

University of Kentucky Center on Drug and Alcohol Research Behavioral Health Outcome Studies

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# **Evidence Base for the Adolescent Kentucky Treatment Outcome Study (AKTOS) Assessment and Methods**

October 2016



## Executive Summary

### The Adolescent Kentucky Treatment Outcome Study (AKTOS)

The Adolescent Kentucky Treatment Outcome Study (AKTOS), initiated in 2004, is a statewide data collection system designed to examine substance abuse treatment outcomes for adolescent clients over time. AKTOS is a corollary of the Kentucky Treatment Outcome Study (KTOS), which examines treatment outcomes for adult clients. When KTOS was initiated, the Kentucky Department of Behavioral Health, Developmental and Intellectual Disabilities (DBHDID), which was charged with carrying out the study, contracted with the University of Kentucky Center on Drug and Alcohol Research (UK CDAR) to develop and implement the study. Both KTOS and AKTOS are statewide outcome studies that documents the ongoing need for services and provides up-to-date regional and state data on substance use trends and treatment outcomes for Kentucky. **Although Kentucky is represented in a few national datasets, those national studies do not provide state, county- and regional-level data, nor do those national surveys consider Kentucky's unique cultural context.**

### What Makes Kentucky Unique?

Kentucky's unique cultural context includes the fact that Kentucky has some of the highest rates in the nation for drug overdose fatalities among 12- to 25-year-olds, smoking, teen births, obesity in 10- to 17-year-olds, and serious health conditions (cancer deaths, cardiovascular related deaths, premature deaths, diabetes, obesity), along with the highest number of preventable hospitalizations and the fourth highest proportion of adolescents on disability in the nation. Furthermore, youth in Kentucky begin smoking at younger ages when compared to the nation as a whole. Kentucky also ranks low in financial opportunity, financial well-being, and the percent of children living in poverty (CDC, 2012, 2016; Erickson, Lee, & von Schrader, 2015; Gallup Polls, 2014, 2015; Hess et al., 2015; Trust for America's Health, 2015; United Health Foundation, 2015). **Given this context, the AKTOS assessment is designed to identify drug use trends, substance use-related co-morbidities, and treatment outcomes in the context of Kentucky specific economic and health-related concerns.**

### What is Evidence-Based Assessment?

Evidence-based assessment is a critical component of evidence-based practice but has **received limited research attention. Information obtained from evidence-based assessments can be used to help determine areas to target in treatment, to develop a case conceptualization, to increase client engagement, and to objectively monitor treatment.** The scope of evidence-based assessment includes both the process through which the assessment is conducted and the instruments utilized for evaluation.

The evidence base for AKTOS conforms to the recommendations for evidence-based assessments for treatment providers in public agencies. The AKTOS assessment:

1

**Is based on theory and research** about substance use-related comorbidities such as education, adverse childhood experiences, family factors, mental health problems, justice system involvement, and recovery supports (or engagement in the treatment process).

2

**Is appropriate for the context of Kentucky substance abuse treatment programs** and includes measures that consider the unique features of Kentucky.

3

**Is face-valid and user-friendly**, in part because of almost 15 years of experience, but also because it targets areas identified in theory and research as related to substance use, relapse, and treatment outcomes for adolescents. AKTOS is also relatively short, easy to use, and is provided to treatment centers at no cost. Further, once the intake assessment is completed, clinical providers can download a client-specific narrative report, which incorporates the information provided by the client during the assessment and provides the ASAM III level of care recommendations.

4

**Is made up of five core components** (substance use, mental health, school attendance and performance, justice system involvement, and adverse childhood experiences) each with **strong reliability and validity research support** and two supplemental components (parental involvement and recovery supports) which have strong reliability and validity research support.

5

**Is focused primarily on dynamic or changeable factors rather than static factors** by including measures such as behavioral health symptoms, school performance, and recovery supports, which are all changeable within the context of substance abuse treatment, rather than more static constructs generally thought to be less amenable to change through substance abuse treatment (e.g., antisocial personality disorder).

6

**Has been used for almost 15 years with no reports of adverse reactions or consequences** due to the assessment or the research procedures. In addition, the AKTOS assessment data are entered into an online, secure Client Information System (CIS) developed and maintained by UK CDAR. This server uses HTTPS for secure data transmission, data encryption for all identifying data elements which are also stored separately from assessment responses, secure server infrastructure that is in a locked-down facility with 24/7 monitoring, and user authentication. AKTOS is reviewed annually by the University of Kentucky Medical Institutional Review Board (IRB) and has a Certificate of Confidentiality issued by the Federal Department of Health and Human Services to provide the highest protection for data privacy and security.

7

**Is sensitive to individual-level change so that outcomes can be measured.** Results from past AKTOS outcomes indicate that a significant proportion of clients benefit from substance abuse treatment. There are significant decreases in use of alcohol and all drugs (except tobacco), significant improvement in school performance and decreases in school absences and disciplinary actions, decreases in depression, anxiety, attention deficit symptoms, and aggressive behavior, improvement in emotion regulation, and decreases in the percent of adolescents under the supervision of the justice system. The 12-month follow-up component uses the same AKTOS evidence-based assessment that is conducted at intake in order to examine change over time. The study has a high follow-up rate of over 85% for each of the last three biannual reports, and over an average of 150 clients were assessed at the 12-month follow-up each year.

8

**Provides data analysis and dissemination.** An additional benefit of this Adolescent Kentucky Treatment Outcome Study is that state-level trends in substance use along with the co-occurring behavioral health, justice system involvement, and education trends for clients entering publicly funded treatment are provided each year. This data system also provides state-level trends in recovery and recovery correlates over time. An important benefit of state-level outcome studies is that funders and legislators can see up-to-date state specific data to provide evidence of need for new programs, continuation of current programs, and changes in programmatic policies. Key trends in substance use and policy needs fluctuate annually depending on economic and other state-specific sociopolitical issues, each year's analytical findings, the latest research, and legislative research commission requests, making the need for easily-modifiable annual data collection even more important. In addition to annual statewide reports, the AKTOS data is used for community-level reports on client characteristics and outcomes for communities applying for Federal or other grants. Specifically,

1. UK CDAR BHOS has produced **5 biannual reports** using AKTOS intake data and follow-up data from 2004 through 2015.
2. UK CDAR BHOS has produced **9 translational research products.**
3. The AKTOS data has also been used in **numerous presentations, meetings, and ad-hoc reports** with clinical providers, agency boards of directors, and other state planning agencies that work closely with DBHDID.
4. **One peer reviewed, scholarly article** using AKTOS data has also been published.

The evidence base for the AKTOS assessment suggests it is a robust, pragmatic, reliable, and valid assessment, which provides statewide and regional data about Kentucky drug use trends, substance use-related comorbidities, and substance abuse treatment outcomes among adolescent clients.

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## Evidence Base for the Adolescent Kentucky Treatment Outcome Study (AKTOS) Assessment and Methods

October 2016

University of Kentucky  
Center on Drug and Alcohol  
Research  
Behavioral Health Outcome  
Studies

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## Introduction

As Federal government and other funding agencies continue to merge and decrease funding for substance abuse, prevention, and mental health services, it is critical to have statewide outcome studies that document the ongoing need for services and provide up-to-date regional and state data on substance use trends and treatment outcomes for Kentucky. Although Kentucky is represented in a few national datasets, those national studies do not provide the state, county- and regional-level data and those national surveys do not consider or account for Kentucky's unique cultural context.

The Adolescent Kentucky Treatment Outcome Study (AKTOS) is a statewide substance abuse treatment evaluation study initiated in 2004. AKTOS is a corollary of the Kentucky Treatment Outcome Study (KTOS), which examines treatment outcomes for adult clients. When KTOS was initiated, the Kentucky Department of Behavioral Health, Developmental and Intellectual Disabilities (DBHDID), which was charged with carrying out the study, contracted with the University of Kentucky Center on Drug and Alcohol Research (UK CDAR) to develop and implement the study. Both KTOS

**Although Kentucky is represented in a few national datasets, those national studies do not provide the state, county- and regional-level data and those national surveys do not consider or account for Kentucky's unique cultural**

and AKTOS are statewide outcome studies that document the ongoing need for services and provide up-to-date regional and state data on substance use trends and treatment outcomes for Kentucky. AKTOS serves as a means of uniformly collecting and analyzing annual outcome information to meet the legislative requirement for KRS 222.465.<sup>1</sup> Data collection is required of all state-funded treatment providers including outpatient, residential, or inpatient treatment programs licensed as a chemical dependency treatment service. The core of AKTOS is: (1) the comprehensive web-based intake assessment, (2) CDAR conducted follow-up assessment, and (3) data analysis and dissemination.

Treatment intake data are collected by community mental health center staff as clients enter treatment (including outpatient, outpatient intensive, and inpatient) using the evidence based AKTOS intake assessment. Client responses are entered into an online secure Client Information System (CIS) developed and maintained by UK CDAR. Once the intake assessment is completed, clinical providers can download a client-specific narrative report, which incorporates the information provided by the client during the assessment and provides the ASAM III level of care recommendations. UK CDAR also conducts telephone follow-up interviews 12-months after completion of the intake using the evidence-based AKTOS follow-up assessment with a randomly selected sample of clients who consent to follow-up at the intake and again when they are re-contacted. The study has a high follow-up rate of over 85% for the three most recent biannual reports, and over an average of 150 clients were assessed at the 12-month follow-up each year.

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<sup>1</sup> A description of KRS 222.465 can be found at <http://www.lrc.ky.gov/statutes/statute.aspx?id=9953>.

## What Is Evidence-Based Assessment?

Evidence-based assessment is an essential part of evidence-based practice but has received limited research attention (Beidas, Stewart, & Walsh, 2015; Jensen-Doss, 2015). Information obtained from evidence-based assessments can be used to help determine what to target in treatment, to develop a case conceptualization, to increase client engagement, and to objectively monitor treatment progress (Christon, McLeod, & Jensen-Doss, 2015; Hunsley, 2015; Jensen-Doss, 2015). The scope of evidence-based assessment includes both the process through which the assessment is conducted and the instruments utilized for evaluation.

Standardized assessments are generally recommended to help determine what treatment(s) to use with clients especially when a comprehensive approach is taken rather than a narrow approach (Basco et al., 2000; Jensen-Doss, 2015; Jensen-Doss, Youngstrom, E., Youngstrom, J., Feeny, & Findling, 2014; Jewell, Handwerk, Almquist, & Lucas, 2004; Tenney, Schotte, Denys, van Megen, & Westenberg, 2003). Fully accounting for clients' concerns has been linked to better treatment engagement and outcomes (Jensen-Doss & Weisz, 2008; Kramer, Robbins, Phillips, Miller, & Burns, 2003; Pogge et al., 2001). Standardized assessments can also provide valuable information about treatment outcomes, and understanding treatment outcomes is a critical component of documenting the effectiveness of evidence-based practice (Beidas et al, 2015).

In general, recommendations for evidence-based assessments for treatment providers in public agencies, who tend to have more limited resources, higher workloads, and more limited time (Glasgow, 2013; Nunno, 2006; Scott & Lewis, 2015) include: (1) the use of theory and research to determine the selection of assessment targets or components most relevant to the client's situation (Hunsely & Mash, 2007); (2) contextual appropriateness for the specific setting in which the measures will be used; in other words that the assessment is appropriate for the target population, local context, and targets the relevant constructs of interest (Glasgow, 2013); (3) having face validity (i.e., measuring what people think it ought to measure) and being user-friendly (including not overburdening staff or clients); (4) having established reliability and validity; (5) measuring dynamic rather than static constructs (amenable to change); (6) not producing adverse reactions or consequences; and (7) being sensitive to change so that outcomes can be measured (Beidas et al, 2015; Glasgow, 2013; Hunsley, 2015; Hunsely & Mash, 2007).

Evidence-based measures are intended to be used in conjunction with clinician decision-making (Hunsley, 2015). The AKTOS assessment is not meant to replace clinician decision-making but rather to assist in the assessment process by examining a range of potential co-occurring problems and provide

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**The AKTOS assessment is not meant to replace clinician decision-making but rather to assist in the assessment process by examining a range of potential co-occurring problems and to provide information about treatment outcomes. The AKTOS assessment can be used to inform treatment(s), engage clients through self-report, and monitor outcomes.**

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information about treatment outcomes. The AKTOS assessment can be used to inform treatment(s), engage clients through self-report, and monitor outcomes.

The following bulleted points highlight how the AKTOS assessment meets each of the evidence-based criteria listed above and one additional benefit is described:

1. **Use of theory and research.** The AKTOS assessment includes a set of instruments developed to provide screening and assessment of psychosocial issues identified in theory and research as related to adolescent substance use including education, adverse childhood experiences, family factors, mental health problems, justice system involvement, and recovery supports (or engagement in the treatment process; Peters, Sherman, & Osher, 2008). Specific research support is outlined with each assessment component described in the next section.
2. **Contextual appropriateness.** The AKTOS assessment was originally developed to consider the unique sociocultural context of Kentucky and has been revised frequently after data analysis and feedback from users and other stakeholders (see Figure 1 on the next page).
  - More specifically, the Kentucky context includes being 7<sup>th</sup> highest in the nation for drug overdose-related deaths among 12- to 25-year-olds (Trust for America's Health, 2015), 3<sup>rd</sup> in the nation for highest smoking rates among high school students (Centers for Disease Control and Prevention [CDC], 2016), 7<sup>th</sup> highest in the nation for teen births (United Health Foundation, 2015), and 8<sup>th</sup> highest in the nation for percent of 10- to 17-year-olds who are obese (CDC, 2012). Furthermore, youth in Kentucky begin smoking at younger ages when compared to the nation as a whole (CDC, 2016). Significantly more children (under 18 years old) had 2 or more chronic health conditions in Kentucky when compared to the nation (15.0% vs. 9.6%; CDC 2012). In addition, Kentucky is in the bottom five worst states for overall well-being (which considers social, financial, and physical indicators; Gallup Polls 2014; 2015), preventable hospitalizations (50<sup>th</sup>), cancer deaths (50<sup>th</sup>), premature deaths (47<sup>th</sup>), diabetes (45<sup>th</sup>), obesity (44<sup>th</sup>), and is in the bottom 10 for cardiovascular deaths (43<sup>rd</sup>).
  - Further, based on the U.S. Census Bureau's 2013 American Community Survey (ACS), Kentucky was the state with the 4<sup>th</sup> highest prevalence rate (7.9%) for disability among individuals (ages 15 - 20) in the U.S. 50 states, District of Columbia, and territory of Puerto Rico (Erickson, Lee, & von Schrader, 2015).
  - Another report on poverty and economic opportunity ranks Kentucky as 48<sup>th</sup> in the nation for economic opportunity (Hess et al., 2015) while Gallup Polls (2014) ranked Kentucky as 46<sup>th</sup> in the nation for financial well-being (which considers having enough money for food, health care, and people's perceived standard of living). Kentucky also was ranked 2<sup>nd</sup> highest in the nation for percent of children living in poverty (United Health Foundation, 2015).



Figure 1.

# Kentucky in Context

The AKTOS assessment was originally developed to consider the unique features of Kentucky and has been revised frequently after data analysis and feedback from users and other stakeholders to consider the unique context of Kentucky.

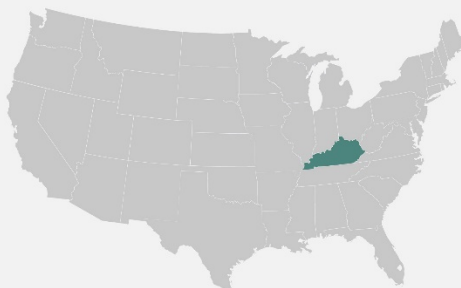
## Kentucky ranks among the highest in the nation for drug overdose deaths and smoking:



Source: United Health Foundation, 2015; CDC, 2016

**7th highest**  
in the nation for

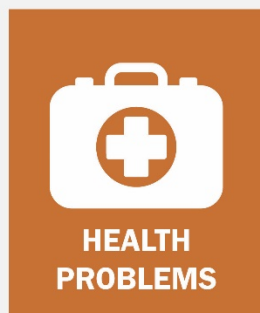
**DRUG OVERDOSE DEATHS AMONG 12- TO 25-YEAR OLDS**



**3rd highest**  
in the nation for

**SMOKING RATES AMONG HIGH SCHOOL STUDENTS**

## Kentucky ranks as one of the unhealthiest states in the nation:



Source: Gallup Poll, 2014, 2015; United Health Foundation, 2015

**50th**  
in the nation for

**PREVENTABLE HOSPITALIZATIONS**

**50th**  
in the nation for

**CANCER DEATHS**

**47th**  
in the nation for

**PREMATURE DEATHS**

**45th**  
in the nation for

**DIABETES**

**44th**  
in the nation for

**OBESITY**

**43rd**  
in the nation for

**CARDIOVASCULAR DEATHS**

## Kentucky also ranks as one of the highest in the nation for the number of disability recipients as well as the number of children in poverty:



Source: Gallup Polls, 2014; Hess et al., 2015; Social Security Administration, 2011; United Health Foundation, 2015

**4th highest**  
in the nation for

**DISABILITY AMONG 15-20 YEAR OLDS**

**2nd highest**  
in the nation for

**CHILDREN IN POVERTY**

Kentucky ranks as one of the states with the lowest financial well-being (which considers having enough money for food, health care, and people's perceived standard of living) and economic opportunity.

**46th**  
in the nation for

**FINANCIAL WELL-BEING**

**48th**  
in the nation for

**ECONOMIC OPPORTUNITY**

3. **Face valid and user-friendly.** The AKTOS assessment is face valid as it focuses on components identified in theory and research as related to substance use, relapse, and treatment outcomes. Further, many standardized assessments are extremely time consuming, labor intensive, and/or costly (Beidas et al, 2015; Bumbarger & Campbell, 2012; Connors, Arora, Curtis, & Stephan, 2015; Jensen-Doss & Hawley, 2010; Peters et al, 2008). The AKTOS assessment is a brief instrument (35 minutes on average) which can be used to document symptoms and patterns of substance abuse and related psychosocial problems as well as to engage clients in the treatment process by allowing clients to report their concerns and problems (Christon et al, 2015; Jensen-Doss, 2015; Peters et al., 2008; Scott & Lewis, 2015). Further, once the intake assessment is completed, clinical providers can download a client-specific narrative report, which incorporates the information provided by the client during the assessment and provides the ASAM III level of care recommendations.
4. **Established reliability and validity.** The AKTOS assessment has five core components and two supplemental components. The five core assessment components include: (1) substance use, (2) mental health, (3) school attendance and performance, (4) justice system involvement, and (5) adverse childhood experiences. The two supplemental assessment components that have been associated with substance abuse and relapse include: (1) parental involvement, and (2) recovery supports. Each of the core assessment components and most of the supplementary components of the AKTOS assessment show good reliability and validity. Specific reliability and validity information for each assessment component is outlined in the following section.

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**Each of the core assessment components and most of the supplementary components of the AKTOS assessment show excellent reliability and validity.**

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5. **Measuring dynamic rather than static constructs.** Although AKTOS does include key demographic indicators the majority of the assessment components focus on current status, symptoms, and constructs that change over time. For example, behavioral health symptoms, school performance, and recovery supports are all changeable within the context of substance abuse treatment whereas measures of personality or criminal histories are considered more static or less amenable to change.
6. **Not producing adverse reactions or consequences.** In more than a decade of conducting AKTOS no adverse reactions or consequences due to the assessment or the research procedures have been reported. Client responses are entered into an online, secure Client Information System (CIS) developed and maintained by UK CDAR. The web-based intake data collection system uses extremely robust security protocols and state-of-the art technology to provide a secure, user-friendly interface for data collection and management. This server uses HTTPS for secure data transmission, data encryption for all identifying data elements which are also stored separately from assessment responses, secure server infrastructure that is in a locked-down facility with 24/7 monitoring, and user authentication. The AKTOS assessment and the research methods are reviewed annually by the CDAR team in collaboration with the

state and community substance abuse and mental health treatment programs. The AKTOS assessment and the research methods are also reviewed annually by the University of Kentucky Institutional Review Board (IRB) and has a Certificate of Confidentiality from the Federal Department of Health and Human Services.

7. **Sensitive to change so that outcomes can be measured.** Results generally suggest that clients of publicly-funded substance abuse treatment, including a variety of treatment modalities, make significant strides in all of the targeted outcomes. Specifically, there are significant decreases in use of alcohol and all drugs (except tobacco), significant improvement in school performance and decreases in school absences and disciplinary actions, decreases in depression, anxiety, attention deficit symptoms, and aggressive behavior, improvement in emotion regulation, and decreases in the percent of adolescents under the supervision of the justice system. Moreover, using Bureau of Labor statistics that show different expected yearly earnings for individuals based on educational attainment, projected likely earnings in the year after treatment and lifetime earnings are estimated to illustrate the greater tax revenues that are expected from keeping children in school to high school graduation. However, each year there remains a significant minority that still seem to be struggling with their addiction and AKTOS results can provide more detailed information about those clients.
8. **Data analysis and dissemination.** An added benefit of AKTOS is that state-level trends in substance use along with the co-occurring behavioral health problems, justice system involvement, and education trends for adolescent clients entering publicly funded treatment are provided each year. This data system also provides state-level trends in recovery and recovery correlates over time. An important benefit of state-level outcome studies is that funders and legislators can see up-to-date state specific data to provide evidence of need for new programs, continuation of current programs, and changes in programmatic policies. Key trends in substance use and policy needs fluctuate annually depending on economic and other state-specific sociopolitical issues, each year's analytical findings, the latest research, and legislative research commission requests, making the need for easily-modifiable annual data collection even more important. In addition to annual statewide reports, the AKTOS data is used for community-level reports on client characteristics and outcomes for communities applying for Federal or other grants (see Appendix C). Specifically,
  1. UK CDAR BHOS has produced **5 biannual reports** using intake data and follow-up data from 2004 through 2016.
  2. UK CDAR BHOS has produced **9 translational research products using AKTOS data.**
  3. The AKTOS data has also been used in **numerous presentations and meetings** and ad-hoc reports with clinical providers, agency boards of directors, and other state planning agencies that work closely with DBHDID.
  4. **One peer reviewed, scholarly article** using AKTOS data has also been published.



## AKTOS Intake and Follow-up: Evidence-Based Assessments

The following paragraphs describe the AKTOS evidence base including the reliability and validity information specific to each AKTOS assessment component, the relevant research related to supplementary assessment components, and assessment adaptations or additions in consideration of the Kentucky context. The AKTOS assessment has demonstrated evidence that each component is sensitive to change and AKTOS provides critical information about treatment outcomes and factors related to relapse.

The AKTOS assessment has five core components and two supplemental components. The five core assessment components include: (1) substance use, (2) mental health, (3) school attendance and performance, (4) justice system involvement, and (5) adverse childhood experiences. The two supplemental assessment components that have been associated with substance abuse and relapse include: (1) parental involvement and (2) recovery supports. Specific demographic information is collected in the last section of the assessment.

### AKTOS Core Assessment Components

#### 1. Substance Use

Substance use is the key construct to examine in a substance abuse treatment outcome study. The substance use measures include: (1) The Teen Addiction Severity Index (T-ASI) substance use questions including alcohol and drug use along with the T-ASI composite score questions; (2) DSM-V criteria for substance use disorder; and (3) targeted questions about smoking, smokeless tobacco, and electronic vapor product use per the request of community and state partners. Data from the AKTOS substance use assessment component has been analyzed and included in ad hoc reports and presentations describing substance abuse trends and treatment outcome trends across the state. AKTOS data has also been used in a peer-reviewed publication that found that adolescents in substance abuse treatment with comorbid psychiatric disorders were more likely to report continued tobacco use at the 12-month follow-up (Cole, Stevenson, Walker, & Logan, 2012).

#### SUBSTANCE USE MEASURES

The AKTOS substance use assessment section incorporates items from the alcohol and drug use sections of the *Teen Addiction Severity Index (T-ASI)* (Kaminer, Bukstein, & Tarter, 1991) that are included in the computation of the T-ASI drug and alcohol use composite scores, which are recommended for measuring substance abuse treatment outcomes (McLellan, et al., 1985). The T-ASI, which is a modification of the widely used Addiction Severity Index (ASI; McLellan, et al., 1992), was developed as a clinical/research assessment of substance use and multiple related problems found in adolescents with substance use disorders (Kaminer, Wagner, Plummer, & Seifer, 1993). Further, the T-ASI is a public domain assessment that is widely used by criminal justice agencies, state and county governments, state psychiatric hospitals, and community treatment centers (Brodey et al., 2005).

Significantly less research has been conducted to evaluate the reliability and validity of the T-ASI when compared to the ASI (Brodey et al., 2005). The research that has been conducted indicates substance use composite scores of the T-ASI have validity and good reliability. The T-ASI, like the AKTOS assessment, assesses several main and supplementary areas. The AKTOS assessments use only the substance use domain of the T-ASI because of the good validity and reliability of this section and because other dimensions of the AKTOS needed more in-depth measurement.

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**The AKTOS assessment primarily uses the substance use domain of the T-ASI because of the good validity and reliability of this section and because other dimensions of AKTOS needed more in-depth measurement.**

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A few studies have examined the construct validity (i.e., the extent the measure actually measures the construct of interest) of the T-ASI with adolescents with substance use disorders and comorbid psychiatric disorders (Kaminer et al, 1991; Kaminer et al., 1993). Construct validity has multiple components including: (1) criterion-related validity, which is the degree to which a measure is related to an external criterion or outcome (e.g., self-reported substance use with urinalysis); (2) convergent validity, which is the degree to which two measures of constructs that are posited by a theory to be related are actually related. For instance, if one has developed a new measure (i.e., series of related questions) of problematic substance use, one would want to examine the relationship of the scores on the new measure along with scores on other similar measures, such as the Alcohol Use Disorders Identification Test (AUDIT), CAGE, and Drug Abuse Screen Test (DAST). And (3) discriminant validity, which refers to whether constructs that are supposed to be unrelated are in fact not related (Campbell, 1959). For example, one would want to demonstrate that scores on a newly developed measure of problematic substance use were not closely correlated with measures of other constructs such as impulsivity or antisocial personality disorder.

In a study of 25 adolescents (13- to 18-year-old clients in a psychiatric and substance abuse treatment facility, Kaminer et al. (1991) found adequate interrater reliability for the T-ASI; the average correlation across scales,  $r = 0.78$ . In a subsequent study to examine the convergent and discriminant validity of the T-ASI, the instrument was administered to 25 adolescents (12 to 17 years old) who were admitted to an inpatient adolescent psychiatric unit with two parallel programs: patients with psychiatric disorders only, and one for patients with substance use disorders and comorbid psychiatric disorders. Additionally, the alcohol and drug abuse diagnostic section of the Kiddie Schedule for Affective Disorders and Schizophrenia-Epidemiological version (K-SADS-E)—a diagnostic interview with well-established reliability and validity, was administered and scored independently from the T-ASI. The psychologist and psychiatrists assigned discharge DSM-III-R diagnoses and Global Assessment of Functioning Scale scores. Finally, each adolescent completed the Youth Self-Report (Achenbach, 1991), a standardized self-report questionnaire with established reliability and validity. Evidence of criterion-related validity was found. The substance use scale from the T-ASI was significantly correlated with the K-SADS-E Alcohol Abuse ( $r = 0.76, p < 0.01$ ) and Substance Abuse scores ( $r = 0.88, p < 0.01$ ). Moreover, the T-ASI scales of Family Function, Peer-Social Relationships, Legal Status, and Psychiatric Status were not significantly correlated with the Substance Abuse scale of the K-SADS-E and none of the same subscales nor the School Status scores were correlated with the Alcohol Abuse of the K-

SADS-E. In addition, T-ASI scores for the Psychiatric Status scale were significantly correlated with the YSR Internalizing T-score ( $r = 0.59, p < .01$ ) and the YSR Externalizing T-score ( $r = 0.57, p < .01$ ). Finally, scores on the T-ASI for the Substance Use subscale were significantly higher for adolescents who had a DSM-III-R diagnosis of substance use disorder compared to individuals with no diagnosis of substance use disorder, while there were no significant differences between the two groups of adolescents on scores for the other T-ASI scales.

## DSM-V MEASURE

The DSM-V diagnostic criteria for substance use disorders included in the AKTOS assessment<sup>2</sup> are similar to the criteria for DSM-IV, which has evidence of excellent test-retest reliability (Hasin, et al., 1996) and validity. For example, Horton, Compton, and Cottler (2000) found excellent test-retest reliability in a sample of African American and Caucasian individuals with alcohol dependence ( $k = 0.78, k = 0.80$ , respectively) and opiate dependence ( $k = 0.77, k = 0.71$ , respectively). Evidence of criterion-related validity is provided by genetics research that some genetic variants lower the threshold for the induction of nicotine dependence, which is summarized by Hogg and Bertrand (2004). In a national probability sample, the 1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES), diagnosis of alcohol abuse and dependence made with the DSM-IV was compared with criterion measured with the Alcohol Use Disorders and Associated Disabilities Interview Schedule (AUDADIS). The odds ratios for diagnosis of dependence vs. no diagnosis, abuse vs. no diagnosis, and dependence vs. abuse were all statistically significant with the criterion variables: alcohol consumption, treatment seeking, suicidal ideation/attempts, and alcohol-induced blackouts (Hasin & Paykin, 1999). However, the DSM-V does away with the distinction between substance abuse and dependence, substituting severity ranking instead and the DSM-5 also deletes the criterion about legal problems arising from substance use and adds a new criterion about craving and compulsion to use (Malone & Hoffmann, 2016). In this analysis that compared the diagnosis of substance abuse and dependence per the DSM-IV and the diagnosis of severity of substance use disorders per the DSM-V, Malone and Hoffman (2016) found that diagnoses of the two sets of criteria were largely in agreement at either extreme of the diagnostic continuum (no disorder and severe substance use disorder) with the most variation for individuals who received a diagnosis of substance abuse per the DSM-IV.

## TARGETED SUBSTANCE USE MEASURES

The question regarding the use of needles to inject drugs in the AKTOS assessment is from the ASI and was included even though it was not part of the T-ASI. Due to the significant issue with smoking in Kentucky (16.9% of high school students, which is the third highest rate in the nation) along with e-cigarette use which is growing each year (Barrington-Trimis et al., 2016; CDC, 2016; Singh et al., 2016), use of smoking tobacco, smokeless tobacco, and e-cigarettes are assessed with items that are

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<sup>2</sup> The difference in diagnostic criteria of the DSM-V from the DSM-IV are the deletion of the legal problems criterion, addition of the cravings criterion, and lack of distinguishing between abuse and dependence in the DSM-V. Instead the threshold of two or more criteria is used to diagnose substance use disorder in the DSM-V. Because the DSM-V is a relatively recent revision, no reliability and validity studies have been conducted using the DSM-V criteria for diagnosing substance use disorder. Nonetheless, the slight differences between the DSM-IV and DSM-V diagnostic criteria suggest the DSM-V diagnostic criteria for substance use disorders will also have good reliability and validity once the body of research is conducted. Furthermore, the changes in DSM-V criteria include some positive changes for defining SUD among adolescents (Winters, 2011).



worded to be consistent with the alcohol and drug use questions. The age of first use for smoking, first alcoholic drink (other than a few sips), and first used illicit drugs is also included in the AKTOS assessment.

## 2. Mental Health

The goal of administering mental health symptom measures is to characterize severity and change over the course of treatment (Scott & Lewis, 2015). The AKTOS mental health section focuses on internalizing problems (i.e., depression and anxiety), externalizing behavior (i.e., conduct and aggressive behavior), attention problems, suicidal ideation/ suicide attempts, and emotion regulation.

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**The PSC-17 has been shown to be valid and reliable measures of psychosocial problems, internalizing and externalizing disorders and attention problems.**

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The Pediatric Symptom Checklist is used in health care to screen for psychosocial problems in children and adolescents. More research has been conducted on assessing the reliability and validity of the full form of the Pediatric Symptom Checklist (PSC), which is a 35-item screening questionnaire to identify school-age children with difficulties in psychosocial functioning (Jellinek et al., 1988) than on the brief version, the PSC-17 (Murphy et al., 2016). Even so, the PSC-17 has been used in over 40 peer-reviewed publications (Murphy, 2015). The PSC-17 total score is designed to evaluate a child's overall psychosocial functioning. Three subscales, consisting of 5 to 7 items, assess functioning in internalizing, attention, and externalizing problems (Gardner et al., 1999). In a large national sample of pediatric patients (ages 4 to 15 years old), internal consistency reliability (Cronbach's  $\alpha = 0.89$ ) and test-retest reliability ( $r = 0.85$ ) of the PSC-17 were high (Murphy et al., 2016). The PSC-17 has been shown to have higher detection rates than pediatricians relying on clinical judgment alone (Wren, Scholle, Heo, & Comer, 2003) and identification rates comparable to those of the PSC-35 (Gardner et al., 1999) and semi-structured interviews such as the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (Gardner, Lucas, Kolko, & Campo, 2007).

Nonetheless, most of the research on the reliability and validity of the PSC-17 is based on the parent-completed version of the instrument. Because the AKTOS assessment is designed to be completed by the clinician/interviewer with the adolescent, the youth self-report version of the PSC-17, Y-PSC-17 (Pagano, Cassidy, Little, Murphy, & Jellinek, 2000), was used in the AKTOS assessment. Duke, Ireland, & Borowsky (2005) examined factors that were associated with positive screens on the PSC-17 filled out by the parent and the Y-PSC-17, which is filled out by the youth, in a sample of youth (10 – 15 years old) who were seen for medical visits. Findings show that when youth and parent reports have a positive PSC-17 the youth are more likely to have a diagnostic cutoff score on at least one of the problem scales of the Child Behaviour Checklist (CBCL) or Youth Self Report (YSR). Cronbach's alpha for the subscales were good: anxiety/depression (0.86), aggression (0.90), delinquency (0.81), and attention problems (0.79).

## INTERNALIZING PROBLEMS

The Internalizing Problems subscale of the PSC-17 includes 5 items that ask about depression and anxiety symptoms. Items ask how often the adolescent “Feels sad, unhappy,” “Feels hopeless,” “Is down on him or herself,” “Worries a lot,” and “Seems to be having less fun.” The response options range from 0 (*Never*), 1 (*Sometimes*), and 2 (*Often*). Thus, as a severity measure, the Internalizing Problems subscale scores can range from 0 to 10. In a study of 269 children and adolescents (8 – 15 years old) whose parents completed the PSC-17 in primary care waiting rooms and children were later assessed using the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL), the PSC-17 Internalizing Problems subscale had the best sensitivity (0.73) and specificity (0.74) when a cutoff score of  $\geq 5$  was used (Gardner et al, 2007).

Excellent internal consistency reliability was found in the sample of AKTOS clients who completed an intake interview in FY 2015 and FY 2016 ( $n = 414$ ): Cronbach’s  $\alpha = 0.895$ .

## EXTERNALIZING PROBLEMS

The Externalizing Problems subscale of the PSC-17 includes 7 items that ask about conduct problems and aggressive behavior. Examples of items ask how often the adolescent “Fights with others,” “Does not understand other people’s feelings,” and “Takes things that do not belong to him or her.” The response options range from 0 (*Never*), 1 (*Sometimes*), and 2 (*Often*). Thus, as a severity measure, the Internalizing Problems subscale scores can range from 0 to 14. In the Gardner et al. (2007) study of 269 children and adolescents, the PSC-17 Externalizing Problems subscale had the best sensitivity (0.73) and specificity (0.83) when a cutoff score of  $\geq 6$  was used, which is lower than the cutoff score recommended for the PSC (i.e., 7).

Good internal consistency reliability was found in the sample of AKTOS clients who completed an intake interview in FY 2015 and FY 2016 ( $n = 414$ ): Cronbach’s  $\alpha = 0.788$ .

## ATTENTION PROBLEMS

The Attention Problems subscale of the PSC-17 includes 5 items that ask about attention deficits and hyperactivity. Items ask how often the adolescent “Is Fidgety, unable to sit still,” “Daydreams too much,” “Is distracted easily,” “Has trouble concentrating,” and “Acts as if driven by a motor.” The response options range from 0 (*Never*), 1 (*Sometimes*), and 2 (*Often*). Thus, as a severity measure, the Internalizing Problems subscale scores can range from 0 to 10. In the Gardner et al. (2007) study of 269 children and adolescents, the PSC-17 Attention Problems subscale had the best sensitivity (0.67) and specificity (0.82) when a cutoff score of  $\geq 6$  was used, which is lower than the cutoff score recommended for the PSC (i.e., 7).

Excellent internal consistency reliability was found in the sample of AKTOS clients who completed an intake interview in FY 2015 and FY 2016 ( $n = 414$ ): Cronbach’s  $\alpha = 0.829$ .

## SUICIDE IDEATION AND ATTEMPTS

These two items were adapted from the T-ASI psychiatric domain. There is no validity information for these two items separate from the rest of the psychiatric domain.

## EMOTION REGULATION

Emotion regulation is sometimes mistakenly considered to be synonymous with coping, however, coping is a broader construct than emotion regulation, and emotion regulation is a form of coping (Gross, 1998). Definitions vary widely within and across disciplines. A broad definition is put forth by Shadur and Lejuez (2015): “efforts, strategies, and responses, whether conscious or not, involved in modifying or maintaining an emotional state and associated behaviors” (p. 355). Shadur and Lejuez (2015) summarize a body of research that has found that emotion regulation deficits are the defining feature of some psychiatric disorders, predict adjustment throughout human development, including internalizing and externalizing problems and substance use. More specifically, emotion regulation deficits are robust predictors of substance use risk (Cheetham, Allen, Yücel, & Lubman, 2010; Griffin, Lowe, Acevedo, & Botvin, 2015; Holtmann et al., 2011). Evidence suggests that emotion regulation deficits are factors in the causal pathway and as a consequence for substance use disorders (Shadur & Lejuez, 2015). For these reasons, a measure of emotion regulation was included in the AKTOS assessment.

The self-report questionnaire, Regulation of Emotions Questionnaire (REQ), was designed to assess the frequency with which adolescents use functional and dysfunctional emotion regulation strategies that draw on internal and external resources (Phillips & Power, 2007). The conceptual framework upon which the questionnaire is based posits that the important function of emotions is to provide useful information and to direct goal-directed behavior. Thus, regulatory strategies that use the information, by processing the emotion, are considered adaptive and functional, while strategies that do not process the information in a helpful way are considered dysfunctional (Phillips & Power, 2007). Furthermore, the nature of the resources from which individuals draw to regulate their emotions is considered important. Phillips and Power (2007) dichotomize the resources used to regulate emotions into internal and external (i.e., interpersonal).

The REQ was developed with four subscales in mind, and for which there was empirical support in the factor analysis, conducted with data from 225 adolescents: (1) Internal-dysfunctional, (2) Internal-functional, (3) External-dysfunctional, and (4) External-functional. Internal consistency reliability was good for three of the four subscales: *Cronbach's*  $\alpha = 0.72, 0.76, 0.76$ , respectively, and below the 0.70 threshold for the external-functional subscale (*Cronbach's*  $\alpha = 0.66$ ; Phillips & Power, 2007). Within the same study, measures of emotional and behavioral problems in children/adolescents (i.e., Strengths and Difficulties Questionnaire), psychosomatic health problems (i.e., Health Behaviour in School-Age Children), and quality of life (i.e., KIDSCREEN-52) were also administered to the adolescents to examine the hypothesized relationships with emotion regulation to examine the convergent validity of the REQ. Results provided support for the construct validity of the REQ. First, adolescents who used internal and external dysfunctional strategies more frequently had greater levels of emotional and behavioral problems. Second, significant positive correlations between internal- and external-dysfunctional strategies with psychosomatic health problems. Finally, more



frequent use of internal- and external-dysfunctional strategies was significantly associated with lower quality of life for most of the 10 dimensions of quality of life assessed with the KIDSCREEN-52. Along the same lines, the more frequent use of internal- and external-functional strategies was significantly associated with higher quality of life in most dimensions.

Good internal consistency reliability was found in the sample of AKTOS clients who completed an intake interview in FY 2015 and FY 2016 ( $n = 414$ ) for two of the four emotion regulation subscales: internal-dysfunctional (Cronbach's  $\alpha = 0.803$ ) and the external-dysfunctional subscale (Cronbach's  $\alpha = 0.760$ ). The internal consistency reliability for the internal-functional (Cronbach's  $\alpha = 0.609$ ) and the external-functional (Cronbach's  $\alpha = 0.616$ ) subscales were lower than the recommended 0.70 threshold.

### **3. School Attendance and Performance**

The relationship between substance use and academic achievement in childhood and adolescence is robust (Jeynes, 2002). Substance use in adolescence is associated with lower educational attainment (Grant et al., 2012). There is a wealth of evidence that school difficulties precede substance use (Bachman et al., 2008; Henry & Huizinga, 2007; Henry, Knight, & Thornberry, 2012; Henry & Thornberry, 2010; Schulenberg, Bachman, O'Malley, & Johnston, 1994). Further, frequent marijuana use in late adolescence has been associated with a lower likelihood of postsecondary educational attainment (Maggs et al., 2015). Thus, school attendance and performance are critical factors to examine in an evaluation study for adolescents in substance abuse treatment.

Some items from the T-ASI section on school status were included with modifications to provide more information in the AKTOS assessment: current enrollment in school, school absences including reasons for absences in the last 3 months of school (e.g., skipped school, detention, suspension, expulsion, sickness, and involvement in the child protection or juvenile justice systems), and participation in extracurricular activities. For example, instead of having dichotomous response options (e.g., No/Yes) for the question about current enrollment in school as is the case in the T-ASI, we provided response options that would tell the type of schooling in which clients were currently enrolled: public school, private school, alternative school, home school, home bound, day treatment, GED classes, community college/university courses, or officially withdrawn. Additionally, several additional items were added to the AKTOS assessment: level of satisfaction with the current school situation, repeated a grade in school, expectation to finish high school or get a GED, expectation to go to college or vocational/technical school.

### **4. Justice System Involvement**

Involvement in the juvenile justice and criminal justice system (for those individuals who are 18 years old and older at the follow-up assessment (i.e., justice system involvement) is assessed with six main questions which were adapted from the T-ASI: (1) nights incarcerated in the past 12 months; (2) times arrested and charged with an offense in the past 12 months; (3) how many of those arrests were for status offenses; (4) whether they are currently on probation; (5) whether they are currently in a drug court program; and (6) whether they are currently in a court ordered diversion program (other than drug court).

In general, research suggests that self-reported criminal justice system involvement is reliable such that self-reported arrests correspond well to arrests noted in official datasets with one study finding self-reported arrests equal to or greater than arrests in the official dataset (Marquis, 1981). For example, in a study comparing self-report and official records among serious juvenile offenders found moderate agreement, which was fairly stable over time and similar across genders and race/ethnicities (Piquero, Schubert, & Brame, 2014). A study with adults found that 73% of those with an official arrest had also self-reported an arrest and 21% had reported an arrest although there was no official history of arrest (Maxfield, Weiler, & Widom, 2000). A review of the psychometric properties of the self-report method for measuring delinquency and criminal behavior found that most studies have found excellent to good test-retest reliability and good construct validity, including criterion-related validity (Farrington et al., 1996).

## **5. Adverse Childhood Experiences and Victimization**

Adverse childhood experiences, defined as abuse and household dysfunction, are common. In the Adverse Childhood Experiences Study (ACES), which surveyed over 17,000 adults who were members of a health maintenance organization (HMO), the questionnaire asked about 10 major categories of childhood trauma: three types of abuse (emotional, physical, and sexual), two types of neglect (emotional and physical), and five types of family dysfunction (having a mother who experienced intimate partner violence, having a household member who was an alcoholic, having a household member who was a drug user, a household member who was incarcerated, a household member diagnosed with a mental disorder or committed suicide, or parents who were separated or divorced (Felitti et al., 1998). Almost two-thirds of HMO adult members who participated in the ACES reported at least one adverse childhood experience, and more than 1 in 5 reported 3 or more (Dong et al., 2004). As the number of adverse experiences increase the risk of many health, mental health, and social problems also increases (Edwards et al., 2005; Felitti et al., 1998). For example, increases in ACE scores is associated with a greater likelihood of depressed mood (Anda et al., 2002; Dube et al., 2003), suicide attempts (Dube et al., 2001), and panic/anxiety (Anda et al., 2006). Of particular importance to AKTOS is the finding that higher numbers of adverse childhood experiences are associated with greater risk of drug abuse (Dube et al., 2003), as well as alcohol abuse, including initiating use during adolescence (Dube et al., 2006) and smoking in adolescence (Anda et al., 1999). Additionally, experiencing more types of childhood abuse is associated with greater likelihood of experiencing an unintended first pregnancy among women (Dietz et al., 1999).

The only report of internal consistency reliability for the ACES survey was conducted with a sample of 75 urban women in a clinical and community sample (Murphy et al., 2014). In this study, internal consistency reliability was excellent (Cronbach's  $\alpha = 0.88$ ). Test-retest reliability was examined for 658 individuals who filled out the questionnaire in two waves of the study (Dube, Williamson, Thompson, Felitti, & Anda, 2004). Kappa coefficients were in the good to excellent range as noted by Fleiss (1981) for abuse categories (0.51 – 0.69) and the household dysfunction categories (0.51 – 0.86) with the exception of having an incarcerated household member (0.46).

Because sibling abuse, peer victimization, and intimate partner violence have been identified as important types of victimization that children may experience that can impact their psychological distress, substance use, and other risk behaviors (Howard & Wang, 2003; Luk, Wang, & Simons-

Morton, 2010; Radliff, Wheaton, Robinson, & Morris, 2012; Temple & Freeman, 2011; Tharp-Taylor, Haviland, & D'Amico, 2009), some additional items to assess sibling and peer emotional, physical, and sexual abuse were taken and modified from the Juvenile Victimization Questionnaire (Finkelhor, Hamby, Ormrod, & Turner, 2005) and were added to the set of questions taken and modified from the ACE Study about child maltreatment/abuse and household dysfunction. Moreover, the one-item measures of emotional abuse and physical abuse by a caregiver used by Finkelhor et al. (2005) was included in the AKTOS assessment instead of the original emotional abuse and physical abuse multiple items included in the ACES survey. Finally, following the Clinical ACES Questionnaire (Murphy et al., 2014), we included a positively worded item in AKTOS about the presence of a person in the child's life who made the child feel special, loved, or important.

## **AKTOS Supplementary Assessment Components**

### **1. Parental Involvement**

Parental involvement is a mediating factor for substance use among adolescents, such that greater parental involvement is associated with lower substance use and risk for addiction (Broman, Reckase, & Freeman-Doan, 2006; Choquet, Hasslen, Morin, Falissard, & Chau, 2008). Typically included within the construct of parental involvement is the degree of parental monitoring of the child and the amount of parental warmth. In a longitudinal, genetically informed study comprised of sibling-pairs where at least one of the adolescents was adopted ( $n = 568$ ) or the biological offspring of both parents ( $n = 412$ ), results support the protective influence of parent involvement on subsequent adolescent substance use (Samek, Rueter, Keyes, McGue, & Iacono, 2015).

A brief measure of parental involvement that assesses the quality and quantity of interactions between parents and adolescents was included in the AKTOS assessment (Harris, Furstenberg, & Marmer, 1998). This 6-item parental involvement scale was used in the National Survey of Children (NSC), which was a panel study of a nationally representative sample of children across three waves beginning in 1976 and ending in 1987. First, three items were asked to assess the affective quality of the child's relationship with his/her parents as perceived by the adolescent. Second, three items were asked to assess the behavioral dimension of parental involvement by asking about doing things together, and supportive types of communication and interaction. Scores on the items are reverse coded so that high scores indicate high levels of parental involvement.

In the NSC, there was evidence of good reliability and construct validity. First, the parental involvement scores had good internal consistency reliability in 584 children who lived continuously with both of their biological parents during all three waves of the study (*Cronbach's*  $\alpha = 0.77$  for fathers and 0.71 for mothers). Second, scores on the parental involvement index were significantly associated with other questions in the NSC that assessed the intimacy and warmth of the family. However, this finding was mentioned as a footnote in the peer-reviewed article by Harris et al. (1998); thus, specific findings cannot be presented here.

In the AKTOS assessment 5 items for the parental involvement scale were included with the same response options. Adolescents were asked to think about their primary caregiver when answering the questions. However, the order of the response options was reversed from the order in the original



index so that reverse scoring is not necessary when computing the index as it was for the original index as reported in Harris et al. (1998). Thus, the minimum score is 5 and the maximum score is 17 (indicating a warmer and more involved relationship with the primary caregiver) for the parental involvement index in AKTOS. Good internal consistency reliability was found in the sample of AKTOS clients who completed an intake interview in FY 2015 and FY 2016 ( $n = 414$ ): Cronbach's  $\alpha = 0.782$ .

## 2. Recovery Supports

The Recovery Supports section closes the AKTOS assessment by asking about: (1) attending AA/NA/MA or other self-help group meetings and whether or not they have had contact with a sponsor recently; (2) how many people the client has they can count on to help them with their recovery and whether their friends or family were supportive of their recovery; (3) what is most useful beside substance abuse treatment that helps them in their recovery; and (4) their level of satisfaction

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**Research has shown that recovery and positive social supports are linked to a lower risk of relapse. In addition, individuals in recovery cite their access to social and spiritual supports as an important key to their success.**

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with the recovery support in their life. The recovery supports questions were adapted from the GPRA (Mulvey, Atkinson, Avula, & Luckey, 2005) with feedback from discussions with state and community stakeholders. Research has shown that recovery and positive social supports are linked to a lower risk of relapse (Havassy, Hall, & Wasserman, 1991). In addition, individuals in recovery cite their access to social and spiritual supports as an important key to their success (Flynn, Joe, Broome, Simpson, & Brown, 2003).

## AKTOS demographic Information

The AKTOS demographic information includes items that were taken or adapted slightly from the standardized Government Performance and Reporting Act of 1993 (GPRA; Public Law 103-62) monitoring tool, which is used by all Center for Substance Abuse Treatment (CSAT) and Substance abuse and Mental Health Services Administration (SAMHSA) funded grantees (Mulvey et al., 2005), or were included on AKTOS as context specific questions: gender, sexual orientation, race/ethnicity, age, marital status, medical insurance type, and primary referral source.

## Conclusion

The Adolescent Kentucky Treatment Outcome Study (AKTOS) is a statewide treatment outcome evaluation that is updated and enhanced annually. AKTOS consists of three main components: (1) an evidence-based intake assessment administered by treatment staff using a secure, web-based instrument as clients enter publicly funded treatment programs; (2) an evidence-based follow-up assessment 12-months after intake. The follow-up rate is over 85% for each of the last three biannual reports and an average of over 150 clients are assessed at the 12-month follow-up each year; and, (3) data analysis and dissemination.

The AKTOS assessment is a brief self-report instrument that documents symptoms and patterns of substance abuse and related psychosocial problems. The AKTOS is easy to use and takes about 35 minutes to complete. The AKTOS assessment was developed in collaboration with key stakeholders and adapted to consider the Kentucky context as well as the unique substance abuse and related trends over time in Kentucky. The AKTOS assessment has five core assessment components which all have strong reliability and validity research data including: (1) substance use, (2) mental health, (3) school attendance and performance, (4) justice system involvement, and (5) adverse childhood experiences. The two supplemental AKTOS assessment components also have strong reliability and validity data for most of the assessment components and includes: (1) parental involvement, and (2) recovery supports.

The evidence base for AKTOS conforms to the 7 recommendations for evidence-based assessments for treatment providers in public agencies presented in the first section of this document.

- (1) *Use of Theory and Research.* The AKTOS assessment includes a set of instruments developed to provide screening and assessment of psychosocial issues identified in theory and research as related to substance use including education, adverse childhood experiences, family factors, mental health problems, justice system involvement, and recovery supports (or engagement in the treatment process).
- (2) *Contextual Appropriateness.* The AKTOS assessment was originally developed to consider the unique features of Kentucky and has been revised after data analysis and feedback from users and other stakeholders to consider the unique context of Kentucky.
- (3) *Face Valid and User-friendly.* The AKTOS assessment is face valid and focuses on components identified in theory and research as related to substance use, relapse, and treatment outcomes. Further, AKTOS is easy to use and takes about 35 minutes to complete.
- (4) *Established Reliability and Validity.* The AKTOS assessment has five core components each with strong reliability and validity research support and two supplemental components many of which have strong reliability and validity research support.
- (5) *Measuring Dynamic Rather than Static Constructs.* Although AKTOS does include key demographic indicators the majority of the assessment components focus on current status, symptoms, and constructs that are amenable to change targeted in treatment over time.

- (6) *Not Producing Adverse Reactions or Consequences.* In over a decade of conducting AKTOS no adverse reactions or consequences due to the assessment or the research procedures have been reported.
- (7) *Sensitive to Change So That Outcomes Can Be Measured.* Results from past AKTOS outcomes indicate that a significant proportion of clients benefit from substance abuse treatment as substance use and substance abuse severity declines, school attendance and performance improves, and behavioral health symptoms are significantly reduced.
- (8) *Data Analysis and Dissemination.* An added benefit of AKTOS is that state-level trends in substance use along with the co-occurring behavioral health problems, justice system involvement, and education trends for adolescent clients entering publicly funded treatment are provided each year. This data system also provides state-level trends in recovery and recovery correlates over time. An important benefit of state-level outcome studies is that funders and legislators can see up-to-date state specific data to provide evidence of need for new programs, continuation of current programs, and changes in programmatic policies. Key trends in substance use and policy needs fluctuate annually depending on economic and other state-specific sociopolitical issues, each year's analytical findings, the latest research, and legislative research commission requests, making the need for easily-modifiable annual data collection even more important. In addition to annual statewide reports, the AKTOS data is used for community-level reports on client characteristics and outcomes for communities applying for Federal or other grants.

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**Key trends in substance use and policy needs fluctuate annually depending on economic and other state-specific sociopolitical issues, each year's analytical findings, the latest research, and legislative research commission requests, making the need for easily-modifiable annual data collection even more important.**

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The AKTOS assessment is not meant to replace clinical decision-making or render diagnosis. The AKTOS assessment can be used to inform treatment(s), engage clients through self-report, and monitor outcomes. The AKTOS assessment, to minimize burden and cost, is not as lengthy, resource intensive, or as costly as other assessments. This may mean that if diagnosis information for a wider variety of conditions (e.g., personality disorder) is sought the AKTOS assessment will need to be supplemented. Although AKTOS is a robust and pragmatic assessment, AKTOS is relatively short (35 minutes) to reduce staff burden. However, that means that some of the components assessed are not included and some components could be measured more comprehensively.

The evidence base for the AKTOS assessment suggests it is a robust, pragmatic, reliable, and valid assessment, which provides statewide and regional data about Kentucky drug use trends, substance use-related comorbidities, and substance abuse treatment outcomes.

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## Appendix B: Reports Generated Using AKTOS Data

In addition to the annual report submitted to the state, regional reports and other ad hoc data reports are generated upon request.

### Annual Reports

Cole, J., Logan, T., Miller, J., Scrivner, A., & Walker, R. (2016). *Findings from the Adolescent Kentucky Treatment Outcome Study (AKTOS) 2016 Report*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research.

Cole, J., Logan, T., Scrivner, A., & Walker, R. (2014). *Findings from the Adolescent Kentucky Treatment Outcome Study (AKTOS) 2014 Report*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research.

Cole, J., Logan, T., Stevenson, E., Scrivner, A., & Parrish, D. (2012). *Adolescent Kentucky Treatment Outcome Study – AKTOS, 2012 Follow-up Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Cole, J., Stevenson, E., Scrivner, A., Newell, J., & Walker, R. (2010). *Adolescent KTOS Follow-up Report 2010*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Walker, R., Cole, J., Mateyoke-Scrivner, A., Logan, TK, & Leukefeld, C. (2008). *Adolescent Kentucky Treatment Outcome Study 2008 Follow-up Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

### Translational reports

Cole, J., Logan, T., Miller, J., & Scrivner, A. (2016). *Adolescent Kentucky Treatment Outcome Study 2016 Fact Sheet*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research.

Cole, J., Logan, T., Miller, J., & Scrivner, A. (2016). *Adolescent Kentucky Treatment Outcome Study (AKTOS) 2016 Findings at a Glance*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research.

Cole, J., Logan, TK, Spence, M., Scrivner, A. (2014). *Adolescent Kentucky Treatment Outcome Study 2014 Fact Sheet*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research.

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## Appendix C: AKTOS Publication

There is one publication from AKTOS published in a peer reviewed journal.

1. Cole, J., Stevenson, E., Walker, R., & Logan, T. (2012). Persistent tobacco use and psychiatric comorbidity among adolescent substance abuse treatment clients *Journal of Substance Abuse Treatment*, 43(1), 20-29.