Center on Drug and Alcohol Research

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

Evidence Base for the Kentucky Opioid Replacement Treatment Outcome Study (KORTOS) Assessment and Methods

October 2016

Executive Summary

The Kentucky Opioid Replacement Treatment Outcome Study (KORTOS)

The Kentucky Opioid Replacement Treatment Outcome Study (KORTOS) is a statewide data collection system designed to examine substance abuse treatment outcomes over time. This study started in 2007 to monitor outcomes for clients on medication-assisted treatment. The KORTOS study was modeled after the Kentucky Treatment Outcome Study (KTOS) which was initiated by the Kentucky Department of Behavioral Health, Developmental and Intellectual Disabilities (DBHDID), which was charged with carrying out the study and contracted with the University of Kentucky Center on Drug and Alcohol Research (UK CDAR) to develop and implement the study. **Although Kentucky is represented in a few national substance abuse treatment 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, smoking, and serious health conditions (cancer deaths, cardiovascular related deaths, premature deaths, diabetes, obesity), along with the highest number of preventable hospitalizations and the second highest proportion of the population on disability in the nation. Other indicators show Kentucky ranks among the highest in number of self-reported poor days of physical health and mental health. Further, Kentucky ranks low in financial opportunity, financial well-being, and the percent of children living in poverty (Gallup Polls, 2014, 2015; Hess et al., 2015; Social Security Administration, 2011; United Health Foundation, 2015). **Given this context, the KORTOS 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 the KORTOS assessment (based on the KTOS structure and components) conforms to the recommendations for evidence-based assessments for treatment providers in public agencies. The KORTOS assessment:

1. **Is based on theory and research** about substance use-related comorbidities such as depression, anxiety, suicidality, criminal justice system involvement, quality of life, difficulties in employment, medical problems, housing instability, and recovery supports.

2. **Is appropriate for the context of Kentucky opioid treatment program (OTP)** and includes measures that consider the unique features of Kentucky and of OTPs. Initially, a pilot study was conducted to ensure the core assessment structure and components were appropriate for the OTP target population.

3. **Is face-valid and user-friendly**, in part because almost years of experience, but also because it targets areas identified in theory and research as related to substance use, relapse, and treatment outcomes. The KORTOS assessment is based on the KTOS assessment core structure with a few minor modifications for adaptation to the OTP environment. KORTOS, like KTOS 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. A statewide survey of the OTPs that participate in KORTOS found that overall, OTPs reported positive experiences with each of the components of KORTOS including the KORTOS assessment, KORTOS annual outcome report, the Client Information System, and the client narratives.

4. **Is made up of five core components** (substance use, mental health, victimization and trauma, criminal justice system involvement, and quality of life) each with **strong reliability and validity research support** and three supplemental components (health and stress-related health consequences, economic and living circumstances, and recovery supports), most of 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 mental health symptoms, quality of life, and recovery supports which can be changed within the treatment context 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 10 years with no reports of adverse reactions or consequences** due to the assessment or the research procedures. In addition, KORTOS 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. KORTOS 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.

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Is sensitive to individual-level change so that outcomes can be measured. Results continue to show that the OTP clients from programs who participate in KORTOS made substantial improvements from intake to follow-up in several important dimensions of their lives including significant reductions in illegal drug and alcohol use as well as the severity of their drug and alcohol use, significant reductions in mental health problems and stress, significant improvements in their living and housing situations, significant reductions in economic hardship, and significant reductions in criminal justice system involvement. Additionally, clients reported high levels of satisfaction with their experience at the OTP, higher quality of life, and more recovery supports at follow-up. The 6-month follow-up uses the same KORTOS evidence-based assessment that is conducted at intake in order to examine change over time. The study has a follow-up rate with over 80% of selected clients and about 200 follow-up assessments completed each year (2011-2016).

Additional benefit

Provides data analysis and dissemination. An additional benefit of this Kentucky Opioid Replacement Treatment Program Outcome Study is that state-level trends in substance use along with the co-occurring anxiety and depression, criminal justice system involvement, employment and economic status, and quality of life trends for clients entering OTPs are provided each year. 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 KORTOS 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 **6 annual reports** using intake data and follow-up data from 1997 through 2015.
2. UK CDAR BHOS has produced **over 20 regional and other ad hoc reports using KORTOS data along with over 10 different translational research products.**
3. The KORTOS data has also been used in **presentations and meetings** with clinical providers, agency boards of directors, and other state planning agencies that work closely with DBHDID.
4. **One peer reviewed, scholarly article** using KORTOS data has also been published.

The evidence base for the KORTOS 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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Evidence Base for the Kentucky Opioid Program Treatment Outcome Study (KORTOS) Assessment and Methods

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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.

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 first Kentucky treatment study, the Kentucky Treatment Outcome Study (KTOS), was initiated in 1997 by the Department of Behavioral Health, Developmental, and Intellectual Disabilities (DBHDID) in collaboration with University of Kentucky Center on Drug and Alcohol Research (UK CDAR) to serve as a means of uniformly collecting and analyzing annual outcome information to meet the legislative requirement for KRS 222.465.[1] With non-medical use of prescription opioids becoming an increasing problem for Kentucky, it became essential to have statewide studies monitoring the outcomes of clients in medication assisted treatment programs (OTPs). In 2007, Kentucky opioid treatment programs (OTPs) began collecting outcome data on medication-assisted treatment. Like KTOS, the core of KORTOS is: (1) the comprehensive web-based intake assessment, (2) CDAR conducted follow-up assessment; and, (3) data analysis and dissemination. The KORTOS assessment parallels the KTOS assessment however the KORTOS methods vary in two main ways. First, KORTOS inclusion criteria for follow-up is that clients must still be in treatment in a Kentucky OTP otherwise they are not assessed at follow-up. Second, the follow-up assessment is conducted 6-months after the intake rather than the 12-month follow-up for KTOS. Thus, the intake and follow-up assessments ask about a 6-month period rather than a 12-month period of time.

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 KORTOS 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. UK CDAR also conducts telephone follow-up interviews 6-months after completion of the intake using the evidence-based KORTOS follow-up assessment with a sample of clients who consent to participate in the follow-up at the intake, who are still engaged in the treatment program, and who consent to participate in the follow-up at the time of re-contact. The study has a high follow-up rate of over 80% and completes about 200 follow-up assessments each year.

[1] 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 KORTOS 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

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

The following bulleted points highlight how the KORTOS assessment, which is based on the KTOS assessment core structure[2], meets each of the evidence-based criteria listed above and one additional benefit is described:

1. **Use of theory and research**. The KORTOS assessment, which 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 difficulties in employment, medical problems, housing instability, depression, anxiety, suicidality, criminal 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 KORTOS assessment structure and components were originally developed to consider the unique sociocultural context of OTPs as well as the Kentucky context. Initially, a pilot study was conducted to ensure the core assessment components and structure were appropriate for the OTP target population and that specific questions were included to assess the treatment context. Revisions were made as needed after data analysis and feedback from users and other stakeholders (see Figure 1 on the next page).
    - More specifically, the Kentucky context includes being 3rd in the nation for highest drug overdose-related deaths and 2nd in the nation for highest smoking rates (United Health Foundation, 2015). 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 (50th), cancer deaths (50th), premature deaths (47th), diabetes (45th), obesity (44th), and is in the bottom 10 for cardiovascular deaths (43rd). Kentucky was ranked 2nd in the nation for the highest number of self-reported poor physical health days in the past 30 days and 4th in the nation for the overall number of self-reported poor mental health days in the past 30 days.
    - Further, the Social Security Administration (2011) indicates 8.1% of the Kentucky population between 18 and 64 are on disability which is the 2nd highest in the nation. Another study found Kentucky had the 4th highest prevalence rate (16.1%) for disability among non-institutionalized working age individuals (ages 21 – 64) in the U.S. 50 states and territory of Puerto Rico (Erickson, Lee, & von Schrader, 2014).
    - Another report on poverty and economic opportunity ranks Kentucky as 48th in the nation for economic opportunity (Hess et al., 2015) while Gallup Polls (2014) ranked Kentucky as 46th in the nation for financial well-being (which considers having enough money for food, health care, and people's perceived standard of living).

[2] For more information, see: Logan, TK, Cole, J., Miller, J., Scrivner, A., & Walker, R. (2016), *Evidence Base for the Kentucky Treatment Outcome Study (KTOS) Assessment and Methods*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research. (Available upon request). There is one minor difference between the KORTOS and KTOS. The KORTOS intake and follow-up assessment ask about a 6-month period rather than the 12-month period.

Kentucky also was ranked 2nd in the nation for highest percentage of children living in poverty (United Health Foundation, 2015).

Figure 1.

Kentucky in Context

The KORTOS 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

3rd highest in the nation for **DRUG OVERDOSE DEATHS**

2nd highest in the nation for **SMOKING RATES**

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

2nd highest in the nation for **POPULATION ON DISABILITY**

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 KORTOS 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 KORTOS assessment is a brief instrument (30 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). A brief satisfaction survey with OTPs that participate in KORTOS to gather feedback on the study was conducted in 2013.[3] Overall, clinicians and directors reported positive experiences with each of the components of KORTOS including the KORTOS assessment and client narratives.[4] In addition, respondents reported the KORTOS findings publications (e.g., annual report, findings at a glance, and fact sheet) were useful. Another satisfaction survey was conducted in 2015 with all ten of the OTPs that participate in KORTOS. Again, respondents reported positive experiences with the Client Information System and the Client Narrative Report.

4. **Established reliability and validity**. The KORTOS assessment has five core components and three supplemental components. The five core assessment components include: (1) substance use, (2) mental health, (3) victimization and trauma, (4) criminal justice system involvement, and (5) quality of life. The three supplemental assessment components that have been associated with substance abuse and relapse include: (1) health and stress-related health consequences, (2) economic and living circumstances, and (3) recovery supports. Each of the core assessment components and most of the supplementary components of the KORTOS assessment show excellent reliability and validity. Specific reliability and validity information for each assessment component is outlined in the following section.

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

5. **Measuring dynamic rather than static constructs**. Although KORTOS does include key demographic indicators the majority of the assessment components focus on current status, symptoms, and constructs that change over time. For example, mental health symptoms, quality of life, and recovery supports are all changeable within the context of substance abuse

[3] Twelve of the fourteen substance abuse directors were contacted; two could not be reached to complete a survey. Two of the twelve directors contacted did not complete the entire survey because of either their inexperience with KTOS or because they chose not to continue the survey. Twenty-seven clinicians from twelve of the fourteen CMHCs were contacted; clinicians from two CMHCs could not be reached.

[4] The *KORTOS Client Information System Satisfaction Survey Summary* can be found in Appendix C of Logan, T., Cole, J., Scrivner, A., Messer, J., Emmick, C., Spencer, M., Miller, J., & Hunt, T. (2014). *KTOS, AKTOS, KORTOS Projects FY14 Annual Progress Report*. Lexington, KY: University of Kentucky, Center on Drug and Alcohol Research.

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 the almost 20 years of conducting KTOS and 10 years of conducting KORTOS 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 KORTOS 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 KORTOS 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 continue to show that the OTP clients from programs who participate in KORTOS made substantial improvements from intake to follow-up in several important dimensions of their lives including significant reductions in illegal drug and alcohol use as well as the severity of their drug and alcohol use, significant reductions in mental health problems and stress, significant improvements in their living and housing situations, significant reductions in economic hardship, and significant reductions in criminal justice system involvement. Additionally, clients reported high levels of satisfaction with their experience at the OTP, higher quality of life, and more recovery supports at follow-up.

8. Data Analysis and Dissemination. An added benefit of this Kentucky Opioid Replacement Treatment Outcome Study is that state-level trends in substance use along with the co-occurring anxiety and depression, criminal justice system involvement, employment and economic status, and quality of life 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 KORTOS data is used for community-level reports on client characteristics and outcomes for communities applying for Federal or other grants (see Appendix B). Specifically,
    1. UK CDAR BHOS has produced 6 annual reports using intake data and follow-up data from 1997 through 2015.

2. UK CDAR BHOS has produced **over 20 regional and other ad hoc reports using KORTOS data along with over 10 different translational research products.**
3. The KORTOS data has also been used in **presentations and meetings** with clinical providers, agency boards of directors, and other state planning agencies that work closely with DBHDID.
4. **One peer reviewed, scholarly article** using KORTOS data has also been published. The KORTOS data has also been used in one dissertation (see Appendix C).

KORTOS Intake and Follow-up: Evidence-Based Assessments

The following paragraphs describe the specific evidence base for the KTOS assessment, upon which KORTOS is based, including the reliability and validity information specific to each assessment component, the relevant research related to supplementary assessment components, and assessment adaptations or additions in consideration of the Kentucky context. The KORTOS methods vary from KTOS in that clients must be participating in a Kentucky OTP at follow-up and the follow-up is done at 6-months after the intake rather than 12-months like KTOS. That means all time references ask about a 6-month period. The KORTOS assessment has demonstrated evidence that each component is sensitive to change and KORTOS provides critical information about treatment outcomes and factors related to relapse.

The KORTOS assessment has five core components and three supplemental components. The five core assessment components include: (1) substance use, (2) mental health, (3) victimization and trauma; (4) criminal justice system involvement, and (5) quality of life. The three supplemental assessment components that have been associated with substance abuse and relapse include: (1) health and stress-related health consequences, (2) economic and living circumstances, and (3) recovery supports. Specific demographic information is collected in the last section of the assessment.

KORTOS 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 Addiction Severity Index (ASI) substance use questions including alcohol and drug use along with the ASI composite score questions; (2) DSM-V criteria for substance use disorder; and (3) targeted questions about smoking, smokeless tobacco, and e-cigarette use, needle use and needle exchange programs per the request of community and state partners. Data from the KORTOS substance use assessment component has been analyzed and included in over 20 regional and ad hoc reports describing substance abuse trends and treatment outcome trends across the state. KORTOS data has also been used in one peer review publication and one dissertation while KTOS data has been used in eight peer reviewed publications and one dissertation. One study of KTOS data found that women in rural Appalachia had disproportionately high rates of opioid and sedative/tranquilizer use compared to women from non-Appalachian areas who had higher rates of methamphetamine, cocaine, marijuana and alcohol use (Shannon, Havens, Mateyoke-Scrivner, & Walker, 2009).

SUBSTANCE USE MEASURES

The KORTOS substance use assessment section includes items from the alcohol and drug use sections of the *Addiction Severity Index (ASI)* (5th edition) including questions about use and questions used to compute the ASI drug and alcohol use composite scores, which are recommended for measuring substance abuse treatment outcomes (McLellan et al., 1985). The ASI was developed as a

clinical/research assessment of substance use and multiple related problems found in alcohol and drug-dependent individuals. Further, the ASI is a commonly used public domain assessment (McLellan et al., 1985).

The ASI substance use measure has shown very good validity and reliability in measuring substance use. The ASI, like the KORTOS, assesses several main and supplementary areas. The KORTOS assessments use only the substance use domain of the ASI because of the good validity and reliability of this section and because the other components of KTOS (and thus KORTOS) were better assessed with other measures.[5]

The KORTOS assessment uses only the substance use domain of the ASI because of the good validity and reliability of this section and because the other components of KORTOS were better assessed with other measures.

Several studies have examined the construct validity (i.e., the extent the measure actually measures the construct of interest) of the ASI and with different populations such as veterans, homeless individuals, and individuals with comorbid psychiatric disorders (Cronbach & Meehl, 1955). 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.

The ASI substance use scores show high correlation with other measures of substance use. For example, the ASI was examined with other validated comparison instruments including the Michigan Alcoholism Screening Test (MAST; Selzer, 1971), Cohen and Klein Drug Use Scale (Cohen & Klein, 1971), and the Gunderson Drug Scale (Gunderson, Russell, & Nail, 1973) to determine the convergent and discriminant validity of the ASI multidimensional scores and the results showed good convergent

[5] Not all dimensions of the ASI have equal support for their reliability and validity. For example, at least one study with a sample of individuals receiving psychiatric care did not find support for discriminant validity of the alcohol, psychiatric, legal, or medical scales (Carey, Cocco, & Correia, 1997). Second, studies conducted with special populations, such as homeless clients and individuals with severe psychiatric disorders have found low test-retest reliability in some of the ASI composite scores including the medical, legal, drug use (Corse, Zanis, & Hirschinger, 1995; Zanis, McLellan, & Corse, 1997), and family/social (Hodgins & El-Guebaly, 1992). Third, there are some problems with the reliability and validity of ASI severity ratings, which are based on subjective judgment of interviewers (Stöffelmayr, Mavis, & Kasim, 1994; Wertz, Cleaveland, & Stephens, 1995). The severity ratings are not intended to be used as outcome measures (McLellan et al., 1992). Thus, ASI severity items were not included in the KTOS interview instruments. Fourth, the authors acknowledge that the family/social dimension of the ASI concentrates on individuals' conflicts with family and other persons; however, other critical dimensions of family and social functioning are not included in the ASI (McLellan et al., 1992).

and discriminate validity (McLellan et al., 1985). In addition, the ASI drug and alcohol composite scores correlated well with other instruments such as the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1995) and with DSM-III-R diagnoses (Appleby, Dyson, Altman, & Luchins, 1997) and DSM-IV-TR diagnoses (Rikoon, Cacciola, Carise, Alterman, & McLellan, 2006). In the Rikoon et al. (2006) study ASI composite scores for alcohol use and drug use identified dependent clients with 85% sensitivity and 80% specificity when ASI composite scores were matched to independent clinical diagnoses.

Other studies have examined how well the ASI self-reported substance use questions correlate with urinalysis results (Chermack et al., 2000; Zanis, McLellan, & Randall, 1994). In a sample of 563 clients admitted for treatment in substance abuse treatment outpatient clinics, conditional kappa values were good and indicated high levels of agreement between self-reported substance use and urinalysis: highest for cannabis (0.93) and lowest for opioids (0.84; Denis et al., 2012). Contrary to what may be expected, most of the discordance between self-reported substance use and urinalysis was because clients reported use of a particular substance but had a negative urinalysis for that substance. Part of the discrepancy is due to the fact that the 30-day self-report period is longer than the time frame captured in urinalysis results.

In general, examinations of various facets of the reliability of multiple dimensions of the ASI have found good interrater reliability and good test-retest reliability for the substance use composite scores (Calsyn et al., 2004; Mäkelä, 2004; McLellan et al., 1985; Wertz et al., 1995). Test-retest reliability, which is a measure of consistency of responses to the same set of questions at two periods, has been examined by administering the ASI interview to the same persons typically 3 days to 10 days apart (Mäkelä, 2004). Interrater reliability, which is the estimate of the equivalence of the responses between more than one rater, has been examined in these studies by having the rater observe the interview being conducted by the primary reviewer through a one-way mirror or via a videotaped recording and recording the interviewees' responses (Stöffelmayr et al., 1994). The degree of agreement between the primary interviewer's recorded responses and the observer's recorded responses is interrater reliability.

A third type of reliability that has been examined in studies is internal consistency reliability, which is a measure of the correlation between several items that purportedly measure the same construct. In other words, low correlations between items that purportedly measure the same construct indicate that the items are likely not measuring the same construct. In a review of studies that examined the reliability and validity of the ASI, Mäkelä (2004) discussed how three of the seven composite scores had consistently been found to have high internal consistency reliability: alcohol use, medical status, and psychiatric status.

DSM-V MEASURE

The DSM-V diagnostic criteria for substance use disorders included in the KORTOS assessment[6] 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.

TARGETED SUBSTANCE USE MEASURES

The question regarding the use of needles to inject drugs in the KORTOS assessment is from the ASI. However, the specific questions targeting needle exchange programs were requested to be added by key stakeholders in the community and DBHDID to assess use of these new programs. Furthermore, due to the significant issue with smoking in Kentucky (26.2% of the population, which is the second highest rate in the nation) along with e-cigarette use which is growing each year (Barrington-Trimis et al., 2016; Singh et al., 2016), use of smoking tobacco, smokeless tobacco, and e-cigarettes are assessed with items that are worded to be consistent with the alcohol and drug use questions. The age of first use for smoking, using smokeless tobacco, first alcoholic drink (other than a few sips), and first used illicit drugs is also included in the KORTOS 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 KORTOS mental health section focuses on depression, anxiety, and

Both the PHQ-9 and the GAD-7 have been shown to be valid and reliable measures of depression and anxiety respectively.

[6] 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.

suicidal ideation and suicide attempts.[7] Items for the depression measure were adapted from the *Patient Health Questionnaire-9 (PHQ-9*) and items for the anxiety measure were adapted from the *Generalized Anxiety Disorder (GAD-7)*. The Patient Health Questionnaire is an instrument for making criteria-based diagnoses of eight DSM-IV mental health disorders, one of which is major depressive disorder (Kroenke, Spitzer, & Williams, 2001). The GAD-7 was developed to identify probable cases of generalized anxiety disorder and to assess symptom severity for the criteria symptoms in the DSM-IV (Spitzer, Kroenke, Williams, & Löwe, 2006). Both the PHQ-9 and the GAD-7 have been shown to be valid and reliable measures of depression and anxiety respectively.

DEPRESSION

The Patient Health Questionnaire-9 (PHQ-9) includes 9 items that comprise the PHQ depression scale, which ask about the 9 symptoms listed as criteria in the DSM-IV for diagnosis of major depressive disorder (Kroenke et al., 2001). The response options range from 0 (*Not at all*) to 3 (*Nearly every day*). Thus, as a severity measure, the PHQ-9 can range from 0 to 27. A diagnosis of major depression is indicated if 5 or more of the criteria have been present at least "more than half the days" in the past 2 weeks, and 1 of the symptoms is depressed mood or anhedonia (Kroenke et al., 2001).

Data from two studies with 6,000 patients in primary care and obstetrics/gynecology clinics provide evidence that the PHQ-9 has good internal consistency reliability (Cronbach's $\alpha = 0.89$) and excellent test-retest reliability (0.84) between the original administration of the PHQ-9 in the clinics and then 48 hours later by telephone.

Data from this same study also found evidence for good criterion-related and convergent validity of the PHQ-9 (Kroenke et al., 2001). Specifically, criterion-related validity was examined with the correlation between the PHQ-9 scores and depression diagnosis by a mental health professional who was blinded to the PHQ-9 score for 580 patients who agreed to be contacted after the initial interview. The PHQ-9 score greater than or equal to 10 had a sensitivity of 88% and a specificity of 88% for major depressive disorder. Sensitivity is a measure of how many of the individuals diagnosed with depression by a mental health professional were also identified by the PHQ-9 as having moderate to severe depression, whereas specificity is a measure of how many of the individuals who were not diagnosed with depression by a mental health professional were identified by the PHQ-9 as having minimal or mild depression (i.e., scores of less than 10). Furthermore, in the same study, several validated measures were included to examine the relationship between scores on the PHQ-9 and constructs that are hypothesized to be related to depression such as lower functioning and quality of life. The highest correlations were found between PHQ-9 scores and the functioning scales that previous studies have demonstrated would be most strongly related to depression: overall mental health, social functioning, overall functioning, and role functioning.

In the KORTOS assessment the items were changed to ask if the client experienced the 9 symptom criteria nearly every day in the same two-week period and the response options were changed to 0 (*No/Absent*) to 1 (*Yes/Present*). Thus, unlike the original PHQ-9 the maximum value is 9. Individuals

[7] Different measures of depression and anxiety were incorporated into the KTOS a few years ago because the ASI mental health measures were not found to be sensitive to change over time in the Kentucky target population.

who responded "Yes" to the depressed mood or anhedonia items and responded "Yes" to at least 5 of the 9 criteria were classified as having met criteria for depression in the KORTOS study. Excellent internal consistency reliability was found in the sample of KORTOS clients who completed an intake interview in FY 2014 and were included in the 2016 Report (n = 717): Cronbach's α = 0.957.

ANXIETY

The Generalized Anxiety Disorder (GAD-7) was developed to identify probable cases of generalized anxiety disorder and to assess symptom severity for the criteria symptoms in the DSM-IV (Spitzer et al., 2006). The original scale is a 7 item measure that asks about the frequency of anxiety symptoms over the last two weeks. Response options range from 0 (*Not at all*) to 3 (*Nearly every day*). Total scores range from 0 to 21 with higher scores indicating greater severity/frequency of anxiety.

Internal consistency reliability is excellent for the GAD-7, with Cronbach α ranging from 0.89 - 0.92 (Delgadillo et al., 2012; Löwe et al., 2008; Spitzer et al., 2006). In a second study with adults in a drug treatment facility in England, for the sample of 60 individuals who completed a retest 4 - 6 weeks later, test-retest reliability was good (Intraclass coefficient [ICC] = .85; Delgadillo et al., 2012).

A validation study of the GAD-7 performed in 15 primary care clinics (n = 2,740) found good criterion-related validity for the GAD-7. Specifically, the study found that a cut-off score of 10 was the ideal score to maximizing sensitivity (89%) and specificity (82%) for a diagnosis of generalized anxiety disorder (GAD) made by a mental health professional (Spitzer et al., 2006). In other words, most patients who were diagnosed with GAD by a mental health professional (89%) had GAD-7 scores of 10 or higher, whereas most patients who were not diagnosed with GAD by a mental health professional (82%) had GAD-7 scores lower than 10. Another study also examined the diagnostic accuracy of the GAD-7 in comparison with ICD-10 psychiatric diagnoses that were assessed using the Revised Clinical Interview Schedule (CIS-R)—a well-validated structured diagnostic interview (Delgadillo et al., 2012). A GAD-7 score of 9 or higher had a sensitivity of 80% and specificity of 86% for any anxiety disorder. In other words, 80% of individuals who were diagnosed with an anxiety disorder using the CIS-R had scores of 9 or higher on the GAD-7 and 86% of individuals who were not diagnosed with an anxiety disorder using the CIS-R had scores of 8 or lower on the GAD-7.

Moreover, convergent validity was found for the GAD-7 which was correlated with two anxiety scales: Beck Anxiety Inventory (r = 0.72) and the anxiety subscale of the Symptom Checklist-90 (r = 0.74) (Spitzer et al., 2006). More evidence of good convergent validity was found in the large effect sizes of GAD-7 severity score classification (i.e., minimal, mild, moderate, and severe) with the Medical Outcomes Study Short-Form General Health Survey (SF-20) functioning subscale scores because as anxiety symptoms increase, functioning is hypothesized to decrease (Spitzer et al., 2006).

In the KORTOS assessments, the response options were changed to 0 (*No/Absent*) to 1 (*Yes/Present*). Thus, unlike the original GAD-7 the maximum value is a 7. Individuals who responded "Yes" to the item about worrying excessively or being anxious about multiple things on more days than not and "Yes" to at least 3 of the 7 symptoms were classified as having met criteria for generalized anxiety in the KORTOS study. Excellent internal consistency reliability was found in the sample of KORTOS clients

who completed an intake interview in FY 2014 and were included in the 2016 Report (n = 717): Cronbach's α = 0.977.

SUICIDE IDEATION AND ATTEMPTS

These two items were adapted from the ASI psychiatric domain. There is no validity information for these two items; however, there is good test-retest reliability and inter-rater reliability for the ASI generally (Mäkelä, 2004; Stöffelmayr et al., 1994).

3. Victimization and Trauma

Trauma and victimization measures are included in KORTOS because these experiences have been found to be linked to substance abuse in treatment populations, prison populations, and in the general public. More specifically, victimization and trauma history increases the risk for drug and alcohol use (Brady, Back, & Coffey, 2004; Kessler, Sonnega, Bromet, Hughes, & Nelson; 1995; Logan, Walker, Cole & Leukefeld, 2002; Logan, Walker, Jordan, & Leukefeld, 2006; Regier et al., 1990) and those who have a substance use disorder report more victimization and traumatic events (Cottler, Compton, Mager, Spitznage, & Janca, 1992; Farley, Golding, Young, Mulligan, & Minkoff, 2004; Logan et al., 2002; Logan et al., 2006; Najavits et al., 2003; Najavits, Sonn, Walsh, & Weiss, 2004; Shane, Diamond, Mensinger, Shera, & Wintersteen, 2006). High rates of victimization exposure are also found in individuals involved in the criminal justice system (Goff, E. Rose, S. Rose, & Purves, 2007; Wolff & Shi, 2012) and arrests, incarceration, and violent criminal charges are associated with a history of trauma (Donley et al., 2012; Sadeh & McNiel, 2015). Additionally, the risk of relapse increases as the number of trauma events increase and those who report a relapse also report experiencing interpersonal violence more often than those who had no history of relapse (Farley et al., 2004). The KORTOS assessment has three main measures of victimization and trauma: (1) the Adverse Childhood Experiences; (2) a victimization screen; and (3) a measure of Post-Traumatic Stress Disorder (PTSD).

ADVERSE CHILDHOOD EXPERIENCES

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., 2006; Dube, Felitti, Dong, Giles, & Anda, 2003), suicide attempts (Dube et al., 2001), and panic/anxiety (Anda et al., 2006).

Of particular importance, is that the risk of alcohol or drug use increases as the number of adverse childhood experiences increases (Anda et al., 2006; Dube et al., 2003a, b; Felitti et al., 1998). Higher ACE scores are associated with initiating alcohol abuse and smoking in adolescence (Anda et al., 1999; Dube et al., 2006). Additionally, experiencing more types of childhood abuse is associated with greater likelihood of experiencing an unintended first pregnancy among women (Dietz et al., 1999). Poor self-rated health as well as health problems such as ischemic heart disease, cancer, and liver disease were more prevalent in those who reported a higher number of ACEs (Felitti et al., 1998). Poor sleep, severe obesity, and multiple somatic symptoms were increased for those with ACE scores over 4 (Anda et al., 2006). Higher ACE scores have been linked to having a higher number of health risk factors for leading causes of death in adults (Felitti et al., 1998) and a higher rate of mortality in women (Chen, Turiano, Mroczek, & Miller, 2016).

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). and test-retest reliability was good for emotional abuse (94%), physical abuse (83%), sexual abuse (90%), and overall ACE score (weighted kappa = .64; Dube et al.,2004).

VICTIMIZATION SCREEN

This screen examines a wide variety of harassment and threatening situations including street harassment, sexual harassment, home invasions, robbery, burglary, assault, rape, stalking, and partner violence. The majority of the threatening situations assessed are included in national surveys (Breiding, 2014; Logan et al., 2006; Logan, 2016; Office for Victims of Crime, 2015; Perreault, 2015; Truman & Langton, 2015). A few modifications were made to more clearly assess exposure to specific threats including: a) assault was assessed by asking about assault with and without a weapon as well as assault by a neighbor, coworker, or schoolmate; b) firearms violence was separated into three categories including directly or indirectly threatened with a gun, being held at gunpoint, and experiencing a public or mass shooting; and c) burglary and robbery were specifically assessed by asking whether they had experienced a robbery or mugging; experienced a home break-in while not at home; and a home invasion while home. The victimization screen also assesses harassment including verbal street harassment and street sexual harassment (Kearl, 2014) as well as road rage (AAA Foundation for Traffic Safety, 2016; Sansone & Sansone, 2010; Smart, Mann, & Stoduto, 2003). The screen also assesses being kidnapped or held hostage (Blumenstein, 2015) and repeated sexual harassment at work, school, or some other place by the same individual or group of individuals (other than an [ex] partner) (Ilies, Hauserman, Schwochau, & Stibal, 2003; Stockdale, Logan, Sliter, & Berry, 2014). Additionally, this screen asks about two indirect victimization experiences including whether someone close to the participant experienced a violent victimization and if someone close to the participant or someone in their family had been murdered (Hale, 1996).

POST-TRAUMATIC STRESS DISORDER (PTSD)

One significant possible consequence of victimization is PTSD. About 1 in 10 of individuals with exposure to traumatic events developed PTSD at some point, with the highest risk of PTSD associated with assaultive violence (20.9%; Breslau et al., 1998). Individuals with PTSD have a high rate of alcohol/drug abuse or dependence in their lifetime (Kessler et al., 1995; Regier et al., 1990) and the overall prevalence of PTSD is high among substance users (Cottler et al., 1992; Najavits et al., 2003). The KORTOS assessment includes a 4-item PTSD Checklist (PCL-5; Weathers et al., 2013). This 4-item PTSD checklist was derived from a 20-item self-report measure of posttraumatic stress symptoms that is designed to reflect the changes to the diagnostic criteria for posttraumatic stress disorder (PTSD) in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). The full PCL-5 displays strong internal consistency (α ranging from .83 to .98), test-retest reliability (.66 to .96), convergent (.62 to .93) and discriminant validity (.87), and sensitivity to change during treatment (Blevins, Weathers, Davis, Witte, & Domino, 2015; Bovin et al., in press; Wortmann et al., in press).

Two abbreviated scales have been developed from this 20-item measure: an 8-item scale and a 4-item scale (Price, Szafranski, van Stolk-Cooke & Gros, 2016). These abbreviated scales, particularly the 4-item scale, have performed as well or better than the 20-item PCL-5 as a screening measure for PTSD (Price et al., 2016). In a sample of veterans receiving treatment at a psychotherapy clinic, the abbreviated 4-item version of the PCL-5 demonstrated high correlations with the full PCL-5 (86%) and good internal consistency (α = 0.82; Price et al., 2016). The 4-item scale was found to have a significantly higher specificity (0.52; p <.01) than the full PCL-5 (0.35) and 8-item scale (0.39) and using a cut score of 10 on the measure resulted in a sensitivity of .76 (Price et al., 2016). The 4-item scale was also just as good as the full PCL-5 at discriminating between those with PTSD and those without PTSD (AUC = .72; Price et al., 2016). These results suggest that the 4-item measure may be a better screening tool for PTSD (Price et al., 2016).

4. Criminal Justice System Involvement

The KORTOS criminal justice system section asks five main questions which were adapted from the ASI: (1) nights incarcerated in the past 12 months; (2) times arrested and charged with an offense in the past 12 months; (3) misdemeanor and felony convictions in the past 12 months; (4) whether they are currently on probation; and (5) whether they are currently on parole.

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). Another study that found 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).

Consistent with other research the KORTOS criminal justice system self-reported information was found to be valid when compared with an independent database. Specifically, a sub-study to examine the concordance between self-reported criminal justice system involvement in the KORTOS assessment with official records was conducted for a 40% random sample of KORTOS clients with an intake during FY 2014 and a follow-up during FY 2015 (n = 93). Self-reported criminal justice system status was compared with the Kentucky Offender Monitoring System (KOMS) database. Less than one-third of the clients were found in KOMS (29.0%; n = 27). Of those individuals with information in KOMS, there was a 100.0% agreement for any incarceration, or incarceration was reported on KORTOS but was not in the KOMS data at intake and follow-up (KOMS does not include local jail data). Additionally, there was an 81.5% agreement for probation at intake and an 88.9% agreement at follow-up. There was a 100.0% agreement for parole at intake and at follow-up.

Of those individuals with information in KOMS, there was a 100% agreement for any incarceration, or incarceration was reported on KORTOS but was not in the KOMS data at intake.

5. Quality of Life

While symptom change often is the primary goal of treatment, quality of life assesses well-being rather than just the absence of a disorder. Quality of life is a commonly used metric for assessing the cost utility of treatment and is an important index in understanding treatment outcomes (Scott & Lewis, 2015). The KORTOS Quality of Life measures have two components: (1) the *Satisfaction with Life Scale (SWLS;* Pavot & Diener, 1993), and (2) one global question asking the client to rate their quality of life today.

SATISFACTION WITH LIFE SCALE

The Satisfaction With Life Scale (SWLS) refers to a cognitive, evaluative process, in which individuals assess the quality of their lives on the basis of self-imposed standards (Pavot & Diener, 1993). In the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) the 5 items are global rather than specific.

Evidence of convergent validity has been demonstrated with moderately strong correlations of SWLS with 10 other subjective well-being scales, indicating the SWLS measures the same or a similar construct to the other subjective well-being scales (Pavot & Diener, 1993). Further, changes in life conditions are associated with changes in scores on the SWLS in the ways hypothesized; specifically, increases in caregiver burden were associated with decreases on the SWLS scores (Vitaliano, Russo, Young, Becker, & Maiuro, 1991). Moreover, consistent with theorized relationships between life satisfaction and psychological distress, several studies have found that greater distress (i.e., depression, negative affect, anxiety, and general psychological distress) is associated with lower life satisfaction, which provides evidence of convergent validity (Arrindell, Meeuwesen, & Huyse, 1991; Larsen, Diener, & Emmons, 1985). Finally, there is evidence from numerous studies that the SWLS has discriminant validity (Pavot & Diener, 1993). Specifically, scores on SWLS have not been correlated (positively or negatively) with affect intensity and impulsivity (Diener et al., 1985).

The SWLS has good internal consistency: Cronbach's α = 0.87 (Diener et al., 1985) as well as good test-retest reliability with the correlation coefficient at 0.82 for 76 students who were re-administered the scale two months after the initial administration. In many studies using the SWLS both strong internal consistency reliability (ranging from Cronbach's α = 0.79 – 0.89) and moderate test-retest reliability (ranging from 0.50 – 0.84) have been found (Pavot & Diener, 1993).

In the KORTOS study, the response options were decreased to 5 options ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Internal consistency reliability was good in the sample of KORTOS clients who completed an intake interview in FY 2014 and were included in the 2016 Report (n = 717): Cronbach's α = 0.837.

GLOBAL RATING OF QUALITY OF LIFE

One other question about the client's assessment of their quality of life is included in the KORTOS assessment. Clients are asked to rate their quality of life, where 1 is approximately worst imaginable, 5 is good and bad parts are about equal, and 10 was best imaginable. Clients are allowed to select their rating anywhere along the scale.

KORTOS Supplementary Assessment Components

1. Health and Stress-Related Health Consequences

The health and stress-related consequences section includes an assessment of: (1) general health status, (2) chronic pain, and (3) stress-related health consequences.

GENERAL HEALTH STATUS

General health status is included in the substance abuse treatment outcome studies because it has been found to be worse among individuals with substance abuse compared to the general population (Morgen, Astone-Twerell, Hernitche, Gunneson, & Santangelo, 2007; World Health Organization [WHO], 2014). In addition, Kentucky ranks high in the nation for a number of significant health conditions including cancer deaths, cardiovascular related deaths, premature deaths, diabetes, and obesity.

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The general health questions were adapted from the Behavioral Risk Factor Surveillance System (BRFSS) Health-Related Quality of Life (HRQOL; Centers for Disease Control and Prevention, 2000; Hennessy, Moriarty, Zach, Scherr, & Brackbill, 1994). Studies show that the health questions are correlated with each other such that those who self-reported fair/poor overall health also reported

more days that their physical and mental health were not good (Centers for Disease Control and Prevention, 2000; Hennessy et al., 1994). Good test-retest reliability was also found for the Healthy Days questions (r = 0.75; Andresen, Catlin, Wyrwich, & Jackson-Thompson, 2003). In a validation study of the BRFSS HRQOL, the physical health not good, mental health not good, and days not good health limited activities items were correlated with the SF-36 HRQOL scales in expected ways, demonstrating good criterion-related validity (Newschaffer, 1998). Specifically, the number of days the respondent's physical health was not good and the number of days that not good health limited activities were significantly, negatively correlated with the SF-36 scales meaning that the higher days of reported poor physical or mental health the lower scores on general health, physical functioning, physical role, mental health, emotional role, social functioning, and vitality. Similarly, the item about the number of days respondents' mental health was not good was significantly, negatively correlated with SF-36 HRQOL scales, with the exception of the physical functioning scale (Newschaffer, 1998).

CHRONIC PAIN

There is a connection between chronic pain and prescription opioids, and a connection between chronic pain and relapse.

There is a connection between chronic pain and prescription opioids, and a connection between chronic pain and relapse (Atkinson, Slater, Patterson, Grant, & Garfin, 1991; Edlund, Sullivan, Han, & Booth, 2013; Mertens, Lu, Parthasarathy, Moore, & Weisner, 2003; Sheu et al., 2008) and this association has also been found using KORTOS data (Stevenson, Cole, Walker, & Logan, 2014). Given the significant problem of nonprescription opioid use in Kentucky, it is critical to include an assessment of chronic pain. In general, nonprescription opioid use is a continuing health concern in Kentucky where 4.1% of adults report nonmedical use of pain relievers (Substance Abuse and Mental Health Services Administration, 2015). The two most frequently reported illicit drugs mentioned as clients' primary substance of abuse were prescription opioids and heroin in 2013 (Center for Behavioral Health Statistics and Quality, 2015). Since 2000, the rate of deaths from drug overdose involving opioids has increased 200% (Rudd, Aleshire, Zibbell, & Gladden, 2016). The United Health Foundation (2015) has Kentucky ranked as 3rd in the nation for highest drug overdose-related deaths with 24 deaths per 100,000 in 2011 - 2013. In 2014, Kentucky had the 4th highest age-adjusted drug overdose death rate in the United States, with 24.7 deaths per 100,000 people (Rudd et al., 2016), and prescription opioids was the primary drug class involved in drug overdose deaths (Slavova, Bunn, & Gao, 2015).

The chronic pain questions included in the KORTOS assessment were adapted from the *Brief Pain Inventory (BPI)* which is one of the most widely used tools for assessing clinical pain and has been shown to appropriately measure pain caused by many different clinical conditions (Cleeland, 2009; Cleeland & Ryan, 1994). In an early study of validity and reliability, the BPI was given to cancer patients as well as rheumatoid arthritis patients and the correlation patterns among pain and interference measures were different for diseases with different pain mechanisms. Patients with rheumatoid arthritis were tested early in the day when their pain may be at its worst and showed a high correlation between worst pain scores and current pain scores (.71) while the same correlation among breast, colorectal, and gynecological cancer patients was much lower (.35, .27, and .42; Daut, Cleeland &

Flanery, 1983). There are four severity items on the BPI that are rated 0-10 and can be averaged to get a composite score. The KORTOS assessment uses only one of these items – rating the client's pain on average. Using this single question as a representation of pain severity is supported by the FDA Draft Guidance for Industry: Patient-Reported Outcome Measures (Cleeland, 2009).

STRESS-RELATED HEALTH CONSEQUENCES SCALE

Members of the UK CDAR BHOS research team developed a scale to measure recent stress-related health consequences (Logan & Walker, 2010). Chronic exposure to stress can tax the body by continuously activating the stress response, which alters the body's normal way of responding to external stimuli (McEwen, 2000). When this process interferes with the body's ability to maintain equilibrium, an individual's allostatic load increases (McEwen, 2000, 2004). High allostatic load over time is associated with physical health and mental health problems such as a weakened immune system, impaired memory, increased risk for heart disease, depression, and anxiety (McEwen, 2004). Further, individuals with a high allostatic load seek ways to return to equilibrium, and substance use may achieve this goal, at least initially (Cleck & Blendy, 2008; Wahler, 2012). However, over time addiction alters the way the way the body responds to stress, increasing allostatic load (Cleck & Blendy, 2008).

Individuals with a high allostatic load seek ways to return to equilibrium, and substance use may achieve this goal, at least initially.

The scale contains 15 symptoms and behaviors and asks clients to indicate how often they have experienced the symptoms/behaviors in the past 7 days. Examples of symptoms include: unexplained aches and pains, poor sleep, and increased heart rate not related to exertion. Response options range from 0 (*None of the time*) to 3 (*All of the time*). The score is computed by summing the responses to all 15 items. Higher scores on the scale indicate greater physiological indicators of stress. The minimum score is 0 and the maximum score is 45. Internal consistency reliability was excellent in a sample of intake interviews completed by KORTOS clients in FY 2014 and were included in the 2016 report (n = 717): Cronbach's α = 0.887.

2. Economic and Living Circumstances

The economic and living circumstances examines; (1) living situation, (2) employment and disability status, and (3) economic hardship.

Economic indicators and economic hardship are associated with higher stress as well as substance abuse treatment relapse.

Prior research suggests that unemployment and lower socioeconomic status are important predictors of alcohol use relapse following treatment (Adamson, Sellman, & Frampton, 2009). In addition, one study found that individuals with higher resource needs (e.g., housing, employment, child care) were more likely to relapse 2 years after substance abuse treatment (Walton, Blow, Bingham, & Chermack, 2003). In FY 2012, using KTOS data, a regression analysis showed that individuals who reported having difficulty meeting more basic needs were significantly more likely to report using alcohol and/or drugs at follow-up (Logan, Cole, Scrivner, & Spence, 2014). The high percentage of individuals who reported having trouble meeting basic needs at both intake and follow-up shows that economic difficulties continue to be a problem for adults after they are in substance abuse treatment. Two other recent studies using KTOS data find that economic indicators and economic hardship are associated with higher stress as well as substance abuse treatment relapse (Wahler & Otis, 2014; Wahler, 2015). In another published study using KTOS data, economic hardship was associated with more stress (Cole, Logan, & Walker, 2011) and stress is associated with increased substance use and abuse and relapse (Sinha, 2008).

Assessing economic and living circumstances is important because Kentucky ranks as one of the highest states (48th in the nation) for poverty as well as the lowest for economic opportunity (Hess et al., 2015) while Gallup Polls (2014) ranked Kentucky as 46th in the nation for financial well-being (which considers having enough money for food, health care, and peoples perceived standard of living). Kentucky also was ranked 49th in the nation for children living in poverty (United Health Foundation, 2015).

LIVING SITUATION

This section assesses where the client has lived in the prior 6 months. The question and responses are adapted from the Government Performance and Reporting Act of 1993 (GPRA; Public Law 103-62) to ask about the past 6 months instead of the past 30 days (Mulvey, Atkinson, Avula, & Luckey, 2005) and whether they have been homeless or not.

EMPLOYMENT AND DISABILITY STATUS

The employment status questions were adapted from the ASI and the categories of type of work were adapted from the Standard Occupational Classification (U.S. Dept. of Labor, 2010). Disability status was included due to the high prevalence of disability in Kentucky. Using data from the 2013 American Community Survey (ACS) Kentucky had the 4th highest prevalence rate (16.1%) of disability among non-institutionalized working age individuals (ages 21 – 64) in the U.S. 50 states and territory of Puerto Rico (Erickson et al., 2014). Further, the Social Security Administration (2011) indicates 8.1% of the Kentucky population between 18 and 64 are on disability which is the 2nd highest in the nation.

ECONOMIC HARDSHIP

The KORTOS assessment includes a measure of economic hardship that was modified from the Survey of Income and Program Participation (SIPP), which is a multi-panel longitudinal nationally representative survey of the non-institutional population conducted by the U.S. Census Bureau. Information on economic hardship was collected as part of the eighth wave of data collection in the 1996 wave, which was in the field in 1998 (Beverly, 2001; Iceland & Bauman, 2004; She & Livermore, 2007). Economic hardship includes difficulty meeting basic needs including food, housing, clothing, and medical care (Beverly, 1999).

In the KORTOS study, the telephone disconnection item was updated to consider difficulty with maintaining their cell phone cost given the prevalence of cell phones rather than landlines with many clients today. Additionally, the food insecurity item was adapted to a 6-month period. Finally, in the SIPP, the inability to obtain health care was measured with two items: needed to go to the doctor or hospital but did not go, or needed to see a dentist but did not go. Because affordable access to prescription drugs is also an important dimension of health care that individuals may lack, an item was added to inquire about participants' inability to obtain a prescription drug because of financial problems.

Economic hardship was measured with two subscales in the KORTOS study: 5 items measuring difficulty meeting basic living needs and 3 items measuring difficulty meeting health care needs. Good internal consistency reliability was found for the scale as a whole in the sample of KORTOS clients who completed an intake interview in FY 2014 and were included in the 2016 Report (n = 717): Cronbach's α = 0.851. Good internal consistency reliability was also found for the basic living needs (Cronbach's α = 0.799) and health care needs (Cronbach's α = 0.822) subscales.

3. Recovery Supports

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.

The Recovery Supports section closes the KORTOS 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; and (3) what is most useful beside substance abuse treatment that helps them in their recovery and readiness to change (their perceived chances they can get off and stay off of drugs/alcohol). The recovery supports questions were adapted from the GPRA (Mulvey et al., 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). The last question in the

KORTOS assessment assesses readiness to change (Prochaska & DiClemente, 1983). However, measurement of readiness to change is often lengthy so this one-item was developed for KORTOS assessments. One study using KTOS data found that client reported perceived chances they can get off and stay off drugs/alcohol (readiness to change) and 12-step program participation at follow-up was associated with positive treatment outcomes, while persistent depression was associated with negative treatment outcomes (Walker, Cole, & Logan, 2008).

KORTOS demographic Information

The KORTOS 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 KORTOS as context specific questions: gender, race/ethnicity, age, marital status, education status, military experience, medical insurance type, and primary referral source.

Conclusion

The Kentucky Opioid Replacement Treatment Outcome Study (KORTOS) is a statewide treatment outcome evaluation that is updated and enhanced annually. The KORTOS assessment is based on the KTOS assessment and 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 for a randomly selected sample of clients 6-months after intake. The follow-up rate is over 80% each year and over 200 clients are assessed at the 6-month follow-up each year in the past two years; and, (3) data analysis and dissemination. The KORTOS methods vary from KTOS in that clients must be participating in a Kentucky OTP at follow-up and the follow-up is done at 6-months after the intake rather than 12-months like KTOS. That means all time references ask about a 6-month period.

The KORTOS assessment is a brief self-report instrument that documents symptoms and patterns of substance abuse and related psychosocial problems. The KORTOS is easy to use and takes about 30 minutes to complete. The KTOS assessment, which is the core of KORTOS, 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. A pilot study was conducted when KORTOS initially began to ensure the assessment structure and components were appropriate and that any specific targeted questions about the OTP context were included. The KORTOS assessment has five core assessment components which all have strong reliability and validity research data including: (1) substance use, (2) mental health, (3) victimization and trauma; (4) criminal justice system involvement, and (5) quality of life. The three supplemental KORTOS assessment components also have strong reliability and validity data for most of the assessment components and includes: (1) health and stress-related health consequences, (2) economic and living circumstances, and (3) recovery supports.

The evidence base for KTOS (and KORTOS) 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 KORTOS 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 difficulties in employment, medical problems, housing instability, depression, anxiety, suicidality, criminal justice system involvement, and recovery supports (or engagement in the treatment process).

(2) *Contextual Appropriateness.* The KORTOS 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.

(3) *Face Valid and User-friendly.* The KORTOS assessment is face valid and focuses on components identified in theory and research as related to substance use, relapse, and treatment outcomes. Further, KORTOS is easy to use and takes about 30 minutes to complete.

(4) *Established Reliability and Validity.* The KORTOS assessment has five core components (substance use, mental health, victimization and trauma, criminal justice system involvement, and quality of life) each with strong reliability and validity research support and

three supplemental components (health and stress-related health consequences, economic and living circumstances, and recovery supports) many of which have strong reliability and validity research support.

(5) *Measuring Dynamic Rather than Static Constructs.* Although KORTOS does include key demographic indicators the majority of the assessment components focus on current status, symptoms, and constructs that are amenable to change and targeted in treatment over time.

(6) *Not Producing Adverse Reactions or Consequences.* In the almost 20 years of conducting KTOS and almost 10 years of KORTOS 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 continue to show that the OTP clients from programs who participate in KORTOS made substantial improvements from intake to follow-up in several important dimensions of their lives including significant reductions in illegal drug and alcohol use as well as the severity of their drug and alcohol use, significant reductions in mental health problems and stress, significant improvements in their living and housing situations, significant reductions in economic hardship, and significant reductions in criminal justice system involvement. Additionally, clients reported high levels of satisfaction with their experience at the OTP, higher quality of life, and more recovery supports at follow-up.

(8) *Data Analysis and Dissemination.* An added benefit of this Kentucky Opioid Replacement Treatment Outcome Study is that state-level trends in substance use along with the co-occurring anxiety and depression, criminal justice system involvement, employment and economic status, and quality of life 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 KORTOS data is used for community-level reports on client characteristics and outcomes for communities applying for Federal or other grants.

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The KORTOS assessment is not meant to replace clinical decision-making or render diagnosis. The KORTOS assessment can be used to inform treatment(s), engage clients through self-report, and

monitor outcomes. The KORTOS 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 specifically, or for a wider variety of conditions (e.g., personality disorder) is sought the KORTOS assessment will need to be supplemented. Further, although the KORTOS assessment is a robust and pragmatic assessment, it is relatively short (30 minutes) in order to reduce staff burden. That means that some of the substance use-related problems are not assessed and some components could be measured more comprehensively.

The evidence base for the KORTOS 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 KORTOS 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, TK, Miller, J., & Scrivner, A. (2016). *Kentucky's Opioid Replacement Treatment Program Outcome Study 2016 Annual Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Cole, J., Logan, TK, Miller, J., & Scrivner, A. (2015). *Kentucky's Opioid Replacement Treatment Program Outcome Study 2015 Annual Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, TK, Cole, J., Scrivner, A., & Spence, M. (2014). *Kentucky's Opioid Replacement Treatment Program Outcome Study 2014 Annual Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Cole, J., Scrivner, A., & Logan, TK. (2013). *Kentucky Opioid Replacement Treatment Outcome Study 2013 Annual Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Scrivner, A., Cole, J., Walker, R., & Logan, TK. (2012). *KORTOS Second Annual Follow-up Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Cole, J., Walker, R., Logan, TK, & Mateyoke-Scrivner, A. (2011). *Kentucky Opioid Replacement Treatment Outcome Study 2011 Annual Report*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Select Regional and Other Ad Hoc Reports

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2014). *KORTOS Brief Report: Bluegrass Comprehensive Care Center- Narcotics Addiction Program.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Spence, M., & Scrivner, A. (2014). *Kentucky Opioid Replacement Treatment Outcome Study Program Report: Bluegrass.org / Narcotics Addiction Program.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Spence, M., & Scrivner, A. (2014). *Kentucky Opioid Replacement Treatment Outcome Study Program Report: Center for Behavioral Health.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Spence, M., & Scrivner, A. (2014). *Kentucky Opioid Replacement Treatment Outcome Study Program Report: Lexington Professional Associates.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Spence, M., & Scrivner, A. (2014). *Kentucky Opioid Replacement Treatment Outcome Study Program Report: MORE Center.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Spence, M., & Scrivner, A. (2014). *Kentucky Opioid Replacement Treatment Outcome Study Program Report: Paducah Professional Associates.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Spence, M., & Scrivner, A. (2014). *Kentucky Opioid Replacement Treatment Outcome Study Program Report: Paintsville Professional Associates and Pikeville Professional Associates.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: Center for Behavioral Health.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: Lexington Professional Associates.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: The MORE Center.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: The MORE Center.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: Paintsville Professional Associates.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: Pikeville Professional Associates.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: Ultimate Treatment Center.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Logan, T., Cole, J., Scrivner, A., & Stevenson, E. (2013). *KORTOS Brief Report: Perry County Treatment Services.* Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Newell, J., Walker, R., Spangler, M., & Hunt, T. (2010). *KORTOS 2010 Brief Outcomes Report: Center for Behavioral Health*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

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Stevenson, E., Newell, J., Walker, R., Spangler, M., & Hunt, T. (2010). *KORTOS 2010 Brief Outcomes Report: MORE Center*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

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Stevenson, E., Newell, J., Walker, R., Spangler, M., & Hunt, T. (2010). *KORTOS 2010 Brief Outcomes Report: Paintsville Professional Associates*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Newell, J., Walker, R., Spangler, M., & Hunt, T. (2010). *KORTOS 2010 Brief Outcomes Report: Perry County Treatment Center*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Stevenson, E., Newell, J., Walker, R., Spangler, M., & Hunt, T. (2010). *KORTOS 2010 Brief Outcomes Report: Pikeville Treatment Center*. Lexington, KY: University of Kentucky, Center on Drug & Alcohol Research.

Appendix C: KORTOS Publications

There is one publication from KORTOS published in peer reviewed journals and one dissertation has also been completed using the KORTOS data.

1. Stevenson, E., Cole, J., Walker, R., and Logan, T. (2014). Association of chronic non-cancer pain with substance abuse treatment outcomes among a Community Mental Health Center sample. *Addictive Disorders and Their Treatment, 13*(1), 30-37. doi: 10.1097/ADT.0b013e31827b0cd9.
2. Stevenson, E. (2012). *Examining chronic non-cancer pain among a sample of individuals in opioid treatment programs* (Doctoral dissertation). Retrieved from http://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1001&context=csw_etds