

score greedy nearest neighbor one-to-one matching algorithm. We matched children with (treatment) and without (comparison) an allergy specialist visit in 2018. The propensity score model included 26 covariates (demographic, clinical, and social determinants of health). Multivariable adjusted logistic regression was used to estimate adverse asthma events (AAE: emergency department visit or inpatient hospitalization with a primary or secondary diagnosis of asthma in 2019). RESULTS/ANTICIPATED RESULTS: We identified 3,031 children with an allergy specialist visit in 2018, and successfully propensity-score matched 2,910 of the treatment group with a non-allergy specialist visit comparison group. The rate of AAEs in 2019 was 9.5% for individuals with an allergy specialist visit versus 10.1% among those without a specialist visit ($p=0.450$). The adjusted regression analysis showed 20.3% lower rates of AAEs (aOR: 0.797; 95% Confidence Interval: 0.650, 0.977; $p=0.029$) in 2019 for children with an allergy specialist visit in 2018 compared to those that did not. DISCUSSION/SIGNIFICANCE: Utilizing allergy specialist care was associated with better asthma outcomes in our statewide study of Arkansas Medicaid-enrolled children with asthma. Asthma quality metrics based on guideline-based recommendations for allergy specialist care should be considered in population health management programs.

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Scaffolding Learning through Digital Play: Translating Theory to Practice

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OBJECTIVES/GOALS: Scaffolding aids learning by gradually removing assistance to encourage independence (Bickhard, 2013; Gross, 2015). Mightier is a commercially available biofeedback game that fosters emotion regulation (ER) skill practice through play. This study aims to evaluate the ability of Mightier to scaffold the learning of ER and reduce irritability. METHODS/STUDY POPULATION: Data were collected via online caregiver report. Inclusion criteria were age of child (≤ 18 years) and study enrollment prior to the child engaging with Mightier. Children wear a heart rate (HR) monitor while playing games in the Mightier app library. As their HR increases, play becomes more difficult. Children can pause the game to use a scaffolded ER activity or regulate independently to return the game to normal difficulty levels. Caregivers were instructed to use the game ad libitum. Participants included caregivers of 195 children (Mean = 7.84 years old; range = 4-18 years old; 24.28% female; 74.57% male); the sample was predominantly White (56%). Caregivers completed the Affective Reactivity Index, a measure of their child's irritability, before and after playing Mightier for 8-12 weeks. RESULTS/ANTICIPATED RESULTS: A first Wilcoxon Signed Rank Test revealed a significant reduction in the ratio of scaffolded cooldowns (using a guided activity to regulate) to total cooldowns on the first play day ($Md = .50$) versus the last play day ($Md = .22$), $z = -6.51$, $p < .001$. A second test revealed a statistically significant increase in the ratio of independent cooldowns (regulating on their own) to total cooldowns on the first play day ($Md = .50$) versus the last day of play ($Md = .80$), $z = 6.34$, $p < .001$. Given the significant, inverse relationships between scaffolded and independent ER on the first play day versus the last play day, further analyses will examine potential mediation and moderation effects of game engagement (play minutes, total cooldowns, scaffolded cooldowns, and independent cooldowns) on changes in irritability.

DISCUSSION/SIGNIFICANCE: ER is vital for healthy development and protects against mental health challenges (LeBlanc et al., 2017). Across domains, scaffolded practice promotes learning (Vygotsky, 1978). Results reveal that scaffolded practice leads to independent ER during play. Future research should explore whether this pathway leads to independent ER outside of play.

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Temporal Trends in Young Adult Cannabis and Tobacco Use in Relationship to Cannabis Policy

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OBJECTIVES/GOALS: Cannabis laws may impact cannabis and tobacco use, given high prevalence of co-use of these products among young adults (YAs). The objective of this study was to examine trends in YA any cannabis, blunt, cigarette, and cigar use from 2002-2018 in states that passed adult and medical use (AMU) or medical use only (MUO) cannabis laws during that time ($N=16$). METHODS/STUDY POPULATION: Using data from the National Survey on Drug Use and Health, we conducted a segmented regression analysis to calculate absolute percent change (APC) in past 30-day cannabis and tobacco use between time points. The National Cancer Institute's Joinpoint software was used to also estimate points of inflection (Joinpoints) when the slope of a trend significantly ($p<0.05$) changes. Separate models were estimated for each state, with time as the independent variable measured in years. Up to three Joinpoints per model were allowed. The model with optimal Joinpoints was determined using a model selection criterion via a permutation test. Joinpoints and APCs were compared with key legalization dates to describe patterns within and across states with varying cannabis policies. RESULTS/ANTICIPATED RESULTS: Generally, the 16 states showed a steady decline in YA cigarette smoking over time, a slight decline in cigar smoking, and increases in cannabis and blunt use. AMU states had lower average 2018 prevalence of cigarette smoking than MUO states (18.3% vs. 21.5%) and higher cannabis use (32.3% vs. 21.3%). Cannabis use consistently increased following opening of MUO retail outlets. Generally, there appears to be a slight delay in cannabis use increases following AMU laws, and in some states temporary declines. For example, Washington experienced an initial decrease (-20.3%) following AMU passage (2012) then increase (+16.3%) after retail dispensaries opened in 2014. In AMU states, blunt use has surpassed cigar smoking, while in MUO states, the prevalence of blunt and cigar use is similar. DISCUSSION/SIGNIFICANCE: Introduction of cannabis laws are correlated with increases in YA cannabis and blunt use, with higher cannabis use in AMU states. Trends may also correlate other state political, economic, or social factors. Joinpoint regression can assess changes in a policy's target behavior with no a priori assumptions regarding timing of policy effects.

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Roles and Expectations for Evaluators within a Learning Health System

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OBJECTIVES/GOALS: Our objective is to explore the evolving role of evaluators within Learning Health Systems (LHSs) and the

implications for evaluation approaches in these dynamic healthcare environments. We aim to disseminate lessons learned to help inform best practices for other CTSA hubs operating under a LHS model. **METHODS/STUDY POPULATION:** Our investigation builds upon our prior qualitative analysis of the LHS literature and contextualization of unique challenges, and potential remedies, of a LHS in Academic Health Centers. As evaluators, we are particularly interested in understanding how evaluation work is conducted in LHSs and exploring ways to optimize the role of evaluators and their skillset in this context. For this investigation, we examined the competencies necessary for evaluators working in LHS and the specialized evaluation approaches needed to fulfill these requirements. Our approach drew from multi-faceted data and experience. We leveraged insights from our literature review, direct experience within WFUSOM CTSI, and discussions with other evaluators. This combination of data sources provided the foundation for our analysis. **RESULTS/ANTICIPATED RESULTS:** We expect that as more health systems move toward the LHS model, they will have an increased need for various forms of evaluation, requiring resources well beyond what they are currently dedicating to evaluation. Expectations for evaluators will be enhanced in the following distinct, yet complementary, categories: generating new knowledge and translating research knowledge into practice. Anticipated results include identifying essential competencies for evaluators in LHS, such as data proficiency, clinical understanding, and adaptive skills. We also expect to uncover various evaluation approaches specific to LHS, including quality improvement studies, pragmatic trials, and stakeholder-engaged research. **DISCUSSION/SIGNIFICANCE:** Understanding the evolving role of evaluators and specialized evaluation approaches in LHS is crucial. It enhances the ability to generate localized evidence, customize interventions, and improve patient care. This knowledge empowers healthcare systems to adapt, innovate and deliver high-quality care for a higher impact on patient outcomes.

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Validating a Coding Tool for Translational Science Benefits Model (TSBM) Data: Delphi Methodology

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OBJECTIVES/GOALS: To develop and validate a tool to systematically identify benefits accruing to research within the Translational Science Benefits Model (TSBM) framework. We used a Delphi panel to reach consensus among a group of experts on criteria required for a clinical, community, economic, or policy benefit to be verified as coming from research. **METHODS/STUDY POPULATION:** A coding tool with proposed criteria to verify each of the 30 benefits was created at UCI to confirm the TSBM benefits resulting from funded research. We convened 11 experts from 8 CTSA hubs, who consisted of evaluators (faculty and staff) with experience using the TSBM. A web-based survey was used for Round 1, followed by a panel discussion of remaining unvalidated criteria, and a Round 2 survey as the final decision for inclusion of items in the tool. Response options for each criterion were “yes, required” or “no, not required”. Criteria that reached consensus (>70% agreement) were considered validated for inclusion in the final version. Panelist suggested criteria in Round 1 were also incorporated in the Round 2

survey for consideration by the experts. **RESULTS/ANTICIPATED RESULTS:** In the web-based survey for Round 1, all 11 experts participated and 92% of criteria reached the determined consensus level (N = 157). The remaining 8% of the criteria (N = 13) were discussed during the panel meeting. The discussion, in which 8 experts participated, was moderated by UCI and took place virtually via Zoom. All experts were sent a recording of the discussion and given the opportunity to post comments online about the remaining criteria before, during, and for a day after the discussion. Round 2 will include 50 newly proposed criteria from panelists and the 13 criteria that did not reach consensus in Round 1. Based on the results of Round 2, the criteria that reach consensus will be included in the final version of the coding tool that can be used across all TSBM benefits. **DISCUSSION/SIGNIFICANCE:** Using the Delphi Methodology, we will have a standardized set of criteria that may be applied to determine whether a TSBM benefit has resulted from a specific research project or program. This standardization will allow for aggregation and comparison of data across CTSA hubs and further multi-level evaluation of impact.

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Benchmarking MICHR's Clinical and Translational Science production as a continuous quality improvement initiative.

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OBJECTIVES/GOALS: In line with NCATS funding requirements, the Michigan Institute for Clinical and Health Research (MICHR) established a continuous quality improvement (CQI) process and used the process to guide the implementation of a benchmarking project to evaluate and set goals for MICHR's production of Clinical and Translational Science manuscripts. **METHODS/STUDY POPULATION:** We aimed to increase the number of Clinical and Translational Science papers MICHR produces and to set a reasonable goal for improvement. Benchmarking was used to obtain a baseline and inform the identification of a reasonable goal for improvement. 11 Peer institutions were identified with similar funding levels. 1,225 Publications from 2022 for all 12 CTSAs were obtained from NIH Reporter. All publications were reviewed by title to identify probable CTS content. Two staff reviewers confirmed a total of 108 CTS publications across all CTSAs, and coded each paper to characterize the theoretical approach, method (quantitative and/or qualitative), analytic method and topic. All publications that were selected for benchmarking were also tracked and compared using Altmetrics for Institutions and Overton platforms. **RESULTS/ANTICIPATED RESULTS:** A total of 108 CTS publications were produced by 12 benchmarked CTSAs in 2022; of those, 70% (77) regarded research infrastructure, 37% (41) regarded research methods, and 15% (16) regarded clinical care. Over half, 53% (58), of the benchmarked papers are empirical research papers; of those, 67% (39) used quantitative methods, 28% (16) used qualitative methods, and 5% (3) used mixed methods. A clear majority of the benchmarked papers, 70% (76), provided only descriptive analyses, 18% (19) provided inferential analyses, and 12% (13) provided predictive analyses. We identified an opportunity to produce more manuscripts with descriptive analyses of research infrastructure. In the long-term, we saw an opportunity to produce predictive analyses of translational