environmental exposure; (2) geospatial and demographic inequality (historic and current) around housing/neighborhood conditions contributing to disproportionate environmental exposures for low-income and minoritized residents; (3) health implications of environmental exposures; (4) prior policy addressing the connections between housing/neighborhoods and environmental risk; and (5) future policy recommendations to improve housing/neighborhood quality and minimize environmental exposures for residents. DISCUSSION/SIGNIFICANCE: This project will illuminate connections between housing conditions and environmental exposures, health implications of these exposures, and contribute to advancing understanding of potential policies to reduce adverse environmental health impacts of poor housing conditions for residents (particularly for low-income, minoritized groups).

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Impact of Pennsylvania Medicaid payment policy change on rural versus non-rural hospital implementation of immediate postpartum long-acting reversible contraception

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OBJECTIVES/GOALS: To apply implementation science strategies to evaluate the impact of the 2016 Pennsylvania (PA) Medicaid payment policy change on hospital-level access to immediate postpartum long-acting reversible contraception (IPP LARC), an evidence-based strategy to increase contraceptive access; to identify differences by rurality and academic status. METHODS/STUDY POPULATION: We conducted a web-based, IRB-exempt survey of Labor and Delivery (L&D) leaders at all PA hospitals in Summer-Fall 2022, assessing hospital characteristics, contraceptive practices, and facilitators/barriers to IPP LARC implementation, using concepts from health services studies of small subsets of implementing hospitals; we translate these concepts into policy evaluation by sampling the complete population of Pennsylvania hospitals with active L&D units. L&D hospitals were characterized as sustainers if they implemented by 2019 and continued to provide IPP LARC, as implementers if they implemented IPP LARC in 2020-22, and non-implementers if they had not started the process. We use the Center for Rural Pennsylvania definition of rural: counties with RESULTS/ANTICIPATED RESULTS: We collected data from 48/74 (64.9%) hospitals with L&D units. Hospitals were heterogenous with 18/48 (37.5%) in rural counties and 15/48 (31.3%) identifying as academic. A minority of hospitals provide IPP LARC, with 17/48 (35.4%) offering implants and 16/48 (33.3%) offering intrauterine devices (IUD) immediately postpartum. Before the PA Medicaid payment policy change, few offered implants [4/48 (8.3%)] or IUDs [1/48 (2.1%)]. Non-rural hospitals implemented IPP LARC more often and on an earlier timeline than rural hospitals: [7/30 (23.3%) v 3/18 (16.7%)] sustainers, [5/30 (16.6%) v 2/18 (11.1%)] implementers. Common facilitators include clinical champions, meeting patient needs, and adequate knowledge. Planned analyses include implementation barriers, and impact of external implementation support. DISCUSSION/SIGNIFICANCE: Despite unmet need in rural populations for evidence-based contraception, rural hospitals were less likely to implement IPP LARC. Implementation support should

be designed to meet the needs of rural hospitals. Implementation science methods can be translated to evaluate the impact of healthcare policy on access to care.

Team Science

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A Comparison of Bone Stresses in Transtibial and Transfemoral Osseointegrated Prostheses

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OBJECTIVES/GOALS: This investigation aimed to develop and validate a subject-specific finite element analysis (FEA) model with subject-specific mechanical loads during walking and to use this method to compare mechanical stresses between transfemoral and transtibial osseointegrated (OI) implants. METHODS/STUDY POPULATION: One patient with a unilateral transtibial OI prosthesis and one with a unilateral transfemoral OI prosthesis participated in motion analysis to collect kinematics and ground reaction forces during overground walking. Subject-specific musculoskeletal models were created, and static optimization was used to estimate muscle and joint reaction forces throughout walking. 3D FEA models of the tibia, femur, and implants were created using ScanIP and exported into ABAQUS CAE. Muscle forces were applied at corresponding origin/insertion locations, determined from the musculoskeletal models [7]. Fixed boundary conditions were applied at proximal joint centers, and bone stresses throughout gait were calculated. OpenSim and FEA derived estimates of joint reaction forces were compared for validation. RESULTS/ANTICIPATED RESULTS: A maximum stress of 65.53 MPa and 60.70 MPa was observed at the bone-implant interface for the transtibial and transfemoral patients (respectively) in the late stance phase of the walking task, corresponding to terminal stance and heel off. Averaged root mean squared errors of the walking task (in the anterior-posterior, inferior-superior, and medial-lateral directions, respectively) for the transtibial and transfemoral patients were (124, 152, 80) N, (71, 80, 30) N, and (190, 62, 30) N, respectively. DISCUSSION/SIGNIFICANCE: The purpose of the above study was to develop a methodology for determining subject-specific mechanical loads during walking using finite element analysis and compare mechanical stresses in patients with transfemoral and transtibial OI. Similar stresses between the two implant types were found.

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A CTS Team Approach to Developing an Effective Vaccine for Non-Typhoidal Salmonella*

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OBJECTIVES/GOALS: Non-Typhoidal Salmonella causes over 95 million infections globally each year, and no effective vaccine exists to combat infections in humans. The goal of this study is to determine the immune protection provided by a novel extracellular

vesicle (EV)-based vaccine generated using lab-strain Salmonella against wastewater-derived Salmonella. METHODS/STUDY POPULATION: We isolated Non-Typhoidal Salmonella (NTS) from raw influent wastewater samples collected from two wastewater reclamation facilities (WRF) in Gainesville, FL. Whole genome sequencing was performed on each isolate and compared to sequences of clinically-derived isolates in FL during our study period to identify a clinical and subclinical isolate for assessing EV based vaccine protection. Mouse serum and stool samples were collected from a cohort of EV-vaccinated mice. Surrogates of protection against Salmonella used anti-Salmonella IgA in the feces of these mice, and anti-Salmonella IgG in serum of the mice, by using ELISAs coated with whole cell lysate collected from the two wastewater-derived isolates. RESULTS/ANTICIPATED RESULTS: We have previously shown that an EV vaccine provides protection against Salmonella enterica Serovar Typhimurium, the serovar used in the generation of the EV vaccine. We anticipate that the EV vaccine generates additional protection against the community-acquired strains, which will be characterized by increases in fecal IgA and serum IgG against two community Salmonella isolates that is similar to responses against the serovar used to generate the EV vaccine (Typhimurium). DISCUSSION/SIGNIFICANCE: This study will improve the translation of our vaccine studies by demonstrating the efficacy of our novel EV vaccine against circulating Salmonella isolates.

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A CTS Team Approach to Fetal Hyperinsulinemia in Diabetic Pregnancy and its Effects on Vasculature and Early Life Metabolism

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OBJECTIVES/GOALS: Fetal glucose dynamics mediate many of the adverse outcomes seen in infants of diabetic mothers (IDM). The goals of this study are to identify: (1) rates of blood glucose change in normoglycemic and hypoglycemic IDM; (2) their relation to in-utero insulin exposure; and (3) their transcriptional impacts on placental and umbilical vasculature. METHODS/STUDY POPULATION: Using a longitudinal prospective study design, placental/umbilical cord tissue and maternal hemoglobin A1c (HbA1c) are being collected from mothers diagnosed with Type 1, Type 2, or gestational diabetes mellitus. Blood glucose levels are also collected from their infants at birth, and every 3-4 hours for up to 9 hours to determine the rate of change. Linear regression modeling will be used to determine associations between placental and umbilical endothelial RNA expression, umbilical cord insulin levels, and maternal HbA1c within each diabetic sub-type. Gene expression from endothelial specimens will be compared between diabetic sub-types and between normoglycemic and hypoglycemic infants via paired t-tests using Benjamini-Hochberg procedure for false discovery rate correction. RESULTS/ANTICIPATED RESULTS: We hypothesize the following; (1) glucose levels will have a steeper rate of change in hypoglycemic infants; (2) maternal HbA1c and in-utero insulin levels will correlate with the level of transcriptional change identified in placental and umbilical endothelial samples; (3) a negative association will exist between cord insulin levels and the rate of change in infant glucose levels; and (4) a positive association will exist between cord insulin level and transcriptional change on the placental and umbilical endothelium. DISCUSSION/SIGNIFICANCE: Identifying gene expression changes in diabetic placental/umbilical endothelium, and the role of insulin/glucose in these changes, is key to managing diabetic vasculopathy and its adverse outcomes. Understanding infant insulin response may also guide management of hypoglycemia and decrease the risk for neonatal intensive care unit admission.

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A CTS team approach to identifying thematic constructs related to kratom use during pregnancy and breastfeeding: A qualitative analysis of social media posts

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OBJECTIVES/GOALS: Research on the safety of perinatal kratom use - an herb that acts on opioid receptors - is scarce. Our transdisciplinary clinical and translational science (CTS) team is conducting parallel qualitative analyses of subreddit posts related to kratom use during (1) pregnancy and (2) breastfeeding. METHODS/STUDY POPULATION: Pregnancy- and breastfeeding-related keywords are being used to extract posts and selected metadata from the following subreddit communities: r/kratom, r/quittingkratom, r/pregnant, and/or r/breastfeeding. After the removal of duplicate posts, posts written in a non-English language and those that state in the post text and/or title that they were published by minors (RESULTS/ANTICIPATED RESULTS: Among the eligible posts, the number of unique usernames of the sources publishing the posts; the range of publication dates; and the mean, median, & range of the number of comments per post will be presented. Inter-rater concordance in thematic coding will be computed. A word cloud will be created with the most used nouns from the eligible posts. Verbatim quotes will be shown to illustrate themes depicted in the sample. The quantitative and qualitative analyses will be conducted separately for the posts related to kratom use during pregnancy and breastfeeding. DISCUSSION/SIGNIFICANCE: These findings could assist clinicians in identifying questions that obstetric patients may have regarding the perinatal use of this emerging substance of concern. Further research is needed to validate these findings using other social media data, such as Twitter.

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A novel mouse model of COVID-19

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OBJECTIVES/GOALS: Rodents are the most widely used experimental animals to study disease mechanisms due to their availability and cost-effectiveness. An international drive to investigate the pathophysiology of COVID-19 is inhibited by the resistance of rats and mice to SARS-CoV-2 infection. Our goal was to establish an appropriate small animal model. METHODS/STUDY POPULATION: To recreate the cytokine storm that is associated with COVID-19, we injected angiotensin converting enzyme 2 knockout (ACE2KO) mice (C57Bl/6 strain) with lipopolysaccharide (LPS) intraperitoneally and measured the expression of multiple cytokines as a function of time