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Alliances to disseminate addiction prevention and treatment (ADAPT): A statewide learning health system to reduce substance use among justice-involved youth in rural communities

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Abstract

Background: Youth in the justice system (YJS) are more likely than youth who have never been arrested to have mental health and substance use problems. However, a low percentage of YJS receive SUD services during their justice system involvement. The SUD care cascade can identify potential missed opportunities for treatment for YJS. Steps along the continuum of the cascade include identification of treatment need, referral to services, and treatment engagement. To address gaps in care for YJS, we will (1) implement a learning health system (LHS) to develop, or improve upon, alliances between juvenile justice (JJ) agencies and community mental health centers (CMHC) and (2) present local cascade data during continuous quality improvement cycles within the LHS alliances.

Methods/design: ADAPT is a hybrid Type II effectiveness implementation trial. We will collaborate with JJ and CMHCs in eight Indiana counties. Application of the EPIS (exploration, preparation, implementation, and sustainment) framework will guide the implementation of the LHS alliances. The study team will review local cascade data quarterly with the alliances to identify gaps along the continuum. The study will collect self-report survey measures longitudinally at each site regarding readiness for change, implementation climate, organizational leadership, and program sustainability. The study will use the Stages of Implementation Completion (SIC) tool to assess the process of implementation across interventions. Additionally, the study team will conduct focus groups and qualitative interviews with JJ and CMHC personnel across the intervention period to assess for impact.

Discussion: Findings have the potential to increase SUD need identification, referral to services, and treatment for YJS.

Keywords

Juvenile justice; Substance use disorders; Learning health system

1. Background

Youth involved in the juvenile justice system (YJS) are the focus of the Indiana hub of the Justice Community Opioid Innovation Network (JCOIN), titled Alliances to Disseminate Addiction Prevention and Treatment, hereafter “ADAPT”. ADAPT aims to improve substance use disorder (SUD) services for YJS in rural communities in Indiana, as both the Midwest and YJS bear a disproportionate burden of addiction. Nationally, Indiana ranks 14th in drug overdose deaths, with 70% of these deaths due to opioids (National Institute on Drug Abuse, 2020); Indiana is also among only a handful of states to experience a significant increase in opioid-related emergency department visits from 2019 to 2020 (Centers for Disease Control and Prevention, 2020). A 2018 national survey on drug use found 12.53% of Indiana youth reported illicit drug use (Substance Abuse and Mental Health Services Administration, 2020). YJS are at particular risk for opioid-related harms, given their high rates of mental health disorders and SUDs compared to youth who have never been arrested (Clemmey, Payne, & Fishman, 2004; Fazel, Doll, & Långström, 2008; Havens, Young, & Havens, 2011; Hogue, Johnson-Leckrone, & Liddle, 1999; Winkelman, Chang, & Binswanger, 2018). A study examining YJS court records of drug screens indicated that 9.8% of youth tested positive for opioids at least once (Dir et al., 2020). Rural communities are also less likely to offer evidence-based SUD services for adolescents (Havens et al., 2011). Indiana ranks 46th in number of behavioral health treatment providers per individuals suffering from addictions (Vestal, 2015).

1.1. Improving the juvenile justice behavioral health services cascade

The difficulty of connecting YJS to SUD treatment is well documented in the literature and quantified by known gaps in the juvenile justice behavioral health services cascade, hereafter, “cascade”. The cascade, a framework that forms the basis for ADAPT intervention, was proposed by investigators affiliated with a multisite cooperative study funded by the National Institute on Drug Abuse: Juvenile Justice—Translational Research on Interventions for Adolescents in the Legal System (JJ-TRIALS) (Belenko et al., 2017; Knight et al., 2015). A goal of JJ-TRIALS was to improve SUD identification and utilization of treatment for YJS. The cascade depicts movement of YJS from justice system supervision to receiving behavioral health care in the community, identifying potential opportunities for YJS to “drop out” along the continuum of SUD care: identification of treatment need (i.e., screening and assessment), referral to services, treatment initiation, treatment engagement, and continuity of care (Belenko et al., 2017). Few YJS achieve the continuum of SUD care. A recent meta-analysis from our team, as well as recent national survey results, show that as little as 21% of YJS in need of SUD services received any behavioral health treatment while under community supervision (Dennis et al., 2019). Among the behavioral health care providers that commonly partner with juvenile justice (JJ) agencies, less than one-third offer SUD treatment, and even fewer offer evidence-based services (Bartkowski, Xu, Avery, Ferguson, & Johnson, 2018; Dennis et al., 2019; Funk et al., 2020). Thus, ADAPT proposes a system-level intervention to improve the cascade.

Improving the cascade means increasing the rate at which YJS in need of SUD services complete each step (from risk screening to engaging in and completing treatment), and

requires YJS and their caregivers to navigate between two independent systems: JJ agencies and community mental health centers (CMHCs) (Scott, Dennis, Grella, Funk, & Lurigio, 2019). For YJS, the JJ system is often the first to identify the need for SUD treatment, such as at detention intake or through a probation officer's initial contact with the youth. Few JJ agencies offer SUD treatment or services beyond monitoring. Most YJS are under community supervision after a need for treatment is identified, requiring them to seek services outside the JJ system. CMHCs are the most likely treatment option for YJS since CMHCs serve a large catchment and are accessible to both insured and uninsured individuals.

1.2. Learning health systems

Learning health systems (LHSs), which have expanded rapidly in health care settings (Institute of Medicine, 2007; Smoyer, Embi, & Moffatt-Bruce, 2016) conduct continuous quality improvement (CQI) cycles in which they collect, analyze, and feedback data into the system to drive change and improve health outcomes (Abernethy et al., 2010). A review of LHSs (Budrionis & Bellika, 2016) reported extensive interest in the LHS model, but there have been few empirical studies of LHS-related outcomes (Kwon et al., 2012). Agile Implementation (AI) is one LHS approach, which we will apply across JJ and health care (CMHC) settings to create an alliance. AI builds on standard LHS principles of CQI by incorporating innovative features to the process, including de-implementation procedures if an intervention fails. AI consists of a trainer-facilitated 8-step process, from identifying an evidence-based practice (EBP) appropriately tailored to the local environment, to implementing and reviewing the EBP at a rapid rate, to developing a standardized operating procedure. Ultimately, establishing such procedures fosters fidelity to and sustainment of EBPs (Boustani, Alder, & Solid, 2018).

1.3. Summary

ADAPT takes a two-pronged approach to improving the cascade for YJS. First, we will employ an LHS to develop, or improve upon, alliances between JJ agencies and CMHCs. Second, we will present local cascade data during CQI cycles within the LHS alliances. By offering JJ and CMHC agency representatives the opportunity to view and discuss local cascade-related data, we will facilitate the development of tailored, localized solutions to improve the cascade for each county's YJS. We hypothesize that, in addition to improved alliances, ADAPT will positively impact YJS with a need for SUD services and recidivism outcomes over time.

2. Methods

2.1. Study design

ADAPT is a hybrid Type II effectiveness implementation trial (Curran, Bauer, Mittman, Pyne, & Stetler, 2012). We will assess LHS alliance implementation with self-report surveys (G.A. Aarons, Ehrhart, Torres, Finn, & Roesch, 2016; M.G. Ehrhart, Aarons, & Farahnak, 2014, 2015; Mancini & Marek, 2004; Shea, Jacobs, Esserman, Bruce, & Weiner, 2014), qualitative interviews, and focus groups (See Table 2). We will conduct a cluster-randomized, stepped wedge clinical trial with $n = 8$ county sites receiving the LHS

intervention at different times during the nearly 36-month intervention period. Three cohorts of counties will receive the intervention in a staggered fashion. The study randomized participating counties to an intervention start date, with 6 months between each start date. Cohort 1 includes two counties, while cohorts 2 and 3 each include three counties each (Appendix A).

2.2. Setting

The research team selected eight rural counties as ADAPT clinical research performance sites because they met one or more of the following criteria: 1) a rate of drug/opioid overdose/prescriptions above the state average and/or 2) fewer than the state average number of behavioral health care providers per individuals suffering addictions.

The team also chose counties based on their participation in Indiana's Juvenile Detention Alternatives Initiative (IJDAI), a model for youth justice system improvement that the Annie E. Casey Foundation developed. IJDAI provides a natural infrastructure for meeting ADAPT aims and achieving sustainability of the interventions. The focus of IJDAI is to limit unnecessary detainment of YJS (Mendel, 2009). To that end, JDAI sites implement standard procedures (e.g., a detention screening tool) and develop local solutions (e.g., diversion programming). Each JDAI county has developed committees of staff and community members that use a data-driven process to identify targets of intervention, assess effectiveness of the interventions, and continue monitoring progress to develop future interventions (Mendel, 2009). Recognizing the benefits of JDAI nationally, Indiana was the second state to initiate statewide expansion (Chief Justice Earl Warren Institute on Law and Social Policy, 2012). IJDAI has been implemented in 32 Indiana counties, which serve nearly 70% of Indiana's youth population (Indiana Department of Correction Division of Youth Services, n.d.). Each IJDAI site is provided state funds for coordination and development of local programming such as training sites in evidence-based practices, implicit bias, and police officer de-escalation strategies. We selected ADAPT sites from IJDAI counties because: 1) IJDAI sites use data-driven decision-making; 2) have strong data quality; 3) have funds available for local interventions; 4) are supported by a state infrastructure that increases sustainment; and 5) the counties can disseminate ADAPT interventions, implementation procedures, and study findings across the 300+ JDAI communities in the United States.

2.3. Implementation model: EPIS

Application of the exploration, preparation, implementation, and sustainment (EPIS) framework will guide ADAPT (see EPIS Fig. 1) (G.A. Aarons, Hurlburt, & Horwitz, 2011; Becan et al., 2018). Each site's LHS alliance will effect change by taking an active approach to improving system and organizational strategies that impact the cascade. We have identified implementation strategies relevant at each EPIS phase (Powell et al., 2015). We have also identified implementation determinants and outcomes that represent or operate in outer system and inner organizational contexts, as well as bridging factors that link outer

Appendix A.: Supplementary data
Supplementary data to this article can be found online at <https://doi.org/10.1016/j.josat.2021.108368>.

and inner contexts (Moullin, Dickson, Stadnick, Rabin, & Aarons, 2019). We will use mixed methods research to assess implementation using the EPIS model as a guide.

2.4. Local cascade data review

To assess local cascade-related outcomes for each ADAPT site, the study will gather county-level administrative data from JJ agencies and CMHCs. We will use a combination of deterministic and probabilistic record linkage algorithms to identify records belonging to the same individual across data sources. A probabilistic matching algorithm defines the probability that a specific pair of data entries is a true match (S.J. Grannis, Overhage, Hui, & McDonald, 2003; S.J. Grannis, Overhage, & McDonald, 2002). Standard pre-processing of individual identifiers is completed first. We create phonetic transformations using “Soundex” and “NYSIIS” algorithms (Knuth, 1998; Lynch & Arends, 1977) that help to eliminate misspellings and other name errors. We will randomly sample and manually review algorithm-declared matches and non-matches, refining the algorithm to desired performance. Overall sensitivity and specificity were 99.4% and 99.1%, respectively, using a similar probabilistic matching algorithm approach across clinical data sources (S.J. Grannis et al., 2003).

The study team will then display linked data with Tableau, a data visualization software, to resemble the cascade. This will enable each county to identify the extent to which YJS drop out of care at each step along the continuum. Cascade data will guide the LHS alliances to choose and implement intervention strategies that are likely to have the most impact on their county’s YJS in need of SUD services. The research team will review the data with the alliance on a quarterly basis.

2.5. Participants and measures

2.5.1. Community partners—JJ and CMHC system personnel will form the LHS alliances. Though the personnel chosen for LHS alliance participation will vary by site, members will typically include administrators, supervisors (e.g., probation supervisors or clinical supervisors), and direct-service providers (e.g., probation officer and behavioral health therapists). Each alliance must include stakeholders from both agencies. Prior to the intervention period, at least one representative from each JJ and CMHC agency will attend a two-day LHS training, which will help them to identify additional key individuals to include in their alliances.

2.5.1.1. Community partners: organizational measures.: System personnel will complete surveys including the following measures. We will measure organizational readiness to implement change (ORIC; [Shea et al., 2014] 12-items; assesses perceived readiness to implement new innovations), the organization’s implementation climate (ICS; [G.A. Aarons, Ehrhart, & Farahnak, 2014] 18-items; assesses the degree to which the climate is supportive of EBPs and adopting new innovations), and an assessment of how their organization’s leadership supports implementation of EBPs (ILS; [G.A. Aarons et al., 2014] 12-items; assesses leadership within organizations). We will also include a new measure of collaboration to assess alliance between JJ and CMHC participants across time

with the Effective Collaboration (EC) subscale (12-items) from the Program Sustainability Index (Mancini & Marek, 2004).

2.5.2. Youth in justice system (YJS)—YJS include all youth who are arrested or otherwise referred to the juvenile justice system for any reason during the 5 calendar years before the study period through the end of the study period. All YJS by virtue of residing in one of the intervention counties, will have the opportunity to receive the benefits of the LHS alliances, though they may not actively experience the intervention.

2.5.2.1. YJS: total record sample.: For all YJS across the ADAPT sites, our research team will collect administrative justice system records, including identifiable data (i.e., name, address, DOB, SSN). For all of these YJS, the study will match their records to their medical records collected through the Indiana Addictions Data Commons to capture patterns of JJ system involvement and recidivism (e.g., probation violations, detentions), health care utilization related to substance use (e.g., emergency room visits, attendance in SUD services, and prescription fills for pain medication or SUD treatment; see Table 1).

2.5.2.2. YJS: LHS working record sample.: We will collect additional administrative records for a subset of YJS with local CMHC treatment records, which we will match with JJ system records for review during LHS alliance meetings. The research team will collect these data to facilitate the LHS alliances' data review and problem-solving regarding the cascade. The research team will de-identify the data for presentation in Tableau.

2.5.3. ADAPT state advisory board—The ADAPT State Advisory Board will consist of delegates from Indiana state agencies (Department of Child Services, Division of Mental Health and Addiction, Office of Medicaid Policy and Planning, Office of the Governor); academic consultants; local practitioners; and youth and parent stakeholders identified through community partners. The purpose of the State Advisory Board will be to 1) evaluate the strengths and weaknesses of ADAPT; 2) recommend state and local policies to enhance impact; 3) disseminate study results; and 4) explore sustainability.

2.5.4. Implementation outcome measures—The Stages of Implementation Completion (SIC) is an 8-staged observation-based assessment tool created as part of a large-scale randomized implementation trial. It is a “universal” tool applicable across implementation strategies (Brown et al., 2014; Chamberlain, Brown, & Saldana, 2011; Saldana, 2014). The study team will apply the SIC stages throughout the ADAPT study period to measure implementation outcomes that map on to well-accepted phases of implementation. As applied to ADAPT through the EPIS framework, stages range from initial *engagement* of system personnel with the research team through LHS alliance training (exploration and preparation stages) to assessing *fidelity monitoring* and *competency* (implementation and sustainment stages). The SIC has demonstrated reliable and valid measurement of implementation activities, specifically the proportion and duration of implementation activity completion (Brown et al., 2014). Previous NIDA funded studies have used the SIC in conjunction with the EPIS framework (Becan et al., 2018).

3. Analysis

We will use the EPIS model to guide our analysis. First, we will include self-report measures longitudinally at each site. Second, we will utilize the Stages of Implementation Completion (SIC)© tool to assess the process of implementation across sites. Third, we will utilize focus groups and qualitative interviews across the intervention to assess for impact.

3.1. Stepped wedge-related implementation and analysis

We will use standard step wedge analytic methods (Baio et al., 2015; K. Hemming & Girling, 2014; K. Hemming, Lilford, & Girling, 2015; Hussey & Hughes, 2007). The study will use linear mixed models to analyze repeatedly measured implementation variables to determine whether implementation variables change over time from the control to intervention conditions. The study will collect organizational survey data at the county level from system personnel at six time points, at six-month intervals. The study will analyze the following continuous scale scores in a separate model as the dependent variable: perceived readiness to implement new innovations (ORIC), climate support of adopting new innovations (ICS), organization's leadership support of EBPs (ILS), and alliance between JJ/CMHC (Effective Collaboration subscale).

3.2. Comparative effectiveness analysis

The study will create a database of all youth arrested or referred in each county. We will define the control condition (i.e., time period before LHS intervention) versus the LHS intervention using administrative records. We will use repeated measures Poisson models to compare control versus LHS intervention conditions on the response rate ratio for the cascade and the opioid-related outcomes. The study will perform Poisson or zero-inflated Poisson regression models using SAS GENMOD to fit repeated measures generalized linear models (GLIM) with generalized estimating equations (GEE) to account for the fact that the study will measure event data for youth repeatedly over time, and to account for the correlation due to within-organization clustering.

In the next step of the model, we will include organizational-level (i.e., county-by-system [JJ and CMHC]) survey predictors including staff characteristics (e.g., age, gender, and race/ethnicity, time in current position, highest/type degree, salary, caseload size, job (dis)satisfaction rating, and burnout rating), implementation variables (e.g., readiness, implementation climate, leadership support, and alliance), and fidelity variables (e.g., SIC scores; percentage of activities performed; and number of days between activities) to determine whether these survey variables predict the response rates for the cascade and opioid-related outcomes.

3.3. Qualitative data analysis

Our team will compile qualitative data from focus groups, individual interviews, and observational coding of alliance meetings. The team will transcribe digital recordings and check them for accuracy and, along with the notes, imported into NVivo 12. The study will use a standard iterative process to analyze the data. First, open coding will locate themes and issues (Corbin & Strauss, 1998; Emerson, Fretz, & Shaw, 1995) and assign codes to

segments of text ranging from a phrase to several paragraphs based on topical domains and questions from the interview guides. Second, the study will use focused coding to determine which themes/issues emerge frequently and which represent unusual cases or particular concern. By coding sets of notes and transcripts, the team will create detailed memos that describe and link codes to each theme/issue, for review with the investigative team. The team will identify discrepancies in coding and analysis during this process and resolve them during research team meetings. For each year of data collection, the team will prepare a summary report of key themes/issues derived from the qualitative analysis. The report will provide a contextual backdrop for analyzing quantitative data regarding ADAPT over time.

3.4. Mixed methods analysis

We will integrate qualitative and quantitative results to assess consistencies and discrepancies in the data, and to determine if we are capturing issues and constructs most relevant to the project, which include: a) success of LHS alliances on improving the cascade, b) alliance building between systems, and c) fidelity to the LHS approach. We will use a QUAN + QUAL structure where we gather data simultaneously and give them equal weight. We will consider each analysis on its own terms and together when working toward overall interpretations and conclusions (Creswell & Clark, 2007; Patton, 2002; Tashakkori & Teddlie, 2003). The study will integrate qualitative and quantitative data through triangulation to examine convergence, expansion, and complementarity of the data (G.A. Aarons, Fettes, Sommerfeld, & Palinkas, 2012; Creswell & Clark, 2007; Palinkas et al., 2011; Teddlie & Tashakkori, 2003). We will create tables to compare across concepts and utilize NIH guidelines for mixed-methods research best practices, as well as guidance regarding the use of mixed methods in implementation research (G.A. Aarons & Palinkas, 2007; Edmondson, 2003; Stogdill, 1974).

4. Discussion

The goal of ADAPT is to improve cascade outcomes for YJS across Indiana through implementation of local LHS alliances. We will reach this goal by improving partnerships between CMHC and JJ agencies, which will allow for effective solutions to address deficits at each stage in the cascade. LHSs have been successful in health care settings but have yet to be applied in the justice system. Thus, by utilizing an innovative LHS approach, we anticipate that JJ agencies will be able to develop and test novel, locally tailored interventions.

4.1. COVID-19 considerations

In the wake of COVID-19, drastic changes have occurred not only to the conduct of research, but also system-level functioning and service provision in JJ agencies and CMHCs. The pandemic has increased YJS dropout at each stage of the cascade as local counties report a significant reduction in youth arrests. This reduction results in fewer youth being processed in the JJ system, fewer youth screened for SUD risk, and fewer youth in need of services referred to treatment. Additionally, CMHC settings have relied on telehealth services to limit face-to-face interactions. In rural settings like ADAPT counties, CMHCs

must operate with limited resources, including inconsistent access to reliable internet service, which hinders telehealth options.

On top of challenges in SUD service provision, substance use itself adds risk for COVID-19 infection. There is evidence that those who vape and misuse substances may be more vulnerable to contracting the virus, and to experiencing more severe symptoms as a result of weakened respiratory systems (Guan et al., 2020; McAlinden et al., 2020). Among adolescents in particular, early results from a sample of Canadian teens (Dumas, Ellis, & Litt, 2020) found that participants continued face-to-face substance use with peers despite social distancing regulations, in addition to exhibiting an increase in solitary substance use. Both scenarios are concerning given that they may increase chances of contracting COVID-19 or experiencing exacerbated virus symptoms.

While the pandemic has made it challenging to facilitate relationship building among CMHCs and JJ agencies, necessary rapid system adaptations have provided more flexibility, namely videoconferencing and telemedicine platforms, that are being normalized and may even solve some barriers to collaboration (e.g., choosing neutral meeting place).

4.2. Summary

We will adapt the LHS approach and apply it in a new way, namely to develop community-based alliances (Mullins, Wingate, Edwards, Tofade, & Wutoh, 2018) between JJ agencies and CMHCs (Stein, Adams, & Chambers, 2016). By completing this project, the scientific community will learn valuable lessons regarding the facilitators and barriers to SUD treatment among YJS. This study will provide valuable information for the general youth population, given the pernicious nature of SUD on youth outcomes in general, and especially valuable for facilitating success for YJS. Moreover, if the results of this hybrid trial are effective, other JDAI sites can expand the methodology in a variety of communities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

ADAPT	Alliances to Disseminate Addiction Prevention and Treatment
AI	agile implementation
CMHC	community mental health center
CQI	continuous quality improvement

EBI	evidence-based intervention
EPIS	exploration, preparation, implementation, sustainability
IJDAI	Indiana juvenile detention alternatives initiative
LHS	learning health system
SIC	stages of implementation completion
SU	substance use
YJS	youth involved in the justice system

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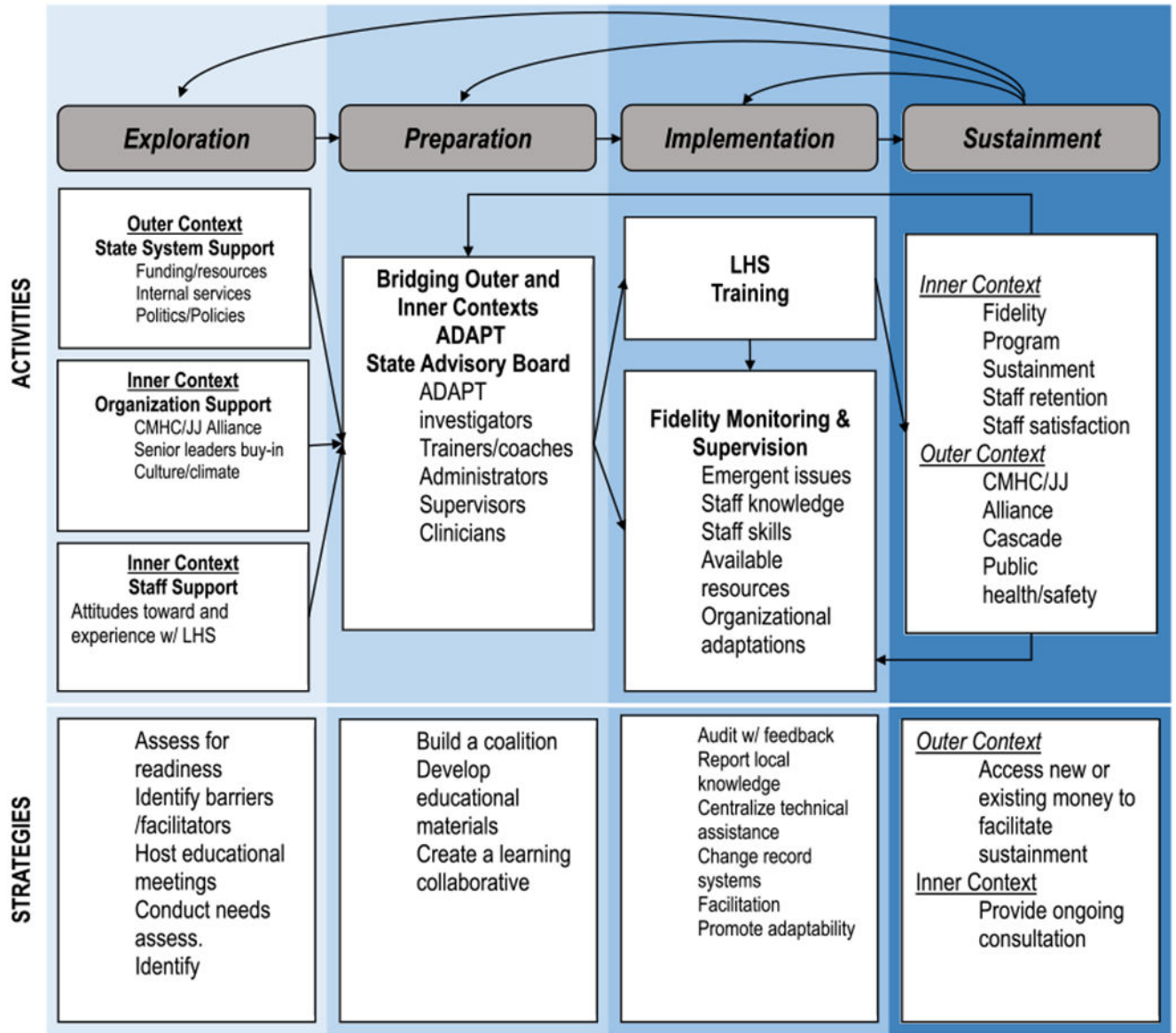


Fig. 1. ADAPT implementation EPIS framework.

Table 1
Effectiveness outcome measures for youth involved in the justice system (YJS).

	Definition	Data source		
		Medicaid/INPC	Addict. commons	JJ
Public health				
SUD Care Cascade	YJJ intake cohort			X
	% Screened for SU			X
	% In Need of SUD tx			X
	% Referred to SUD tx			X
	% Initiated SUD tx		X	
	% Engaged in SUD tx		X	
Opioid outcomes	OUd prevalence		X	
	Opioid-related overdoses		X	X
	Opioid-related inpatient		X	X
Public safety	Recidivism			X

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Table 2

ADAPT study timeline.

	Year 1 1-3 4-6 7-9 10-12 13-15 16-18	Year 2 19-21 22-24 25-27 28-30 31-33 34-36 37-39 40-42 43-45 46-48 49-51 52-54 55-	Year 3	Year 4	Year 5
Project start-up					
IRB and OHRP approval					
County random assignment to stepped-wedge LHS intervention start					
Preparation (EPIS stage)					
Finalize ADAPT State Advisory Board & schedule biannual meetings					
AI training adaptation					
Develop MOU and protocol for data sharing across sites					
EMPACT Solutions Tableau creation					
Develop and pilot process for local LHS data linking					
Discuss and implement substance use risk screening across all sites					
Aims 1 & 2 LHS implementation & tracking solutions					
Overall LHS stepped wedge Implementation (EPIS stage)					
Cohort 1					
Cohort 2					
Cohort 3					
AI training w/ JJ & CMHC leaders					
LHS implementation					
Monthly AI consultation meetings					
Regular LHS alliances meetings, as decided by alliance participants					
LHS admin data collection/review					
Monthly AI fidelity monitoring					
Sustainment (EPIS stage)					
Evaluation and sustainment					
Local data cleaning, linking & analysis					
Aim 3 implementation analysis					
System personnel and board qualitative interviews & survey data collection					
Ongoing SIC assessment					
Aim 4 effectiveness analysis					
Admin data cleaning & analysis, 5 yrs pre-study period + 5 yrs study period					
Qualitative interviews of YJJ/Parent dyads					
Overall					
Dissemination					
Manuscript preparation					

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Study Month 1 = October 2019.

Note: Exploration phase occurred prior to Project Start-up (before Oct. 2019).