adults but tend to decline with age, especially in Alzheimer's disease (AD) patients. METHODS/STUDY POPULATION: Physical balance (PB) impairments further exacerbate this decline, affecting the quality of life and independence. Balance training (BT) emerges as a potential non-pharmacological intervention to enhance EF. This study aims to 1) assess the association between PB impairments and EF deterioration in older adults with AD; 2) evaluate the impact of BT on EF enhancement in this population; and 3) explore changes in brain-derived neurotrophic factor (BDNF) biomarkers before and after physical activity related to BT. This pilot study employs a cross-sectional design with older Hispanic adults (>65 years) in Puerto Rico, comparing a control group without BT intervention to an experimental group with BT intervention. Both groups will be assessed for EF and BDNF biomarkers pre- and post-physical activity. RESULTS/ANTICIPATED RESULTS: Expected outcomes include identifying significant correlations between PB impairment and diminished EF, demonstrating measurable EF improvements following BT, and evidencing sustained BDNF release post-BT despite PB impairments. By understanding the biological mechanisms linking BT and cognitive improvements, particularly the role of BDNF, this research could inform future strategies to mitigate cognitive decline in AD patients through targeted physical interventions. DISCUSSION/SIGNIFICANCE OF IMPACT: The findings of this study could provide valuable insights into the development of new preventive interventions, enhancing the quality of life and independence for older adults.

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Beyond checking the box: Engagement and capacity building of persons with lived expertise in research

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OBJECTIVES/GOALS: There has been a significant increase in the engagement of researchers with persons with lived and living experience, driven by a growing recognition of the invaluable insights and expertise these individuals bring to the research process. However, there remains a need for research teams to learn how to engage with patients and community partners. METHODS/STUDY POPULATION: The EMPOWER project is a collaborative of members with lived/living expertise of substance use during pregnancy. EMPOWER meets three times per month in support of their goals of patient-centered research, changing the narrative through conversations, and building the capacity of persons with lived experience to co-lead research. Through over 4 years of active collaboration and co-learning, EMPOWER has identified and created methods that support meaningful patient engagement and capacity building. RESULTS/ANTICIPATED RESULTS: EMPOWER has identified the following methods that support meaningful engagement and capacity building: Mind-Mapping Exercises, Personal and Collective Journey Mapping, 8-month research training curriculum, Digital Storytelling, Learning Labs, and World Cafe Meetings. These methods have led to a collaborative of 20 individuals with lived experience of substance use to identify research gaps, prioritize research questions, design data collection tools, analyze research data, disseminate research results, and consult with healthcare teams in efforts to improve clinical care. To-date EMPOWER have given over 10 invited presentations and is currently writing manuscripts. DISCUSSION/SIGNIFICANCE OF IMPACT: Meaningful patient and community engagement is critical to developing and implementing healthcare interventions. Unfortunately, engagement efforts are often lack in building capacity of patients and community, which impedes their ability to fully engage in all phases of research.

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Acceptability of a Mobile K-12 School-Based Clinic for pediatric diabetes and obesity care*

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OBJECTIVES/GOALS: To determine the acceptability of a mobile/school-based diabetes and prevention clinic to overcome transportation barriers and improve attendance at endocrinology appointments for youth with type 1 diabetes, type 2 diabetes, MODY diabetes, and obesity living in socially vulnerable communities METHODS/STUDY POPULATION: This study utilized a 3-phase implementation process focused on feasibility, demand, and acceptability. Phase 1: identified high-need areas using patient volume and disease control metrics. Collaborated with school districts to define needs, enrolled them through a memorandum of understanding, and subsequently recruited and consented existing patients attending these schools. Phase 2 piloted the program to refine logistics and workflows. Semi-structured interviews and surveys were conducted with caregivers to assess program acceptability and satisfaction. Phase 3 is ongoing and will track clinical outcomes including glycemic control, appointment attendance, hospital admissions, emergency department visits, and self-management metrics. RESULTS/ANTICIPATED RESULTS: Demand for the program was high with 91% (10/11) of approached districts agreeing to participate. District enrollment was staggered, starting with 1 district in August 2023, expanding to 5 in September, 7 in October, and reaching 8 districts by May 2024. From August 2023 to July 2024, the school-based mobile clinic conducted 355 individual clinical encounters addressing diabetes and obesity. The encounters included 180 for type 1 diabetes, 69 for type 2 diabetes, 8 for MODY diabetes, and 98 for obesity. Interviews and surveys with 36 caregivers are ongoing to evaluate program satisfaction. DISCUSSION/SIGNIFICANCE OF IMPACT: The data suggest that this innovative healthcare delivery model is feasible. District-level enrollment demonstrates a demand for the program. Results from the interviews and surveys will further characterize the program's acceptability among caregivers and lay the groundwork for future efficacy testing.

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Adversities, Distress, and Resilience in Hispanic Pregnant Women from Puerto Rico

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OBJECTIVES/GOALS: Pregnancy increases vulnerability to stress and mental health symptoms, particularly among Hispanic women in Puerto Rico (PR), a population with unique socioenvironmental adversities, such as poverty and natural disasters. This study examined the relationships between life adversities and psychological distress in this at-risk population. METHODS/STUDY POPULATION: Participants ($n = 50$) in this cross-sectional study were recruited from an obstetrician's office in Southern PR. All participants provided written consent and completed the Adverse Life Experiences Scale

(ALES, Cronbach's alpha = 0.71) to identify lifelong adversities faced and the overall duration (chronicity). Measures of psychological distress included the Perinatal Anxiety Screening Scale (PASS, Cronbach's alpha = 0.96), the Edinburg Postnatal Depression Scale (EDPS, Cronbach's alpha = 0.87), the Perceived Stress Scale (PSS, Cronbach's alpha = 0.79), and the Brief Resilience Scale (BRS, Cronbach's alpha = 0.86). Descriptive and Spearman's rho correlation analyses were conducted. RESULTS/ANTICIPATED RESULTS: The mean age of the participants was 27.90 years (SD = 6.05), with most in the first trimester (66.0%). On average, participants reported 4.32 (SD = 3.1) out of 23 lifetime adversities. The most common adversities were natural disasters (60.0%), loss of a beloved (58.0%), and financial difficulties (38.0%). Nearly half (44.0%) experienced five or more adversities. A significant number of participants met the clinical threshold for anxiety (38.0%, PASS), depression risk (22.0%, EPDS), moderate-to-severe perceived stress (52.0%, PSS), and low resilience (24.0%, BRS). The overall duration of adversities was significantly associated with anxiety (rs = 0.50, p = 0.001) and stress (rs = 0.50, p = 0.007). DISCUSSION/ SIGNIFICANCE OF IMPACT: Hispanic pregnant women in PR face high levels of adversity and distress, which can negatively affect both maternal health and fetal development, influencing long-term child outcomes. Early identification and targeted interventions addressing adversities, can improve maternal mental health and child health-development outcomes.

Informatics, AI and Data Science

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Income predicts low back pain but not lumbar disc height: Data for the UK Biobank Image Dataset

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OBJECTIVES/GOALS: Here, we utilize deep learning to automate the analysis of dual X-ray absorptiometry (DEXA) scans in the UK Biobank (UKB) imaging dataset to enable a large-scale assessment of lumbar spine disc degeneration, low back pain, and socioeconomic status. METHODS/STUDY POPULATION: Study Population: The UKB is a biomedical database that includes lateral spine DEXA imaging for 50,000 participants. Deep Learning Model Development: A computer vision model was developed that receives a DEXA scan as input and outputs a quadrilateral that corresponds to the corners of 5 lumbar vertebral bodies. The model is a deep, fully convolutional, encoder–decoder network using DeepLabV3. Statistical Analysis: To determine our preliminary model accuracy, we used the intersection over union (IoU) metric. We analyzed data using an ordinal regression model to determine the relationship between income/ neighborhood level multiple deprivation index (MDI) and low back pain (LBP), as well as a mixed effects model to estimate the relationship between income/MDI and disc height index (DHI). RESULTS/ANTICIPATED RESULTS: Our model predicted vertebral body quadrilaterals in training and unseen test data (train IoU = 0.96, test IoU = .91) and was used to infer data for 10,440 participants. Confirming previous studies, there were significant relationships (p0.05) between income or MDI and DHI (Figure 2). DISCUSSION/SIGNIFICANCE OF IMPACT: Low back pain is the world's leading cause of disability, and socioeconomic factors play an important role. We found no relationship between disc height index and socioeconomic status. Thus, disc degeneration may not be a factor in this low back pain phenotype.

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Modeling long-term environmental effects on discrete events using shapelets: An application for stillbirth

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OBJECTIVES/GOALS: To develop an informatics framework that will allow study of environmental effects on stillbirth at large scale (i.e., US-level) and leverage recent advances in machine learning and artificial intelligence to produce reproducible results that can be compared across multiple institutional settings. METHODS/ STUDY POPULATION: Experimental exposure data are often available in "absolute time," where a clinical event can be anchored using a timeline transformation. We associate each stillbirth event with a set of $\{t_i…t_{i+1}\}L$ shapelets [1] associated with a location, L, and time intervals for the entire dataset. These shapeless are aggregated using a state-of-the-art shapelet classifier [2]. An autoencoder is used to reduce the dimensionality of the stillbirth classification and to cluster stillbirth events according to their corresponding exposure patterns. The stillbirth cluster can be analyzed for other nonexposure (i.e., genetic, SDoH, and demographics) factors, which may be enriched and/or depleted. RESULTS/ANTICIPATED RESULTS: The framework we are developing leverages a shapelet-based approach to produce clusters of stillbirth events according to their corresponding exposure patterns. These clusters can be analyzed for depletion or enrichment of nonenvironmental factors. This analysis will inform how to formulate (or not) class models of exposure that can be more informative and have better predictive power than overall population models. Moreover, the finding of depletion and enrichment of physiological properties of the individuals may lead to novel physiological hypotheses to better understand the injury mechanisms that the environmental exposure profile produces. DISCUSSION/SIGNIFICANCE OF IMPACT: Nearly 20,000 babies are stillborn in the USA each year [3]. Environmental exposures, usually studied as time averages over certain periods of time, have produced mixed results for stillbirth risk [4]. However, temporal profiles matter [1], and we argue that they can be assessed using shapelet technology.