preterm delivery risk was not increased. Increased maternal risk at short interpregnancy intervals was only observed in women ≥35, while increased fetal-infant risks did not vary by maternal age. Conversely, increased risk of spontaneous preterm delivery was largest in women 25-35.

PLASMA METABOLOMICS REVEAL NOVEL METABOLITES IN EARLY PREGNANCY IN ASSOCIATION WITH GESTATIONAL DIABETES RISK

Cuilin Zhang, Yen-Chen Anne Feng, Oliver Fiehn, Michael Tsai, Yeyi Zhu, Paul Albert, Liming Liang (NICHD, National Institutes of Health)

Although metabolomics may shed light on the pathophysiology of impaired glucose homeostasis in pregnancy, prospective studies on their roles in the development of gestational diabetes (GDM) are sparse. We aimed to prospectively investigated metabolomics (both targeted and non-targeted) and GDM risk in a matched case-control study of 107 GDM and 214 non-GDM women in a multi-racial cohort, the NICHD Fetal Growth Studies-Singletons. GDM diagnosis was based on Carpenter & Coustan Criteria by medical record review. Twenty two amino acids were quantified using plasma collected at gestational weeks (GW) 8-13, 16-22, 24-29, and 34-37. In addition, 331 primary metabolites were quantified by gas chromatography time-of-flight mass spectrometry as a part of non-targeted metabolomics approach. Adjusted odds ratios (aORs) and 95% confidence intervals of GDM related to metabolites (in quartiles) were estimated using conditional logistic regression after adjusting for pre-pregnancy body mass index and other GDM risk factors. Multiple testings were corrected using false discovery rate control for metabolites from the non-targeted approach. The present report focuses on findings using blood samples in early pregnancy, 8-13 GW. Among amino acids, alanine levels in GW 10-14 were significantly higher in GDM women than controls (mean: 30.5 vs. 27.6 umol/dl) and were positively related to GDM risk; aORs across increasing quartiles were 1.00, 1.69, 2.86, 3.05, (P for trend =0.020). By contrast, asparigine and glycine levels were significantly lower in GDM women than controls, and were inversely related to GDM risk; aORs across increasing quartiles were 1.00, 0.92, 0.74, and 0.48 (P = 0.045) for asparagine and 1.00, 0.42, 0.36, and 0.24 (P <0.001) for glycine. In addition, among primary metabolites from the non-targeted approach, isocitric acid levels were significantly and positively related to GDM risk; aORs across increasing quartiles were 1.00, 1.30, 1.04, 2.32 (P for trend = 0.002). Furthermore, we identified two unknown metabolites that were strongly and inversely associated with GDM risk (aORs were 1.00, 0.52, 0.18, 0.11, and 1.00, 0.33, 0.12, 0.06 respectively; both P for trend < 0.001). In conclusion, our study revealed several novel metabolites that may be implicated in the early pathogenesis of GDM. These findings might provide new etiological insights into GDM.

PREDICTORS OF INCONTINENCE FOLLOWING SURGICAL REPAIR OF VESICOVAGINAL FISTULA IN UGANDA

Alison El Ayadi, Hadija Nalubwama, Justus Barageine, Josaphat Byamugisha, Susan Obore, Haruna Mwanje, Othman Kakaire, Abner Korn, Suellen Miller (University of California, San Francisco)

Introduction Obstetric fistula affects approximately 2-3 million women, most in sub-Saharan Africa. Accessibility of surgical fistula repair services has dramatically increased over the past decade; however, women may not achieve continence despite surgery. Understanding predictors of surgical success may influence treatment patterns and inform surgical innovation needs. Methods Collaborators from Makerere University School of Medicine and University of California, San Francisco followed a cohort of 59 women with vesicovaginal fistula who underwent surgery at Mulago Hospital, Kampala, Uganda. Data on patient and fistula characteristics were captured via self-report and medical record abstraction. We described associations with resolution of urinary incontinence by hospital discharge using descriptive analyses and logistic regression. Results Over half (63%) of women achieved continence. Age at fistula was positively associated with continence (odds ratio (OR) 1.11, 95% confidence interval (CI) 1.02-1.20), but time with fistula (OR 0.71, 95% CI 0.53-0.96) and post-surgical duration of bladder catheterization (OR 0.82, 95% CI 0.68-0.99) were both inversely associated with continence. Severity of incontinence at baseline was not associated with continence (OR 1.01, 95% CI 0.36-2.81). Among a reduced sample, vaginal scarring and stenosis conferred significantly lower odds of continence (OR 0.07, 95% CI 0.01-0.46 and OR 0.16, 95% CI 0.04-0.67, respectively). Conclusion Despite our small sample, we identified several important predictors significantly associated with achievement of continence at hospital discharge following vesicovaginal fistula repair. Our findings around time living with fistula and variables representing the severity of fistula confirm the need for women to be rapidly repaired following occurrence of fistula to optimize outcome and the critical role of prevention for maintaining women's reproductive health.

MATERNAL AND NEONATAL THYROID FUNCTION AND CHILD COGNITION IN US PRE-BIRTH COHORT. Samantha Lain, Emily Oken, Sheryl L. Rifas-Shiman, Elizabeth N. Pearce, Natasha Nassar (University of Sydney)

Background: The relationship between mild developmental thyroid hormone deficiency and childhood neurodevelopment remains incompletely characterized. In prior work we found no association of maternal first trimester thyroid hormone levels or neonatal thyroxine (T4) levels with neurodevelopment in early childhood. Aim: Examine the association of newborn T4 levels with cognitive outcomes in mid-childhood, and assess whether newborn T4 is a mediator between maternal thyroid hormone concentration and cognitive outcomes. Methods: We examined maternal thyroid hormone levels, neonatal levels of T4 and cognitive outcomes (verbal and nonverbal intelligence, visual memory, and visual motor abilities) in mid-childhood (median 7.6 years) for 391 children in Project Viva, a US pre-birth cohort. We used multivariable linear regression to examine the associations of neonatal T4 levels and maternal thyroid hormone levels with cognitive outcomes, adjusted for gestational age (GA), birthweight for GA z-score, sex, and sociodemographic variables. Results: Mean (SD) newborn T4 was 17.6 (4.0) ug/dl; 1.8% had a neonatal T4 2.5mU/L, and 80% were college graduates. Mean verbal and nonverbal IQ, memory, and motor scores were 115, 108, 17, and 93 points, respectively. In multivariable analysis, newborn T4 (per ug/dl) was not associated with any of the cognitive outcomes; verbal IQ β=0.11 (95% CI -0.22, 0.43), nonverbal IQ β=0.37 (-0.07, 0.81), memory β=0.07 (-0.05, 0.19), and motor abilities β=0.05 (-0.39, 0.48). Maternal thyroid function also was not associated with childhood cognition; TSH (>2.5 mU/L) and verbal IQ β=-0.74 (-4.19, 2.71). Conclusion: Maternal or neonatal thyroid hormone levels were not associated with cognitive outcomes in mid-childhood in this population with generally normal thyroid function. Sample size and a highly educated cohort may impact the results and generalizability of the findings.

EARLY CHILDHOOD SUCKING BEHAVIORS AND ATOPY IN LATER LIFE Jennifer Thompson, Michael S. Kramer, MD, Richard M. Martin, BMBS, PhD, Carsten Flohr, MD, PhD, Emily Oken, MD, PhD (Harvard Medical School and Harvard Pilgrim Health Care Institute)

Background: Previous research has suggested that thumb-sucking during early childhood may increase microbial exposure and thereby reduce the risk of later atopic conditions like asthma and eczema. Methods: In an observational analysis of data from the PROBIT cohort in Belarus, we evaluated associations between thumb-sucking and sucking on objects (including pacifiers, toys, and blankets) and symptoms of atopy in childhood and adolescence. Results: At mid-childhood (mean age 6.5 years), 4.8% (660/13,849) of participating mothers reported that their children had sucked their thumb; 54.6% (7,560) had sucked on an object; and 10% (1,385) had sucked both their thumb and an object. Atopic disease prevalence was low; only 1.8% (251) were reported to have a recurrent itchy rash and 3.1% (426) to have had wheezing/whistling in the chest in the previous 12 months. In multivariate logistic regression analysis, accounting for clustering by clinic and confounders, children who sucked both their thumb and an object were more likely to have a recurrent itchy rash (adjusted OR 1.74, 95% CI: 1.17, 2.59) and to have had wheezing or whistling in their chest (aOR 1.42, 95% CI: 1.04, 1.94) than children with neither sucking behavior. In adolescence (mean age 15.6 years), children who had ever sucked their thumb and an object were more likely to report shortness of breath while at rest (aOR 1.45, 95% CI 1.06, 1.99) and during exercise (aOR 1.35, 95% CI 1.18, 1.54), as well as nighttime cough (aOR 1.50, 95% CI 1.28, 1.76) than those with no sucking history. They were not, however, more likely to have been diagnosed with asthma or eczema by a doctor. Conclusions: Contrary to previous studies, in a setting with low prevalence of atopic diseases, we found that habitual thumb- or object-sucking in early life was associated with a higher risk of some atopic symptoms in mid-childhood and adolescence. Additional research is needed to clarify the direction and strength of this association.

ESTIMATING THE EFFECTS OF AN INTERVENTION TO REDUCE JUICE CONSUMPTION DURING PREGNANCY AND EARLY CHILDHOOD ON MID-CHILDHOOD BODY MASS INDEX Z SCORE: AN APPLICATION OF MARGINAL STRUCTURAL MODELS Yu-Han Chiu, Sheryl Rifas-Shiman, Zilu Zhang, Ken Kleinman, Emily Oken, Jessica Young (Harvard T.H. Chan School of Public Health)

Juice is a possible contributor to pediatric obesity but no study has assessed the effect of sustained lower versus higher juice consumption in pregnancy and early childhood. Without data from randomized trials, valid estimation of such effects might be achieved with observational data given sufficient and appropriate adjustment for both baseline and time-varying confounders. We used longitudinal data from Project Viva, a pre-birth cohort, to estimate the effects of a joint pre- and postnatal juice intervention on mid-childhood body mass index (BMI) Z-score via inverse probability (IP) weighting of marginal structural models (MSMs). Our baseline sample consisted of 1743 pregnant women. We defined 5 intervention intervals: prenatal (early and late pregnancy) and postnatal (6 months, 1 year, and 2 years old) periods. We censored participants at first interval of missing covariates or BMI Z-score. We fitted a MSM via weighted linear regression with stabilized IP treatment and censoring weights to estimate the mean difference in BMI-Z score under interventions: "maintain juice consumption below (versus above) an interval-specific threshold in all intervals," with thresholds defined as 1 serving/day for prenatal and 0.5 servings/day for postnatal periods. We computed 95% confidence intervals via 1000 bootstrap samples. The means (SDs) of juice consumption were 1.2 (1.0), 1.3 (1.1), 0.2 (0.4), 0.6 (0.7), and 1.9 (1.5) servings/day in early and late pregnancy, 6 months, 1 year and 2 years, respectively. In mid-childhood, the mean (SD) of BMI Z-score was 0.32 (0.95). 62.8% of subjects were censored by incomplete follow-up. After adjustment for baseline and time-varying confounders, the IP estimate of the difference in mean outcome comparing the interventions maintaining below versus above the thresholds was -0.09 (95% CI: -0.50, 0.36). In conclusion, we did not find evidence that sustained restricted juice consumption affects mean BMI-Z score in mid-childhood.

ASSOCIATIONS BETWEEN AIR TOXICS, MATERIAL HARDSHIP AND PEDIATRIC ADHD BEHAVIORS Kayla Dellafratte, Jeanette Stingone, Luz Claudio (Icahn School of Medicine at Mount Sinai)

Behaviors associated with attention deficit hyperactivity disorder (ADHD) are widespread and can be identified at early age. The purpose of this study was to determine the relationship between exposure to ambient air pollutants (benzene, toluene, ethyl benzene, and xylene) individually and together (BTEX) and material hardship in a national subset (N=4650) of the Early Childhood Longitudinal-Study Birth cohort (ECLS-B) assessed for ADHD symptoms at kindergarten age. Pollutant exposure was linked to the 2002 National Air Toxics Assessment by Zip code of residence. Material hardship was assigned as a composite score of access to food, health care, and housing security through parent response. Teachers assessed the ADHD outcome as a composite score involving inattention, lack of independent work, inability to complete tasks, impulsivity, over activity, and fidgeting. Logistic regression models were used to estimate the effect of both exposures on ADHD behaviors individually, when controlling for confounders, and for effect modification. The odds of ADHD behaviors was greater in those with combined high level exposure to BTEX and in children experiencing material hardship (Odds Ratio 1.32 [1.01, 1.74] and 1.40 [1.21, 1.62], respectively). When restricting the study population to urban areas, the adjusted model encompassing both BTEX exposure and material hardship showed a larger effect on odds of ADHD (1.83 [1.23, 2.72] and 2.44 [1.32, 4.51], respectively). However, there was no evidence of statistical interaction between the two variables. The findings suggest that both BTEX and material hardship exposure are independently associated with increased risk of ADHD symptoms. These results are congruent with a New York City cohort study and add to the growing literature on how environmental and socioeconomic factors affect neurodevelopment.

S/T=Student/Trainee

MATERNAL OBESITY, GESTATIONAL WEIGHT GAIN AND OFFSPRING RISK OF WHEEZE AND FOOD ALLERGY: THE UPSTATE KIDS STUDY Griffith Bell, Pauline Mendola, Rajeshwari Sundaram, Hyojun Park, Erin Bell, Temilayo Adeyeye, Edwina Yeung (Eunice Kennedy Shriver National Institute of Child Health and Human Development)

Background: Maternal obesity and allergic disease have both increased over the past three decades. Maternal obesity may affect risk of offspring allergic disease by altering fetal immune system development. However, the evidence linking maternal obesity and offspring allergy is mixed and few studies have examined the role of gestational weight gain (GWG). We examined the relationships between maternal body mass index (BMI), GWG, and risks of wheeze and food allergy in offspring through 3 years of age. Methods: A total of 6,062 offspring from the Upstate KIDS Study, a population-based longitudinal cohort study of children born in Upstate New York (2008-2010) were included in the analysis. Maternal pre-pregnancy BMI and GWG were obtained through vital records. Offspring wheeze and food allergy were reported by mothers at 4, 8, 12, 18, 24, 30, and 36 months. Generalized linear mixed effects models were used to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI) comparing risk of wheeze and food allergy in offspring by maternal pre-pregnancy BMI and GWG. Results: In our cohort, 1,674 (27.9%) children were reported as having ever wheezed, while 521 (8.6%) reported ever having a food allergy. In all, 1,630 (26.9%) women were obese (BMI≥30) prior to pregnancy and 1,489 (24.6%) were classified as having excessive GWG. We found an association per 5 kg/m2 increase in pre-pregnancy BMI and increased risk of wheeze (aOR 1.09, 95% CI: 1.01, 1.18), but not food allergy (aOR 0.88, 95% CI: 0.76, 1.03) in offspring. GWG was not associated with increased risk of wheeze (aOR 0.98, 95% CI: 0.95, 1.01), but was associated with increased risk of food allergy in offspring (aOR 1.05, 95%CI: 1.01, 1.09 per 5 lb increase in weight gained)." Conclusions: Maternal pre-pregnancy BMI was associated with increased risk of offspring wheeze, while higher GWG was associated with risk of food allergy in offspring.

BIRTHWEIGHT AND NEWBORN ADIPOCYTOKINES AMONG TWIN PAIRS Hyojun Park, Rajeshwari Sundaram, Erin Bell, Griffith Bell, Akhgar Ghassabian, David Lawrence, Barbara Luke, Edwina Yeung (NIH/NICHD)

Objective Understanding how birthweight relates to adipocytokines can provide information on newborn adipose function. However, factors associated with pregnancy and delivery make it difficult to tease apart true associations. Using twins, we conducted sib-pair analyses to elucidate the impact of confounding on associations between birthweight and adipocytokines. Methods We analyzed 594 twin pairs in the Upstate KIDS Study with biomarker data from newborn dried blood spots. Interleukin (IL) 6, IL-8, brain-derived neurotrophic factor (BDNF), adiponectin, complement factor D (CFD), C-reactive protein (CRP), and resistin were measured using Luminex multiplex assays and log-transformed. Generalized estimating equations were used to simultaneously estimate adipocytokines and birthweight associations for unrelated twin pairs (i.e., by modeling mean birthweight of each pair) and related twin siblings (i.e., by modeling differences in birthweight within pairs). Models were adjusted for maternal age, education, marital status, pre-pregnancy BMI, drinking and smoking, maternal diabetes, private insurance, infertility treatment, and infant sex. Results Among unrelated twins, birthweight was associated with IL-6 (b=-0.21 in log-scale units per kilogram increase in mean birthweight; 95%CI: -0.34, -0.08) and CRP (0.60; 0.13, 1.07). Among twin-sibling pairs, within pair differences in birthweight were associated with increased levels of both adiponectin (0.18; 0.05, 0.32) and CFD (0.20; 0.08, 0.33). Other biomarkers were not associated with birthweight. Conclusion Our findings suggest that levels of inflammation measured by IL-6 and CRP were associated with birthweight potentially due to residual confounding by pregnancy-related factors not controlled for in analyses of unrelated twins (e.g., mode of conception, pregnancy complications). Adiponectin and CFD, however, were directly associated with birthweight even among related twins where maternal characteristics are well controlled.

BIRTH COHORT DIFFERENCE IN THE ASSOCIATION BETWEEN ENVIRONMENTAL FACTORS AND EARLY MENARCHE IN KOREAN GIRLS Seung-Ah Choe, (School of Medicine, CHA University)

Background: Early menarche (age at menarche< 12 years) is associated with higher risk for chronic diseases. As environmental factors change, the association between environmental factors and risk of early menarche can be changed across birth cohorts. We explored birth cohort-based difference in the effect of established sociodemographic factors on the risk of early menarche. Method: A total of 353,637 female middle- and high-school students who participated in the Korea Youth Risk Behavior Web-based Survey (KYRBS) from 2006 to 2015 were analyzed. The study population was divided into three groups according to year of birth: cohort 1 (birth in 1988-1992), 2 (1993-1997), and 3 (1998-2003). Log-binomial regression analysis including body mass index, father's and mother's education, level of residence area, cohabitation with each of parent, general level of stress and year of survey was conducted to calculate the relative risk (RR) for early menarche. Result: Prevalence of early menarche increased over time from 18.8 % (13,533/73,924) in girls born in 1988-1992 to 22.2 % (16,438/74,223) in those born in 1998-2003. Living less urbanized area reduced risk for early menarche in girls born in 1988-1992 (RR=0.88, 95% CI: 0.84 - 0.93) or 1993-1997 (0.87, 0.84-0.9) but this association was not significant in cohort born in 1998-2003 (0.96, 0.91-1.01). Living without father increased risk of early menarche for those born earlier (1.14 for 1988-1992 cohort and 1.17 for 1993-1997), while it did not increase the risk in 1998-2003 birth cohort. On the other hand, mother's middle school or lower education was associated with higher risk of early menarche among girls born in 1993-1997 (1.08, 1.03-, 1.13) and 1998-2003 (1.21, 1.11-1.32). Conclusion: This study suggests association between environmental factors and early menarche can be different by birth cohort. Future studies would need to consider the birth cohort effect in occurrence of early menarche.

MATERNAL PRENATAL PLASMA FOLATE AND CHILDHOOD ASTHMA IN A US COHORT Margaret Adgent, Aditi Roy, Tebeb Gebretsadik, Terry Hartman, Mehmet Kocak, Chandrika Piyathilake, Frances Tylavsky, Kecia Carroll (Vanderbilt University Medical Center)

Prenatal folic acid supplementation is recommended to prevent birth defects. Some countries, including the US, fortify foods with folic acid to augment intake among reproductive-aged women, but high prenatal folate exposure may be a risk factor for childhood respiratory disease. We investigated associations between prenatal folate and asthma in a US cohort (Conditions Affecting Neurocognitive Development and Learning in Early Childhood [CANDLE]). We studied 978 mother-child dyads, enrolled prenatally (2006 -2011). We measured folate in 2nd and 3rd trimester maternal plasma. At 4-6 years of age, we determined current wheeze (wheeze in previous 12 months) and current asthma (combined assessment of provider diagnosis, current wheeze and medication use) by parent report. We examined associations with log-transformed folate using multivariable logistic regression. We also examined folate by child sex interactions. Over 60% of women were African American; 49% of infants were male. Median (interquartile range [IQR]) folate levels were 22.5(15.5-29.9) and 22.8(15.5-29.7) ng/mL for 2nd and 3rd trimesters, respectively. Current wheeze and current asthma were reported for 19% and 15% of children, respectively. We did not detect significant associations between 2nd or 3rd trimester folate and either outcome (e.g., adjusted odds ratio (aOR) (95% confidence interval [95%CI]) for current asthma per IQR increase of 3rd trimester folate: 1.02(0.80, 1.29)). The association between 3rd trimester folate and asthma was modified by sex (p-interaction=0.04): aOR (95%CI) per IQR increase: 1.23(0.89,1.69) in boys and 0.76(0.52,1.10) in girls. Conclusion: Over half of women in CANDLE exhibited plasma folate levels often considered supraphysiologic (>20 ng/mL). We did not observe significant main effect associations between prenatal plasma folate and childhood wheeze or asthma. However, the association between folate and asthma may be modified by child sex, warranting further investigation.

PREVALENCE OF HEAD INJURY AND DIZZINESS AND BALANCE PROBLEMS IN CHILDREN IN THE UNITED STATES Chuan-Ming Li, Howard J. Hoffman, Christa L. Themann, Devin McCaslin, Rose Marie Rine, Anne E. Hogan, Helen S. Cohen, Charles C. Della Santina (NIH/NIDCD)

Objective To study the prevalence of balance and dizziness (BD) problems and the association with head injury in U.S. children. Study design A multistage, nationally-representative sample of children (n=9,247; aged 3-17 years) was selected for the 2016 National Health Interview Survey. Parents were asked if during the past 12 months their child had BD symptoms (i.e., vertigo/motion sensation, light-headedness/fainting, clumsiness/poor coordination, poor balance/unsteadiness when standing-up or walking, frequent falls, or other BD problems) and if their child had ever had a significant head injury or concussion. Logistic regression was used to examine associations. Results BD prevalence was 5.5% (3.4 million); females, 5.6%, males, 5.4%. Non-Hispanic (NH) white (5.7%) and Hispanic (5.8%) had slightly increased prevalence compared to NH black (4.9%) children. BD prevalence increased from 3.4% for children aged 3–5 years to 9.1% for children aged 15–17 years, p<0.001. Head injury prevalence was 7.0% (4.3 million children); females, 5.8%, males, 8.1%, p<0.001. NH white (8.7%) had increased prevalence compared to Hispanic (5.9%) and NH black (4.5%) children, p<0.001. Head injury prevalence increased with age, from 4.0% for children aged 3–5 years to 11.8% for children aged 15–17 years, p<0.001. Among those with head injury, 13.7% had BD problems, while among those with BD problems, 17.5% had head injury. Overall, 39.4% of children with BD problems were seen by healthcare providers during the past 12 months and 33.8% received treatment. Among children with BD rated as moderate/big/very big problems, 79.3% had seen healthcare providers and 62.0% received treatment for BD. After adjusting for age, sex, race/ethnicity, and family education, head injury was significantly associated with BD (odds ratio=2.7; 95% confidence interval: 2.0-3.7). Conclusions Prevalence of BD and head injury were common and head injury was associated with BD problems in children.

TRAJECTORIES OF SOCIAL SUPPORT IN THE PERINATAL PERIOD

Erin Hetherington, (University of Calgary)

Background Low social support during the perinatal period can increase the risk of postpartum depression and anxiety up at one year after giving birth but little is known about women's trajectories of social support during this time. This study will identify trajectories of social support among women from second trimester to 4 months postpartum. Methods Using data from a longitudinal birth cohort, All Our Families, 3231 women were asked about their percieved social support during their second trimester, third trimester, and at 4 months postpartum. Group based trajectory modeling was used to determine the number of groups, shape and proportion of women with differing trajectories. Model fit was assessed using Bayesian Information Criterion and model adequacy statistics. Multinomial regression was used to compare probability of group membership. Results Six distinct trajectory groups were identified, with the majority of participants belonging to groups with stable, high social support (60.6%) or stable moderate support (35.8%). Only 2.6% of women had consistently low levels of social support and 1% had rising levels. Groups with stable high support were more likely to have higher incomes, be Caucasian, lived in Calgary for over 2 years, lower levels of depressive symptoms at baseline, fewer pregnancy complications, and increased community engagement than those with low or rising trajectories. Among women who began with low support, those with persistent low levels were more likely to not be in the paid work force and have low levels of optimism compared to those with a rising trajectory (OR 2.72, 95% CI 1.05, 7.06 and OR 3.50 95% CI 1.36, 9.00). Conclusion The majority of women in this sample had high levels of social support that were maintained. Among women who began with low levels of support (3.6% of the overall sample), only a third improved over time. Targeted assistance for women with low levels of perinatal social support may improve outcomes.

INFANT OUTCOMES AFTER ELECTIVE EARLY-TERM DELIVERY COMPARED WITH EXPECTANT MANAGEMENT IN SOUTH CAROLINA, 2014 Jihong Liu, Sabrina Karim, Janice Probst, Judith Burgis, Elizabeth Crouch, Bo Cai (University of South Carolina)

Background: In 2013, South Carolina (SC) was the first state to adopt a nonpayment policy for elective, non-medically indicated, early-term deliveries (37-38 weeks gestation; EEDs) across both Medicaid and a major private payor. A 2011-2012 educational effort had reduced EED rates to 5.5%. Little is known about the prevalence of EEDs and associated infant outcomes in SC after the payment policy's implementation. Methods: A linked database of SC birth certificates, and maternal and infant hospital discharge data for all singleton live births delivered in 2014 was used and further restricted to full term (37-40 wks of gestation) infants without any medical or obstetric conditions that would justify delivery before 39 weeks (n=26,165). Using the Joint Commission's definition and based on both the timing and reason for delivery initiation, infants were categorized as: early-term deliveries (elective cesarean, elective induction, spontaneous, and medically-indicated) and deliveries at 39-40 weeks. Results: Over 5.0% of full term births were delivered via elective cesarean (3.7%) or elective induction (1.5%) in early term. Elective cesarean deliveries were more frequent among older women ($\geq$ 35)(5.9%), parous women with prior cesarean delivery (13.7%), having adequate plus prenatal care (5.1%), and obese women (I: 4.4%, II/III: 4.7%). Compared to infants delivered in 39-40 weeks, infants delivered via elective cesarean section in early term had higher risks of respiratory morbidity (adjusted odds ratios (AOR): 1.34) and neonatal hypoglycemia (AOR: 2.42), while having a lower risk of high birth weight ($\geq$4000g) (AOR: 0.57). Conclusion: Despite changed payment policy, one in 20 SC mothers experienced EEDs in 2014. Infants delivered via elective cesarean early term were at increased risks for adverse health outcomes. Additional programs are needed to inform providers and women about the health risks associated with elective early term delivery.

THE NUMBER OF BIRTHS IN CHINA IN 2015: POLICY MEETS SUPERSTITION Hongtian Li, Yubo Zhou, Jianmeng Liu (Institute of Reproductive and Child Health, Peking University Health Science Center)

Background: Enactment of the Selective Two-Child policy was expected to result in a mini-baby boom in China in 2015. Yet 2015 was also a Year of the Sheep, and children born during Sheep years are widely believed to be unlucky. Methods: We analyzed variations in the number of monthly (2014–2016) births, using newly available national data drawn at the county level from 29 of the 31 provinces in Mainland China. We looked for increases in births that could be attributed to the new Selective Two-Child policy, as well as decreases that could reflect reductions in births around the Year of the Sheep. Results: Compared with 2014, there was a 15.1% decrease in the number of births in 2015. Monthly data showed spikes in births just before and just after the "unlucky" year. Births declined in almost all provinces in 2015 (28 out of the 29), but there was a wide range in rates of reduction (0.7-41.3%), with the most pronounced reduction occurring in the eight north and northeast provinces (34.9-41.3%). Conclusions: In Mainland China in 2015, superstition based on the Chinese zodiac appears to have substantially influenced pregnancy and birth timing, confounding expert projections of increased fertility following the announcement of the Selective Two-Child policy. Reductions in births during 2015 were greatest in the north and northeast provinces, where the culture of the Year of the Sheep may have its ethnic roots.

IMPACTS OF THE 2014 MEDICAID EXPANSION ON PRECONCEPTION HEALTH AMONG WOMEN OF REPRODUCTIVE AGE Claire Margerison, Colleen MacCallum, Yasamean Zamani-Hank (Michigan State University)

Improved access to pre-conception health care is hypothesized to improve pregnancy health and outcomes. Yet, tests of this hypothesis are limited. The Affordable Care Act expanded Medicaid to all adults below 138% of federal poverty level, but participation in expansion differed by state, offering a natural experiment to examine whether increasing health care coverage for low income women of reproductive age improves self-reported health care access, health behaviors, or health outcomes. Using Behavioral Risk Factor Surveillance System 2011-2016 data for low income women 18-44, we applied a difference-in-difference analysis comparing change in prevalence of outcomes from pre-(2011-2013) to post- (2014-2016) Medicaid expansion between women who lived in Medicaid expansion states and women who did not live in expansion states. The percentage of women in expansion states who reported avoiding health care due to cost declined 11.9 percentage points post-expansion, compared to 6.8 points in non-expansion states (p<0.01, Breslow-Day test). Other outcomes that showed significantly greater improvement in expansion (vs. control) states included: had a check-up in past year +5.0 (vs. +2.3, p<0.01); in good to excellent health+1.6 (vs. +0.2, p=0.02); met aerobic recommendations +1.7 (vs. -0.5, p=0.04). Outcomes with non-significant improvement included taking blood pressure medicine (if hypertensive): +2.9 (vs. -1.9, p=0.08), taking insulin (if diabetic): 1.4 (vs.-3.0, p=0.32); had cholesterol check in past year: +3.2 (vs.+1.9, p=0.32); attempted to quit smoking in past year:+1.6 (vs. +0.4, p=0.54); received flu vaccine: +3.3 (vs. +2.4, p=0.19). Improvements were not seen in pap screening, body weight, or alcohol use. Results suggest Medicaid expansion improved many—but not all—pre-conception health measures among women of reproductive age. Next steps include examining impacts of Medicaid expansion on pregnancy health and outcomes.

THE PATH TO SAFE FACILITY DELIVERY IN INDONESIA: WHAT PROGRAM WORKS? Vitri Widyaningsih, Claudia Holzman, Claire Margerison-Zilko, David Todem, Steven Haider (Michigan State University)

Safe facility delivery (SFD) is an important strategy to improve maternal health, particularly in low-middle income countries. In Indonesia, where prevalence of SFD have been historically low (20.3% in 1980s), intervention programs were implemented over the past 3 decades that might increase SFD. This study assesses changes in SFD prevalence following 3 programs: the Village Midwife (1991), the Improving Awareness on Maternal Health/Alert Campaign (1998), and the Social Health Insurance (SHI) program (2005). We used data from six rounds of Indonesian Demographic and Health Survey (IDHS) covering 111,826 births from 1986 to 2012 to measure SFD, defined as having a skilled birth attendant and a facility birth. Using segmented logistic regression in STATA svy procedure we analysed: 1) the immediate change (shift in odds of SFD immediately after each program initiation); and 2) annual trends (change in odds of SFD per year after each program implementation). We adjusted analyses for socio-demographic characteristics and stratified by wealth and region. There was a significant increase in SFD immediately after the Alert Campaign in 1998 (aOR 2.06, 95%CI 1.60-2.67). Also, the odds of SFD increased each year after Village Midwife Program (aOR per year 1.02, 95%CI 0.99-1.06), the Alert Campaign (aOR 1.08, 95%CI 1.04-1.12) and SHI program (aOR 1.21, 95% 1.16-1.26). The trends differed by wealth and region. The SFD trend following SHI was more pronounced among women of low socioeconomic status (SES) living in Java Bali, compared to women in less-populated islands (effect modification $p<0.05$). A positive, though statistically significant trend in SFD was observed after the Village Midwife and Alert Campaign Program among women from other islands, specifically women of low SES. In Indonesia, the annual trend in proportion of safe facility deliveries increased following initiation of maternal health programs, however these trends varied by women's wealth and region.

LOWER PREVALENCE OF PRETERM BIRTH AMONG AFRICAN-AMERICAN PARTICIPANTS IN A FEDERAL HEALTHY START PROGRAM: A COMPARISON OF PROPENSITY SCORE METHODS Kelly Strutz, Zhehui Luo, Peggy Vander Meulen, Jennifer Raffo, Lee Anne Roman (Michigan State University)

Rigorous evaluations of programs that address preterm birth disparities for African-American women are needed. The Healthy Start national evaluation recommends and currently uses propensity score methods for this purpose, given that participants self-select into the program. However, no specific recommendations are made for choosing among propensity matching/weighting strategies. A quasi-experimental evaluation was conducted over a 7 year period (2009-2015) to examine preterm birth among African-American women enrolled in the Strong Beginnings federal Healthy Start program (n=698) compared to Medicaid-insured African-American nonparticipants (eligible n=2996) in Kent County, Michigan. Data came from linked programmatic records, vital records, census data, and Medicaid claims. After calculating propensity scores, several different matching-based and weighting-based estimators were used to estimate the average treatment effect in the treated program participants (ATT). Preliminary results indicate that Strong Beginnings participants were less likely to have a preterm birth than comparison women; ATT ranged from -0.02 (95% confidence interval [CI]: -0.06, 0.02) to -0.05 (95% CI: -0.09, -0.01). Thus findings were consistently favorable across methods, although effect sizes and statistical significance varied. Reporting across methods demonstrates robustness of findings and should be recommended at the national level.

SCREENING PREGNANT WOMEN FOR SUICIDAL BEHAVIOR IN ELECTRONIC MEDICAL RECORDS: DIAGNOSTIC CODES VS. CLINICAL NOTES PROCESSED BY NATURAL LANGUAGE PROCESSING Qiu-Yue Zhong, (Harvard)

Objective: We examined the comparative performance of structured, diagnostic codes vs. natural language processing (NLP) of unstructured text for screening suicidal behavior among pregnant women in electronic medical records (EMRs). Methods: Women aged 10-64 years with at least one diagnostic code related to pregnancy or delivery (N=275,843) from Partners HealthCare were included as our "datamart." Diagnostic codes related to suicidal behavior were applied to the datamart to screen women for suicidal behavior. Among women without any diagnostic codes related to suicidal behavior (n=273,410), 5,880 women were randomly sampled, of whom 1,120 had at least one mention of terms related to suicidal behavior in clinical notes. NLP was then used to process clinical notes for the 1,120 women. Chart reviews were performed for subsamples of women. Results: Using diagnostic codes, 196 pregnant women were screened positive for suicidal behavior, among whom 149 (76%) had confirmed suicidal behavior by chart review. Using NLP among those without diagnostic codes, 486 pregnant women were screened positive for suicidal behavior, among whom 146 (30%) had confirmed suicidal behavior by chart review. Conclusions: The use of NLP substantially improves the sensitivity of screening suicidal behavior in EMRs. However, the prevalence of confirmed suicidal behavior was lower among women who did not have diagnostic codes for suicidal behavior but screened positive by NLP. NLP should be used together with diagnostic codes for future EMR-based phenotyping studies for suicidal behavior.

EXOGENOUS ESTROGEN INCREASES VITAMIN D BINDING PROTEIN CONCENTRATION Quaker Harmon, Andrew Hoofnagle, Donna Baird (NIEHS)

Increasing awareness of the importance of adequate vitamin D has ignited interest in determinants of 25-hydroxyvitamin D [25(OH)D] and the role of the vitamin D binding protein (VDBP). Previous work has reported 1) differences in VDBP concentration by VDBP isoform, 2) associations between genetic variants in the VDBP gene (GC) and the concentration of 25(OH)D, and 3) increased VDBP concentration with use of exogenous estrogen. However older monoclonal immunoassays for VDBP had significant measurement error. We re-evaluate these findings using a valid VDBP assay in African Americans who have a high risk of vitamin D deficiency. We used a sample of 100 black women (age 24-36) from the Study of Environment, Lifestyle & Fibroids (SELF) to 1) quantify the concentration of VDBP and 25(OH)D using LC-MS/MS, 2) identify the isoforms of VDBP, and 3) examine differences in VDBP concentrations by isoform and by exogenous estrogen use. Differences were assessed using ANOVA without adjustment. In this population common isoforms of VDBP were Gc1f/Gc1f (51%), Gc1f/GC1s (22%) and Gc2/GC1f (22%). Mean VDBP concentration was 266 ug/ml and mean 25(OH)D was 16.0 ng/ml, neither differed by VDBP isoform (p=0.2 and p=0.9 respectively). Women using exogenous estrogen (combination birth control) (N=40) had elevated VDBP (322 ug/ml) compared to those not using exogenous hormones (N=60) (230 ug/ml, p<0.001). These findings support previous associations between exogenous estrogen and increased VDBP, although the biological relevance of this finding is unclear. Earlier reports of an association between VDBP isoforms and the concentration of VDBP are likely due assay error. Although GWAS studies have suggested that functional polymorphisms in GC are associated with 25(OH)D we do not find evidence that VDBP isoforms themselves are associated with 25(OH)D. Previously identified associations in vitamin D biomarkers must be re-evaluated using valid assays in populations of interest.

THE EFFECTS OF MODERATE TO VIGOROUS INTENSITY SPORTS AND EXERCISE ACTIVITY DURING PREGNANCY ON INFANT SIZE AT BIRTH Samantha Ehrlich, Romain Neugebauer, Monique Hedderson, Assiamira Ferrara (University of Tennessee Knoxville)

Studies of the association of physical activity during pregnancy with infant size at birth have yielded inconsistent results. This study estimated the causal effects of moderate to vigorous intensity sports and exercise activity during pregnancy on delivering large and small for gestational age infants (LGA and SGA, respectively). Data come from PETALS, a diverse pregnancy cohort (n= 1,691) of women delivering at Kaiser Permanente Northern California (KPNC) from February 2014 to October 2016. Participants completed a study survey at 12.7 weeks gestation (SD 2.3) which included a pregnancy physical activity questionnaire; active pregnancy was defined by the upper quartile for moderate to vigorous intensity sports and exercise activity. Infant data were obtained from the electronic health records, and LGA and SGA designations (>90th and <10th percentiles, respectively) based on KPNC's race-ethnicity and gestational age–specific birthweight distributions. The causal risk differences for LGA and SGA if all pregnancies had been active versus non-active were estimated with Targeted Maximum Likelihood using linear marginal structural models for a single time-point intervention. Propensity scores were estimated by logistic regression using pre-exposure covariates only (e.g., prepregnancy BMI, diet, education). The causal risk difference for all women having had active pregnancies versus non-active pregnancies was -0.0305 (95% CI -0.0559, -0.00520; P= .02) for LGA and 0.0339 (95% CI -0.00341, 0.0713; P= .07) for SGA. These results suggest that, at the population level, active pregnancy for all would modestly shift the distribution of infant size to the left and that the clinical impact would be negligible. As such, this study provides additional assurance to providers and women of the safety of moderate to vigorous intensity sports and exercise during pregnancy.

BARRIERS AND FACILITATORS RELATED TO BREASTFEEDING AMONG WOMEN RECEIVING MEDICATION-ASSISTED TREATMENT FOR OPIOID USE DISORDER Laura Garrison, Alyssa Ortega, Yuridia Leyva, Andrea Baca, Sandra Cano, Elizabeth Jimenez, Nicole Yonke, Lawrence Leeman, Ludmila N. Bakhireva (University of New Mexico)

Leading professional health organizations worldwide have endorsed breastfeeding (BF) among women receiving medication-assisted treatments (MAT) for opioid use disorder (OUD); however, BF rates among women with OUD are significantly lower than in the general population. Socio-structural factors and self-efficacy are key predictors of BF in the general population, but BF barriers and facilitators in women with OUD are largely unknown. This pilot study examines self-efficacy, BF barriers and facilitators among 6-week postpartum women with OUD attending a comprehensive prenatal specialty program. Participants had to be at least 18 years of age, between 4 and 8 weeks postpartum, prescribed MAT prenatally, and English-speaking; women were excluded if their provider had advised against BF due to medical complications. As of January 2018, 35 eligible patients (29 on buprenorphine and 6 on methadone) had enrolled and completed a semi-structured interview, which included the New General Self-Efficacy Scale (NGSES) and questions about the participant's decision to continue or discontinue BF. Prevalence and the most common reasons for BF discontinuation were summarized; mean self-efficacy score was compared among those who continued vs. never or discontinued BF. Mean age of participants was 29.2 years; nearly 75% were multiparous. By 6-weeks postpartum, 51.4% of subjects were neither directly breastfeeding nor giving pumped breastmilk (28.5% started but discontinued and 22.9% never breastfed). Similar BF rates were observed among those on buprenorphine vs. methadone (p >0.05). Among those who discontinued, 50% indicated they had not breastfed as long as desired. Self-efficacy was lower among those who never breastfed or discontinued (32.4 vs. 34.8); however, differences did not reach significance (p=0.24), possibly due to a limited power. Among those still BF, infant health benefits and mother-infant bonding were cited most commonly as reasons for continued BF (100% and 35.3%, respectively). Among those who never breastfed or discontinued, concerns about exposing the infant to MAT and about insufficient milk supply were most common (50% and 39%, respectively). The study findings highlight the need for appropriate BF promotion, education, and supportive services targeting postpartum women with OUD.

MATERNAL ANESTHESIA DURING EARLY PREGNANCY AND RISK OF BIRTH DEFECTS IN THE NATIONAL BIRTH DEFECTS PREVENTION STUDY, 1997-2011 Sarah Fisher, Kamalnain Siag, Meredith M. Howley, Alissa R. Van Zutphen, Jennita Reefhuis, Marilyn L. Browne (New York State Department of Health)

There is little recent evidence of the effects of anesthesia during early pregnancy on the developing fetus. We used National Birth Defects Prevention Study (NBDPS) data to estimate the risk of birth defects associated with early pregnancy anesthesia exposure. NBDPS includes more than 50 major structural birth defects; we analyzed those with at least 100 cases. We used logistic regression to separately assess associations between general and local anesthesia for non-obstetric surgery during the month before through the third month of pregnancy and individual birth defects. We calculated odds ratios and 95% confidence intervals for 25 birth defects with at least 5 exposed cases (11,504 controls, 24,982 cases), adjusted for maternal race/ethnicity, age, body mass index, first trimester exposure to X-ray, CT, or radionuclide scans, and study site. Overall, 230 case and 73 control mothers reported early pregnancy general anesthesia; 236 case and 89 control mothers reported early pregnancy local anesthesia. Mothers who reported general or local anesthesia were more likely to be non-Hispanic white, over age 35, overweight or obese, and to report at least one X-ray, CT, or radionuclide scan during early pregnancy. Mothers who reported general anesthesia were also more likely to report early pregnancy injury. The most commonly reported general anesthesia procedures were dental procedures (16% of control procedures, 15% of case procedures), cholecystectomy (9% of control procedures, 12% of case procedures), cervical cerclage (9% of control procedures, 11% of case procedures), and appendectomy (5% of control procedures, 7% of case procedures). We did not observe any significant associations between either type of anesthesia exposure and the birth defects studied. In general, odds ratios were close to null and imprecise. Our findings suggest that anesthesia during early pregnancy is not strongly associated with the birth defects assessed in this study.

Unit policies and breast feeding at discharge of very preterm infants: The EPIPAGE-2 cohort study Ayoub Mithaa,b, Aurélie Piedvachea, Isabelle Glorieuxc, Jennifer Zeitlina, Jean-Michel Rouéd, Béatrice Blondela, Mélanie Duroxa, Antoine Burguete, Monique Kaminskia, PierreYves, Ancela,f, Véronique Pierrata,b and the EPIPAGE-2 Neurodevelopmental Care Writing Group (INSERM, CHU Lille)

BACKGROUND: Facilitating factors and barriers to breast feeding a preterm infant have been poorly studied at a national level. We aimed to describe breast feeding at discharge (BFD) for very preterm infants and to analyze factors associated with BFD, with a special focus on unit characteristics.
METHODS: We evaluated BFD in 2890 very preterm children enrolled in EPIPAGE-2, a French national cohort. Breast feeding support policies (presence in units of professionals trained in human lactation), presence of a neurodevelopmental care training program (none, introductory course, sensory motor program, Newborn Individualized Development Care and Assessment Program [NIDCAP]), and regional breast feeding rates in the general population were investigated by a multilevel logistic regression analysis. **RESULTS:** 47.2% (range 21.1% to 84.0%) of preterm infants were breastfed at discharge. Unit policies explained a large part of the variation in breast feeding rates among units, regardless of individual factors. Overall, 9.7% and 53.4% of the units had trained professionals, full-time available for breast feeding support, and training in neurodevelopmental care, respectively. Rate of BFD was increased with kangaroo care during the first week of life (adjusted odds ratio [aOR] 1.40 [95% confidence interval (CI) 1.14, 1.73] and in NIDCAP units (aOR 1.48 [95% CI 1.07, 2.04]) but not regional breast feeding rates in the general population.
CONCLUSION: Unit policies affected BFD in very preterm infants, independent of breast feeding rates in the general population. Through unit policies, there is a pragmatic and realistic potential to increase the breast feeding rate in preterm population.

S/T=Student/Trainee