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Richard Dembo
University of South Florida, rdembo@usf.edu

Rhissa Briones-Robinson
University of South Florida

Laura M. Gulledge
University of Southern Mississippi, Laura.Gulledge@usm.edu

Lora M. Karas
13th Judicial Circuit

Ken C. Winters
University of Minnesota, winte001@umn.edu

See next page for additional authors

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Stress, Mental Health and Substance Abuse Problems In a Sample of Diversion Program Youth: An Exploratory Latent Class Analysis*

Richard Dembo, Ph.D.,
University of South Florida, Department of Criminology, Tampa, Florida

Rhissa Briones, M.A.,
University of South Florida, Department of Criminology, Tampa, Florida

Laura Gulledge, M. A.,
School of Criminal Justice, University of Southern Mississippi Hattiesburg, Mississippi

Lora Karas, B.A.,
13th Judicial Circuit, Tampa, Florida

Ken C. Winters, Ph.D.,
Department of Psychiatry, University of Minnesota, Minneapolis, Minnesota

Steven Belenko, Ph. D., and
Department of Criminal Justice, Temple University, Philadelphia, PA

Paul E. Greenbaum
Department of Child and Family Studies, University of South Florida, Tampa, Florida

Abstract

Reflective of interest in mental health and substance abuse issues among youths involved with the justice system, we performed a latent class analysis on baseline information collected on 100 youths involved in two diversion programs. Results identified two groups of youths: Group 1: a majority of the youths, who had high levels of delinquency, mental health and substance abuse issues, Group 2: youths with low levels of these problems. Comparison of these two groups on a variety of psychosocial measures and parent/guardian reports found differences between them that were consistent with their problem group classification. Follow-up analysis confirmed problem behavior that was consistent with the youths' latent class placement. Implications of the findings for research and practice will be presented.

Keywords

diversion youth; risk classification of juvenile offenders; latent class analysis

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Address correspondence to Richard Dembo, Ph.D., Department of Criminology, University of South Florida, 4202 E Fowler Avenue, Tampa, FL 33620. jac@gate.net.

Introduction

It is now well established that youths entering the juvenile justice system are experiencing substance use and mental health problems. There is a growing recognition that many of these problems can be traced to their stressful or traumatized backgrounds.

Substance use among juvenile offenders has been consistently documented. For example, Teplin et al. (2006) administered the Diagnostic Interview Schedule for Children (DISC) to youths entering the Cook County (Chicago) Detention Center. They found approximately half of the detainees (51% male, 47% female), had a DSM-IV substance use disorder. Marijuana use disorder was the most frequently identified substance use disorder, followed by alcohol use disorder, in each gender group. Additional research on these detainees (Abram et al., 2003) found a sizable comorbidity between having a substance use disorder and having an anxiety disorder (29%) and ADHD or behavioral disorder (62%). High rates of drug involvement have also been found among youths placed in diversion programs (Dembo et al., 2006); and among youths shortly after arrest (Dembo et al., 2008).

Youths entering the juvenile justice system also experience psychological problems (Abram et al., 2003; Dembo & Schmeidler, 2003; Teplin et al., 2002; Wasserman et al., 2002). Considerable attention has focused on conduct disorders, characterized by aggressiveness, property destruction, deceitfulness, or lack of regard for rules or laws, which is quite prevalent among juvenile offenders, especially among incarcerated youths (Lahey et al., 1994; Wasserman et al., 2005; Teplin et al., 2006). Particular interest has sought to differentiate youths with conduct disorder according to the presence/absence of callous and unemotional traits (Frick & White, 2008; Dembo et al., 2007)---analogous to the conceptualization of adult psychopathy (Hare, Hart & Harpur, 1991; Hare, 1998). Research has found that callous CD juvenile offenders, who comprise a minority of incarcerated youths, are responsible for the majority of crime, especially serious crime (Hill & Maughan, 2001; Dembo et al., 2007; Frick & White, 2008).

Until relatively recently, much less attention was been paid to ADHD and its relationship to delinquency and other psychosocial functioning problems among juvenile offenders. This is surprising, given the prevalence of this disorder among these youths. For example, Teplin et al. (2006) found six month prevalence for ADHD of 17% among male, and 21% among female, Cook County, Chicago detainees that they studied—with the highest prevalence occurring among non-Hispanic White detainees (21%; also, see: Gordon & Moore, 2005). Further, a sizable comorbidity has been found between ADHD and affective disorders, substance use disorders, and anxiety disorders among juvenile offenders (Abram et al., 2003; also see: Molina & Pelham Jr., 2003). Related research has suggested that ADHD delinquents are more cognitively impaired compared to youths with ADD who have not developed delinquent behavior—suggesting that significant neuropsychological deficits exist in this group (Moffitt & Silva, 1988). A recent report by Winters et al. (2009) indicates impulsivity is an important component of ADHD among youths, resulting in an increased likelihood of engaging in problem behaviors such as drug use and risky sexual activities (e.g., having sexual intercourse without using a condom).

A recent report by Lara et al. (2009), using World Health Organization, World Mental Health Survey Initiative data (Kessler & Ustun, 2004), highlights the persistence of childhood ADHD into adulthood. At the same time, as Jensen et al. (1997) assert, research on ADHD among youths, its correlates and comorbidity, remains relatively unexplored.

In recent years, an increasing amount of research has been conducted on the trauma experienced by juvenile offenders. Most of this research has involved incarcerated youths. The experience of major life stressors, such as exposure to violence, death of loved one, or

serious illness, has been found to be prevalent among justice-involved youths, particularly females, and to have an adverse impact on developmental outcomes in the areas of delinquency and emotional/psychological functioning—including PTSD (Ariga et al., 2007; Flouri & Kallis, 2007; Dixon et al., 2005; Ruchkin et al., 2002). For example, analyses of data on adolescents in the 1995 National Survey of Adolescents found a high prevalence of trauma among male youth reporting they engaged in violent offending in the past year (Maschi, 2006). Ariga et al. (2007) found experiencing traumatic events was common among the female detainees they studied in Japan, with the girls having a high prevalence of PTSD. Similar results were obtained in a study of detained female offenders in Australia (Dixon et al. (2005); among females detainees in Florida (Lederman et al., 2004); and among male detainees in Russia (Ruchkin et al., 2002). The results of this research underscore the importance of routinely assessing for trauma, along with other psychosocial problems, among juvenile offenders.

Of particular importance is the need to identify subgroups of newly arrested youths who exhibit multiple problems in the areas of substance use, mental health, externalizing behaviors, and stressful-traumatic experiences. Increased understanding of youths entering the front end of the justice system can better inform their placement in needed services, and public policy.

The above discussed research informed the present study. Reflective of the mental health and substance abuse issues experienced by youths involved with the justice system, we performed a latent class analysis on psychosocial baseline information collected on youths involved in two diversion programs, and their parents/guardians; and assessed the youths' -follow-up psychosocial outcomes. Our analyses were guided by three research questions: (1) Are there identifiable subgroups that differ in their psychosocial functioning problems and trauma experiences? (2) If so, do these subgroups differ in their demographic and psychosocial characteristics, based on both youth and parent reports? (3) Do the subgroups differ in their psychosocial outcomes. Implications of the findings for research and practice are also discussed.

Description of the Brief Intervention Project

Juvenile Drug Cour

Youth arrested on misdemeanor charges, who do not have a significant arrest history on felony charges are eligible, with State Attorney Office approval, for placement in a diversion program. Arrested youths in Hillsborough County, Florida are processed at the Juvenile Assessment Center (JAC), where, among other things, they are asked to provide a urine specimen for drug testing as part of the JAC assessment process. Youths who are arrested on drug related charges, or who are found to be drug positive at the time of their JAC processing are often recommended to Juvenile Drug Court. Youths arrested on non-drug related charges, but who report drug use to a JAC assessor, are often placed, again with State Attorney approval, in other diversion services.

Juvenile Drug Court is a six to twelve month program. Youths entering the program, and their parents, are asked to sign a contract in which the youths admit guilt and agree to follow program rules and regulations. Contract signing occurs at a Juvenile Drug Court Orientation, usually held bi-weekly, and is followed by an initial arraignment, and reporting that day to a drug treatment program for a urine drug test. At that time, a psychosocial assessment is scheduled for a later date. The assessment information is used to place the youth in one or more community-based treatment programs, reflecting differing intensity and length of program services. Less intensive programs last six months; the most intensive programs last up to twelve months. Progress in the program is based in compliance with the requirements

of the treatment program, including random urine drug tests, as well as making required court appearances, satisfactory progress at school, and behaving responsibly at home. Youths who successfully complete the program will have their charges sealed in their records.

Recruitment into the Brief Intervention Project (BIP) occurred during the Juvenile Drug Court Orientation meetings. During these meetings, community service agencies were given an opportunity to give a brief overview of their services. BIP staff were also able to make a brief presentation about the project to parents and youths at the orientation meeting. At the end of the orientation meeting, we were able to approach eligible youths and their parents to begin our enrollment process. Youths charged with a non-felony offense associated with illicit drug use (i.e., a non-alcohol offense) or charged with a non-felony offense for illicit drug possession or possession of drug paraphernalia or who tested positive during processing at the JAC following arrest, were 12 to 17 years of age and lived within a 25 mile radius of the court house were eligible for this project. Brief intervention (BI) services were free.

Enrollment at Juvenile Drug Court Orientation involved project staff answering any questions parents and youths had about the project, and staff requesting an in-home meeting to discuss the project further. In contrast to the treatment program placement, which was required by the juvenile drug court, participation in the Brief Intervention project was voluntary.

Following the project consent and assent processes, the staff member proceeded to complete a baseline interview. Following completion of this interview, and a quality control review of the interview material by another staff member, the family was randomly assigned to one of three service groups from a previously generated list of random numbers, each representing one or another of the intervention conditions: (1) the usual program services, (2) two BI sessions with the youth, or (3) two BI sessions with the youth, one BI session with the parent, and one BI session with both the youth and parent. The BI incorporates elements of Rational-Emotive Therapy (RET) and Problem-Solving Therapy (PST) to help develop these adaptive beliefs and coping skills. Drug involvement is viewed as learned behavior that develops within a context of personal, environmental, and social factors (Catalano, Hawkins, Wells, & Miller, 1991; Clark & Winters, 2002) that shape and define drug use attitudes and behaviors. Developed over the course of an adolescent's learning history and prior experience with drugs, maladaptive beliefs and coping skill deficits are viewed as primary determinants of drug use. The goal of the BI therapist sessions is to diminish factors contributing to drug use (e.g., maladaptive beliefs) and promote factors that protect against relapse (e.g., problem solving skills). Following is a brief description of these sessions:

SESSION 1 (Youth) - Focuses on discussing information about the youth's substance use and related consequences, the level of willingness to change, examining the causes and benefits of change, and discussing what goals for change the youth would like to select and pursue. Youth are allowed to pursue goals of drug abstinence or reduction in drug use.

SESSION 2 (Youth) - Reviews the youth's progress with the agreed upon goals, identifies risk situations associated with difficulty in achieving goals, discusses strategies to overcome barriers toward goal achievement, reviews where the youth is in the state of change process, and negotiates either continuation or advancement of goals.

SESSION 3 (Parent) - Informed by an integrated behavioral and family therapy approach, the parent session addresses: the youth's substance use issues, parent attitudes and behaviors regarding this use, parent monitoring and supervision to promote

progress towards their child's intervention goals, and parent communication skills to enhance youth-parent connectedness.

SESSION 4 (Parent and Youth) The focus of this session is to establish a dialogue between the youth and his/her parent. During this session, youth and parent discuss and rate (with the aid of a worksheet) one another on a number of relationship areas: family relations, school, social relationships, and youth substance use; and assess the convergence and divergence of their views of one another. Efforts made by the youth and parent in improving communication, quality of time spent with one another, and their overall relationship are reviewed. Next, the interventionist reinforces the positive changes that both the youth and parent have accomplished, and explores ideas for possible change. Concrete suggestions are given for ways to improve communication in stressful situations, and in improving coping and problem solving skills. Each session lasts for 1–1/4 hours, and the sessions occur about a week apart. With youth and parent/guardian permission, the BI sessions are tape recorded for fidelity assessment.

Juvenile Diversion

The JD program provides an alternative to adjudication for youths who have been arrested, usually for the first time, for a relatively minor offense (e.g. shop lifting). Youths that opt to enter the program are assigned an arbitrator who designates a set of mandatory sanctions. These sanctions fall under several categories. Restitution involves activities such as completing community service, providing financial restitution to the victim, and the writing of an apology letter. Psychoeducational interventions may be assigned and tailored to the type of offense for which the youth was arrested. For example, STEAL (Stop Theft Early and Learn) classes emphasize topics such as resisting peer pressure to shoplift and the economic impact on the community of shoplifting. Urban League and Derrick Brooks Charities classes focus on decision making, crime prevention, conflict resolution, and resisting peer pressure. Youths charged with substance use/abuse related offenses must be evaluated by community providers with the attendant recommendations becoming part of their mandatory sanctions. These recommendations include psychoeducational classes, treatment, or random urine screens. Several community agencies offer group, individual and family sessions specifically designed for youths charged with domestic violence.

While a core set of sanctions are required for all youths in the program (e.g. apology letter to the victim), the specific sanctions are individualized and are at the discretion of the arbitrator. Some sanctions are determined on the basis of the youth's offense; for example, those charged with a drug-related offense are assigned to substance abuse counseling and monitoring, while those charged with domestic violence are referred to a domestic violence program. Youths are in the program for a minimum of 5 weeks although some interventions go considerably longer (e.g., the usual drug treatment and domestic violence programs may run as long as 6 months). Youths' are monitored by the case managers for satisfactory progress toward completion of all assignments, including acceptable school attendance and performance.

Recruitment into the BIP occurred during the intake meeting with the Juvenile Diversion Program case manager assigned the case. Project staff were informed beforehand about the scheduled intake meeting of an eligible youth. Depending on case manager preference, before or during the intake meeting a project staff member was given an opportunity to give a brief overview of the project. Youths and their parents/guardians were informed that the BIP were free, and that participation in the project was voluntary. For interested parents and youths, an in-home meeting was scheduled to discuss the project further, to answer any questions they had, and to conduct separate baseline interviews with the youth and his/her parent/guardian.

Method

Of the 240 Juvenile Drug Court and Juvenile Diversion Program youth who were eligible for enrollment, 63% of families agreed to an initial in-home meeting. Of families who agreed to an initial in-home meeting, 66% completed the baseline assessment. Comparisons of participating and non-participating youths in regard to gender, age, race and ethnicity found no significant differences between the two groups.

As noted above, the youths were recruited into a NIDA funded, clinical trial accessing the efficacy of a brief intervention adapted for use among juvenile offenders. The main data collection instruments used in the study were the Adolescent Diagnostic Interview (ADI, Winters & Henly, 1993), and the Parent/Guardian ADI (Winters & Stinchfield, 2003). All study procedures were approved and monitored by the IRB committee at the Treatment Research Institute, the organization that provided IRB oversight for this project. .

Key Measures

Delinquency—Based on the work of Elliott, Ageton, Huizinga, Knowles and Canter (1983), we measured the youths' delinquent behavior in the 12 months prior to their baseline interviews by asking how many times they engaged in each of 23 delinquent behaviors. Youths reporting an act 10 or more times were asked to indicate how often they participated in this behavior (i.e., once a month, once every two or three weeks, once a week, two to three times a week, once a day, or two to three times a day). Further, youths were asked to indicate their age during which a committed act first occurred for each delinquent behavior. Similar to Elliot et al. (1983), we developed five summary measures of delinquent involvement: general theft (e.g., petit theft, vehicle theft/joyriding, burglary), crimes against persons (e.g., aggravated assault, fighting, robbery), index crimes (similar to UCR Index Part I offenses); drug sales; and total delinquency (i.e., the sum of the 23 delinquent activities).

Problem Substance Use—Two sources of information were used to assess youths' substance use involvement: (a) a question on the ADI asking if the youth ever had a problem with drug or alcohol abuse, and (b) for youths reporting alcohol, marijuana or other drug use, detailed questions for each drug used five of more times in their lives were asked regarding the extent, experiences, and consequences of use. For each drug, the responses were keyed to DSM-IV criteria for a substance use disorder, leading to a classification of each youth as having no diagnosis, a diagnosis of being an abuser, or dependent on the drug. Finally, the diagnostic results for the three categories of drugs (alcohol, marijuana and other drugs) were combined into an overall measure, based on their most serious diagnostic classification on any of the three drug categories: 0 = no diagnosis on any of the three categories of drugs, 1 = abuse on any of the drug categories, and 2 = dependence on any of the three categories of drugs.

Emotional/Psychological Problems—The youths' experience of emotional/psychological problems was probed in two ways: 1. The youths were asked if they ever received services for an emotional or behavioral problem. 2. ADHD was assessed by four questions on the ADI mental health section keyed to DMS-IV criteria for this troubled behavior: (1) Do you often get complaints from parents/teachers that you don't listen to instructions or directions? (2) Do you frequently tend to act before thinking? (3) Do you often have difficulty waiting for your turn during games or when doing things with other people your age? (4) Do you often fidget and find it difficult to sit? As discussed in the results section, a confirmatory factor analysis was used to assess how well the four ADHD items, fit the data (Muthen & Muthen 1998–2007, version 5.2).

Parent Reports of traumatic events experienced by youth or other family member—The youths' parents/guardians were asked to indicate if the youth or their family ever experienced various traumatic events. Following are the nine items: (1) unemployment of parent, (2) divorce of parents, (3) death of loved one, (4) serious illness, (5) victim of a violent crime, (6) eviction from house or apartment, (7) legal problem resulting in jail time or detention, (8) accidental injury requiring hospitalization, and (9) other traumatic event.

Analysis Strategy

This study involved a latent class analysis using Mplus version 5.1 (Muthén and Muthén 1998–2007). LCA is useful in a wide range of substantive areas involving cross sectional and longitudinal data (Clogg 1995; Hagenaars and McCutcheon 2002). This statistical technique seeks to identify an underlying classification of entities (e.g., sub-types or latent classes of individuals) that are related to manifest indicators in probabilistic terms (Dayton 1998). In particular, the latent class model is useful when studying a heterogeneous population. Our use of latent class analysis was exploratory in nature, i.e., without specification of hypotheses relating to the values of the conditional or latent class probabilities.

The issue of class enumeration, determining the appropriate number of latent classes for a study population, in mixture modeling remains unresolved; therefore, experts recommend using multiple criteria to aid in class enumeration (Nylund et al. 2007). The statistical criteria used to assess the number of classes were: (1) the classification table based on class probabilities for the most likely latent class membership by latent class, (2) the entropy score, (3) the Akaike Information Criterion (*AIC*), (4) the Bayesian Information Criterion (*BIC*), (5) the sample size adjusted BIC (*saBIC*), (6) the Vuong-Lo-Mendell-Rubin likelihood ratio test (*LRT*), Lo-Mendell-Rubin adjusted likelihood ratio test (*aLRT*), (7) the bootstrap likelihood ratio test statistics (*bLRT*) (Nylund et al. 2007; Lo et al. 2001), and (8) the model fit to the univariate and bivariate frequency tables (Lubke and Neale 2006; Ramaswamy et al. 1993; Akaike 1987; Bozdogan 1987). For the classification table, high diagonal values and low off-diagonal values indicate good classification quality (Muthén and Muthén 2001:372). The values of entropy range from 0 to 1, with scores closer to 1 indicating clearer classifications (Muthén and Muthén 2001:372). For *AIC, BIC*, and *saBIC*, lower scores, those closest to zero, indicate a better fit of the model. For *aLRT*, a significant *p*-value indicates that the specified model (with k classes) fits significantly better than a model enumerating one less class (k-1). The *bLRT* is similar to the *aLRT* except the distribution is estimated based on bootstrap samples. For the fit of the model to the univariate and bivariate frequency tables, smaller standardized residuals between the observed and estimated (expected) probabilities indicate a better fit. Additionally, along with statistical criteria, the substantive meaningfulness of the latent class results is also important in deciding on the number of classes.

The following observed variables comprised the manifest indicators that were used in the latent class analyses: Continuous: (1) youth total self-reported delinquency in the prior to baseline interview (log transformed), (2) youth ADHD factor score, and (3) caretaker reported number of traumatic events experienced by the youth or family. Categorical: (4) youth reported experiencing a substance abuse problem (0 = no, 1 = yes), (5) youth reported receiving services for emotional/behavioral problems (0 = no, 1 = yes), and (6) combined youth alcohol, marijuana, other drug DSM substance abuse/dependence diagnosis (0 = none, 1 = abuse, *2* = dependence).

Results

Sample Characteristics

Most of the youths in the study (N = 100) were male (75%). The youths averaged 15.58 years in age (SD = 1.20). Nearly half the youths were Caucasian (49%), with 23% being African American and 25% Hispanic. Less than a quarter of the youths (22%) were living with both their biological parents. On the other hand, a majority of the youths were living either with their biological mother alone (27%) or with their mother and another adult (26%). The youths tended to live in modest socioeconomic circumstances. Twenty percent of the caretakers reported an annual income of more than $75,000; on the other hand, 38% reported annual incomes of $25,000 or less.

Psychosocial Description

The youths reported significant problems experienced by their families (see Table 1). More specifically, nearly half of the youths reported a family member ever had a substance abuse problem, and nearly a quarter indicated a family member had received substance abuse treatment. In addition, 15% of the youths reported a family history of mental health problems.

The youths also reported they had experienced significant psychosocial problems. As Table 1 shows, over a quarter of the youths claimed they ever had a substance abuse problem, and 15% reported they had received substance abuse treatment. In addition, four out of five youths claimed they had received treatment for emotional or behavioral problems.

Four questions keyed to DSM-IV criteria for ADHD were included in the youth interviews. As Table 1 shows, large percentages of the youths, ranging from 24% to 50%, reported ever experiencing one or more of these issues.

Confirmatory Factor Analysis of the ADHD Items

Confirmatory factor analysis was used to assess how well a one factor model, involving each of the four ADHD items, fit the data (Muthen & Muthen 1998–2007, version 5.2). Two fit indices, the comparative fit index (CFI) and the Tucker-Lewis index (TLI), were used to evaluate model fit. The typical range for both CFI and TLI is between 0 and 1, although the TLI may achieve values slightly greater than 1, with values greater than .90 indicating acceptable fit and values greater that .95 indicating good fit (Hu & Bentler, 1999). Two additional indices were used to evaluate the model fit to the data: (1) the root mean square error of approximation (RMSEA); RMSEA values of .05 or less indicate close model fit, and values between .05 and .08 indicate adequate fit (Brown & Cudeck, 1993). (2) the weighted root mean square residual (WRMR) for categorical variables; Yu and Muthén (2001) suggest WRMR <.90 indicate good models. Results indicated a very good fit for the single factor model (CFI = 1.000, TLI = 1.183, RMSEA = 0.000, WRMR= .044), with respectable standardized loadings (ADHD1= .56; ADHD2= .75l ADHD3=.64; ADHD4=. 50) (see Table 2 for the four items).

Youth Substance Use

Table 2 provides details on the youths' substance use. A majority of the youths reported ever using alcohol to the point of feeling a buzz or intoxicated, and nearly a third indicated they had this experience five or more times in their lives. Almost all the youths indicated that they had ever used marijuana, and over 8 out of 10 youths reported having used marijuana five of more times in their lives. In response to questions about their use of other drugs, between 10% and 16% of the youths reported that they had ever used barbiturates, cocaine,

and hallucinogens. Urine test results were available for 96% of the youths. Results indicated 47% of the youths were positive for marijuana.

For each drug a youth reported using five or more times in their lives, detailed questions were asked about their use and consequences of use. Geared to DMS-IV criteria, the youths' responses to the alcohol, marijuana and other drug use questions permitted their classification into abuse/dependence categories. As Table 2 shows, 20% of the youths had abused alcohol; 60% had abused and 20% were dependent on marijuana; and 10% had abused other drugs. Across the various drug types, over 6 out of 10 youths had abused one or another drug, and nearly a quarter of them were dependent on one or another drug at some point in their lives. Fifteen percent of the youths were not diagnosed as having a substance problem.

Self-Reported Delinquency

Table 3 summarizes the youths' responses to questions probing their involvement in delinquent behavior in the 12 months before their baseline interviews. As can be seen, high prevalence rates were found for their involvement in index offenses (39%), crimes against persons (60%), general theft offenses (51%), and drug sales (38%). In addition, over 8 out of 10 youths reported engaging in one or more of the 23 delinquent acts.

The range of responses to the items comprising the self-reported delinquency indices was large, ranging from no activity to hundreds (and, in a few cases, thousands). Due to nonnormality, analysis of the frequency data as an interval scale was not appropriate as a measure of delinquent involvement. Instead, a log (base 10) transformation was employed so that equal intervals on the transformed scale would represent equal differences in involvement (with a raw score of −1 assigned to youths reporting 0 offenses). This evaluates the difference between no offense and one offense as equal in importance as the difference between 1 offense and 10, 10 offenses and 100, or 100 offenses and 1000.

The correlation between the log transformed measure of total delinquency and the other delinquency measures was sizable and statistically significant (mean correlation =.66). Hence, we decided to use the log transformed measure of total delinquency in our analyses.

Traumatic Events

The youths' parents/guardians were asked to indicate if the youth or their family ever experienced various traumatic events. As Table 4 shows, large percentages of the youths/families had these experiences, with divorce of parents (38%), death of a loved one (43%), legal problem resulting in jail or detention (25%) being noteworthy. In addition, 45% of the caretakers reported other traumatic experiences (e.g., youth being placed in foster care, not having a relationship with their father, fighting with brothers and sisters, losing the opportunity to obtain a driver's license, separation from their mother). Overall, an average of 2.19 (SD = 1.38) traumatic events were reported. For each youth, we calculated the total number of traumatic events he/she or another family member experienced. This measure was used in our analysis.

Relationships among the variables in the Latent Class Analysis

Preliminary examination of the Pearson and tetrachoric correlations among the continuous and binary indicators, respectively, included in the latent class analysis is presented in Table 5. Following conversion of the correlations to z-scores, these results highlight significant relationships exist between 11 of the 15 pairs of variables. Most of the relationships are in the low to moderate range.

Latent Class Analysis Fit Indices

LCA models were estimated for a series of models including one-class, two-class, and three-class models. The LCA fit indices are shown in Table 6. Given the limited number, and distribution, of, cases across the various variables—especially the categorical variables---up to a three-class LCA solution could be estimated. As the *LRT, aLRT* and *bLRT* results reported in Table 7 indicate, a two-class solution appears to best fit the data ($p < 0.001$). Further, the 2-class solution has the lowest BIC value.

Latent Class Analysis Results

The LCA results are shown in Table 7. The two classes identified in the data, which differ in important ways across the six variables included in the analyses, were termed: (1) *High Risk* youths ($n = 53$), and (2) *Lower Risk* youths ($n = 47$). Compared to Lower Risk youths, High Risk youths report more delinquency, have higher ADHD scores, have higher rates of exposure to traumatic events as reported by caretakers, are more likely to report ever having a substance problem, ever receiving services for emotional/behavioral problems, and have a DSM-IV substance use diagnosis of dependence. The classification table based on an individual's model-estimated (posterior) probabilities for most likely latent class membership indicates high main diagonal and low off-diagonal values suggesting that the model produces relatively unambiguous classifications. Importantly, a high entropy value of .800, which represents a quantification of the classification uncertainty, was obtained for the multi-group LCA results. The univariate model fit results indicated zero standardized residuals between the observed and estimated (expected) probabilities for the categorical variables in the model. Further, low, and all nonsignificant, standardized residuals were found for the bivariate model fit information involving cell comparisons (not shown) for the categorical variables, indicating a respectable fit of the two-class model. Additionally, the nonsignificance of the bivariate standardized residuals supports the assumption of local independence for the categorical indicators in the latent class model. Local independence is a critical assumption of the model when trying to enumerate the correct class model, as the existence of local dependencies will artifactually increase the optimum number of classes extracted (Reboussin, Ip, & Wolfson, 2008). For the continuous variables, the local independence assumption was tested by introducing the observed variables as a latent factor in the LCA analysis and comparing the obtained BIC from this model with the BIC from the selected 2-class model. A smaller BIC for the selected 2-class model was obtained supporting the local independence of the indicators.

Comparison of Various Covariates across the High Risk and Lower Risk Latent Class Groups

We sought to compare High Risk and Lower Risk youths on a number of demographic and psychosocial characteristics drawn from both the youth and caretaker baseline interview data. However, we needed to first take into account the many comparisons we planned to make.

The Bonferroni inequality (Miller, 1981) gives an upper bound of 1.00 as the probability that 1 or more of 26 related tests of significance will be significant at the .05 level. Thus, it is not appropriate to claim that results are statistically significant by evaluating each test of significance as a separate study at the .05 level. One strategy for controlling for the probability of claiming significance by chance is to make a single, overall statement of significance for the entire study, with significance if any of the 26 tests achieve the .0019 (i.e., .05/26) level of significance. Such a strategy, however, penalizes a researcher for evaluating multiple outcomes and encourages fragmentation of reports. Miller (1981) proposed an intermediate strategy: grouping the tests into "families" and evaluating each family as a separate study at the .05 significance level, using the Bonferroni inequality. This

provides a reasonable balance; it yields a small number of conclusions concerning substantively distinct objectives of research. Using this strategy, we grouped our 30 tests into the five families, which are discussed in the next paragraph. The five families had, respectively, 6, 4, 5, 6, and 9 tests of significance.

The Mplus Auxiliary option (Muthén and Muthén 1998–2007:454) of specifying variables for which the equality of means across latent classes is tested using posterior probability-based multiple imputation was used to compare the equality of means for youth and caretaker responses to baseline interview questions in the five families of hypotheses noted above with the Bonferroni probability level noted in parentheses: (1) youth demographics, urinalysis test results for marijuana, and their reported experience of various anxiety symptoms (e.g., worry a lot about how he/she is doing as a student or whether they have enough friends, worry a great deal about how future events will turn out; $p = .018$), (2) youth reported family problems in regard to substance use, substance use treatment, and emotional/mental health ($p = .017$), (3) parent/guardian reports of youth receiving mental health or substance abuse care, being sent to live away from home due to emotional/behavioral problems, receiving medication for attention, learning or emotional problems, and receiving special school services (e.g., for learning or mental health problems; $p = .01$), (4) parent/guardian reports of their own substance use; $p = .008$), and (5) parent/guardian reports of target youths' lifetime experience of various consequences of substance use, $p = .006$).

Results indicated no significant differences between High and Lower Risk youths in regard to the family 1 and family 2 variables. Two significant differences were found between the two groups in regard to parent/guardian reports that they were sent to live away from home due to emotional/behavioral problems and received special school services, with High Risk youths reported to have been sent to live away from home and to have had these experiences, than Lower Risk youths (family 3 variables). No significant differences were found between the High and Lower Risk youth groups in regard to parent/guardian reports of their own substance use (family 4 variables). Of particular interest, as Table 8 notes with respect to the family 5 variables, High Risk youths' parents/guardians reported these youths were more likely to have experienced various adverse consequences of their substance use, than was the case for Lower Risk youths, with several of these being statistically significant: (a) got into fights or tried to hurt someone, (b) taken or sold things that weren't his/hers, (c) got into fights with friends due to using substances, and (d) broken promises to him/herself to limit or cut down on use.

High Risk and Lower Risk Youths at 3 Months Follow-up

We completed 3 month follow-up interviews with 98% of the originally interviewed youths. We also collected voluntary urine specimens to test via the Onsite® urine screen procedure for the recent use of methamphetamines, cocaine, opiates, and marijuana. The follow-up period covered the 3 months following the date of the last intervention session or the baseline interview date (for usual program service youths). In line with the main interests of the study, we were particularly interested in the youths' substance use and participation in delinquent behavior at follow-up, and the potential effect of BI services on these outcomes. Although we did not find a strong intervention effect in the youths' substance use and involvement in delinquent behavior at follow-up, High Risk and Lower Risk group youths reflected expected differences in these behaviors over time.

Overall, 19.4% of the youths reported drinking alcohol to the point of feeling a buzz or intoxicated, and 9.2% reported drinking alcohol 5 or more times to this level of effect. The youths reported 6 days of marijuana use in the previous 90 days. UA test results indicated 46.8% of the 94 youths providing a urine specimen were marijuana positive; little use of

other drugs was found (methamphetamines, 2.1%; cocaine, 2.1%; and no opiate positives). Based on the youths' detailed responses to the alcohol/other drug use questions, 14.3% had abused, and 5.1% were dependent on, one or another substance.

In regard to the prevalence of self-reported delinquency on the summary measures discussed above, 23.5% of the youths reported engaging in general theft offenses, 25.5% in crimes against person, 15.3% in index offenses, 15.3% in drug sales, and 45.9% in one or more of the 23 delinquent acts. As for the baseline self-reported delinquency data, a log transformed total delinquency was a good summary measure of this behavior. Its correlation with the other delinquency summary measures was sizeable and statistically significant (mean correlation=0.701). There was no need to adjust for time at risk in the delinquency data. Ninety of the 98 youths had no secure facility placement days during the three month follow-up period; five youths had an average of 4.4 incarceration days, and 2 youths averaged 14.5 incarceration days. (No secure time information was available for one youth.)

We replicated the latent class analysis on the 98 youths for whom we had follow-up data, and the results were the same as for the baseline LCA analysis. The Mplus Auxiliary option (Muthén and Muthén 2007:454) was, then, used to assess the equality of means across the 3 month psychosocial functioning variables noted above for the High Risk and Lower Risk latent classes using posterior probability-based multiple imputation. Table 9 presents these results. As can be seen, High Risk youths reported significantly more use of alcohol to the point of feelings its effects, have a significantly higher marijuana positive rate, are significantly more likely to be diagnosed as having a substance abuse or dependence problem, and report significantly more involvement in delinquent behavior during the follow-up period, than Lower Risk youths.

Conclusions

Our results provided clear answers to the research questions guiding our analyses. The findings increase our knowledge about the constellation of psychosocial problems experienced by the at-risk youths we studied. They also point to a novel use of latent class analysis.

In answer to our first research question, specific subgroups of youths were identified, reflecting different levels of delinquency, mental health and substance use/abuse issues. The two identified subgroups differ in important ways across the six variables included in the latent class analysis: (1) High Risk youths ($n = 53$), and (2) Lower Risk youths ($n = 47$). Compared to Lower Risk youths, High Risk youths report more delinquency, have higher ADHD scores, have higher rates of exposure to traumatic events as reported by parents/guardians, are more likely to report ever having a substance problem, ever receiving services for emotional/behavioral problems, and have a DSM-IV substance use diagnosis of dependence.

In regard to our second research question, comparisons of these two groups of youths on a variety of demographic and psychosocial covariates found significant differences between them that were consistent with their problem group classification. Specifically: (1) parent/guardian reports indicated High Risk youths were reported to have more often been sent to live away from home due to emotional/behavioral problems and to have received special school services, than Lower Risk youths, and (2) High Risk youths' parents/guardians reported these youths were significantly more likely to have experienced various adverse consequences of their substance use: (a) got into fights or tried to hurt someone, (b) taken or sold things that weren't his/hers, (c) got into fights with friends due using substances, and (d) broken promises to him/herself to limit or cut down on use.

In regard to the third research question, analysis confirmed the High Risk and Lower Risk youths' substance use and self-reported delinquency during the 3 month follow-up period were consistent with their latent class placement. High Risk youths, compared to Low Risk youths, were more substance involved, more likely to have a substance use diagnosis of abuse or dependence, and reported greater participation in delinquent behavior.

Important conclusions flow from our analyses of the youth and parent/guardian interview data, which underscore the interrelationships among the youths' mental health, substance use, delinquency and trauma experiences in understanding their psychosocial risk. The risk classification was related to parent/guardian reports of: (1) emotional/behavior problems of sufficient magnitude for the youth to be sent to live away from home, (2) to receive special school services, and (3) to experience various adverse consequences of the use of substances. It is noteworthy that a majority of the youths we studied, who were involved in the Juvenile Drug Court and Juvenile Diversion Program, had high levels of these risk factors. In addition, the association of parent/guardian reported youth/family trauma experiences with the youths' other risk level factors highlights the need to incorporate routine assessment of these stressful events in obtaining a more comprehensive picture of the youths' psychosocial profile and service needs. Moreover, the High Risk youths' substance and delinquency problems continued during the 3 month follow-up period covered in the study.

Easily administered, standardized assessments should be widely adopted for use by diversion programs in order to gain an informed understanding of a youth and his/her family prior to placement in any intervention program. Although such assessments might seem more appropriate for "deeper end" delinquent youths, a sound assessment is indispensable for all youth having contact with the justice system in order to best allocate service resources based on identified needs and problems.

A very high, 83% of the youths we studied were diagnosed as meeting criteria for either marijuana abuse or dependence disorder, and only 2 of the 100 youths reported no use of marijuana. Further, 40 % of participants reported having received services for emotional/ behavioral problems. These findings plus the positive correlations between self reported ADHD type behavior and their delinquency and substance involvement (see Tables 1 and 5) point to the need for holistic intervention services for many High Risk youths.

Our analysis strategy involved a rather novel use of latent class analysis. The use of latent class analysis to identify subgroups of youths involved in various community service programs, who reflect different constellations of psychosocial problems, can be useful to program administrative and clinical staff. First, such analyses can provide some evidence that the agency or program is serving its intended target population. Second, subgroups of youths reflecting different constellations of psychosocial problems can lead to more informed referrals or treatment placement. For example, youths who exhibit lower risk may not require intensive mental health or substance abuse services, as will likely be the case for high risk youths. It is appreciated that the youth subgroups identified by latent class analysis are statistical constructs, rather than actual youths. Hence, the results of latent class analysis should be interpreted with this understanding.

There are several limitations to our study. First, the study involved a relatively small number of cases. Together with the distribution of cases across the levels of the categorical variables in the data we analyzed this precluded illumination of additional subgroups that might exist. Second, the analyses were based on cross-sectional data. Although analyses indicated good psychosocial measurement properties, and associated content validity, for the latent class results, we could not assess the prospective implications of our two-group, latent class

solution. Third, our trauma measure was of the multi-item life event variety, a procedure that is widely used in the literature. At the same time, use of the measure precluded our ability to parse out the relationships between various types of traumatic life events and the youths' drug use and other psychosocial functioning. Future research would benefit from the use of more nuanced, gender specific, trauma measures (see, for example, Carver, 1997; Wolfe & Kimerling, 1997). Fourth, our results were based on diversion youths in one large Southern urban area, so may not be generalizable to other delinquent youths. Fifth, 42% of 240 eligible youth enrolled in the project. Although comparisons of participating and non-participating youths on demographic factors (i.e., gender, age, race and ethnicity) found no significant differences between the two groups, it is possible the two groups differed in other ways. Sixth, our follow-up period was relatively brief. Replication of our findings is needed in comparable settings in other locations serving youths from different demographic and socio-cultural backgrounds.

An urgent need exists to direct resources to strengthen front-end, juvenile justice assessment and intervention services in an effort to reduce the flow of youths reflecting the problems we uncovered from moving deeper into the justice system. Directing resources to the front-end of the juvenile justice system is far less costly, and has greater potential for redirecting troubled lives in more prosocial directions, than placing troubled youths in residential facilities—which often merely warehouse youth and serve to further alienate them from society.

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TABLE 1

Psychosocial Description of the Youths and Their Families ($N = 100$)

Issue	Percentage
Family Problems	
Family member ever had an alcohol/other drug abuse problem	48
Family member ever received alcohol/other drug use treatment	22
Family history of mental health problems	15
Youth Problems	
Ever had an alcohol/other drug abuse problem	27
Ever received treatment for alcohol/other drug abuse problem	15
Ever received services for emotional/behavioral problems	40
ADHD Questions—Ever	
Do you often get complaints from parents/teachers that you don't listen to instructions or directions?	39
Do you frequently tend to act before thinking?	50
Do you often have difficulty waiting for your turn during games or when doing things with other people your age?	24
Do you often fidget and find it difficult to sit still?	31
Experienced any of these problems in past year? (Among youths answering "yes" to Q1–4 above)	64

TABLE 2

Youth Alcohol/Other Drug Use ($N = 100$)

Issue			Percentage
Alcohol			
Ever drank alcohol to point of feeling buzzed or intoxicated			57
Ever drank alcohol 5+ times in lifetime to the point of feeling buzzed or intoxicated			30
Marijuana			
Ever used marijuana			98
Ever used marijuana 5+ times in lifetime			84
Other Drugs Ever Used by 10% of Youths			
Barbiturates			16
Cocaine			15
Hallucinogens			10
Ever used other drug 5+ times			12
Urine Test Results ($N = 96$ or 97)			
Positive for Methamphetamines			2
Positive for Cocaine			2
Positive for Opiates			0
Positive for Marijuana			47
Substance Use/Abuse Diagnoses			
	None	*Abuse*	*Dependence*
Alcohol	80	20	0
Marijuana	17	60	23
Other Drugs	90	10	0
Combined/Overall Diagnoses	15	61	24

TABLE 3

Self-Reported Delinquency in 12 Months Prior to Interview (N = 100)

Index/Behavior	0	1–4	5–29	30–54	55–99	100–199	200+	Total
Index Offenses	68%	19%	10%	3%	0%	0%	0%	100.0%
Crimes–persons	40%	38%	21%	1%	0%	0%	0%	100.0%
General Theft	49%	25%	18%	3%	4%	1%	0%	100.0%
Drug Sales	62%	16%	13%	5%	1%	2%	1%	100.0%
Total Delinquency	17%	29%	36%	4%	7%	4%	3%	100.0%

TABLE 4

Parent/Guardian Report of Youth or Their Family Experiencing Traumatic Events in Lifetime (N = 97 to 100)

Traumatic Event	Percentage
Unemployment of parent	19.0%
Divorce of parents	38.0%
Death of loved one	43.0%
Serious illness	15.0%
Victim of violent crime	17.0%
Eviction from house or apartment	10.0%
Legal problem resulting in jail time or detention	25.0%
Accidental injury requiring hospitalization	8.0%
Other traumatic event not listed	45.0%

Note. Average number of reported traumatic events: Mean = 2.19; SD = 1.38

TABLE 5

Correlations among the Variables in the Latent Class Analysis (N=100)

	1	2	3	4	5	6
1. Self-reported total delinquency	-					
2. Youth-reported alcohol/other drug abuse problem	.386***	-				
3. Youth-reported emotional/behavioral problems	.353**	.523***	-			
4. Youth-reported ADHD problems	.396***	.428***	.381***	-		
5. Number of youth/family trauma experiences	.126	.127	.292*	.210*	-	
6. Overall alcohol/marijuana/ other drug *DSM* diagnosis	.524***	.476***	.252	.401***	.136	-

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 6

Latent Class Analysis Fit Statistics ($N = 100$)

	Likelihood Ratio Chi-square	*df*	Akaike (*AIC*)	Bayesian (*BIC*)	Sample Size Adjusted *BIC*	Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (*LRT*)	Lo-Mendell-Rubin Adjusted *LRT* (*aLRT*)	Parametric Bootstrapped *LRT* (*bLRT*)
1 Class	24.60	7	1163.89	1189.94	1158.36	N/A	N/A	N/A
2 Classes	4.46	2	1089.70	1136.60	1079.75	$p = 0.0000$	$p = 0.0000$	$p = 0.0000$
3 Classes	3.64	-	1089.44	1157.18	1075.06	$p = 0.5484$	$p = 0.5544$	$p = 0.2000$

Notes. AIC = Akaike Information Criterion; *BIC* = Bayesian Information Criterion. Two-tailed values.

TABLE 7

Latent Class Analysis Results

Latent Class 1 (*N* = 53)			
Means	Estimate	S. E.	Critical Ratio
Total Delinquency	1.208	0.109	11.088***
ADHD	0.257	0.047	5.447***
Traumatic Events	2.363	0.195	12.131***
Variances			
Total Delinquency	0.548	0.076	7.236***
ADHD	0.078	0.015	5.116***
Traumatic Events	1.605	0.202	7.949***
Categorical Variable Proportions (Results in Probability Space)			
Youth ever had an alcohol/ other drug abuse problem			
No	0.526	0.074	7.090***
Yes	0.474	0.074	6.396***
Youth ever received services for emotional/behavioral problems			
No	0.427	0.076	5.621***
Yes	0.573	0.076	7.542***
Substance Use/Abuse Diagnosis			
None	0.030	0.032	0.932
Abuse	0.558	0.074	7.544***
Dependence	0.411	0.072	5.683***
Latent Class 2 (*N* = 47)			
Means	Estimate	S. E.	Critical Ratio
Total Delinquency	−0.056	0.138	−0.407
ADHD	−0.285	0.046	−6.226***
Traumatic Events	1.918	0.204	9.401***
Categorical Variable Proportions (Results in Probability Space)			
Youth ever had an alcohol/ other drug abuse problem			
No	0.974	0.027	36.594***
Yes	0.026	0.027	0.981
Youth ever received services for emotional/behavioral problems			

Latent Class 1 (*N* = 53)			
No	0.807	0.069	11.743***
Yes	0.193	0.069	2.817**
Substance Use/Abuse Diagnosis			
None	0.293	0.075	3.934***
Abuse	0.672	0.079	8.483***
Dependence	0.035	0.034	1.032
Categorical Latent Variable Mean			
C#1	0.177	0.240	0.737

Average Latent Class Probabilities for Most Likely Latent Class Membership (row) by Latent Class (column)

	1	2
1	0.961	0.039
2	0.074	0.926

Entropy: 0.800

Note.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 8

Parent/Guardian Reports of Consequences of Youth's Alcohol/Other Drug Use (Lifetime)

	Youth Group				
	High Risk (*N* = 53)		Lower Risk (*N* = 47)		
Consequences of Alcohol/ Other Drug Use	**Mean**	**S.E.**	**Mean**	**S.E.**	**Chi-square *p*-value**
1. Got into trouble with the law	0.465	0.070	0.234	0.067	.021
2. Avoided family activities to get high	0.209	0.058	0.134	0.055	.363
3. Got into fight or tried to hurt someone	0.561	0.069	0.277	0.070	.004
4. Had sudden outburst of temper, crying spells	0.241	0.060	0.073	0.041	.025
5. Taken or sold things that weren't his/hers	0.148	0.049	0.003	0.012	.006
6. Got into fights with friends due to using	0.562	0.070	0.230	0.068	.001
7. Broken promises to himself/herself to limit or cut down use	0.434	0.070	0.099	0.048	<.001
8. Had trouble with coworkers, supervisors, or school officials due to use	0.093	0.041	0.047	0.034	.403
9. Committed a crime when using	0.579	0.070	0.340	0.074	.023

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TABLE 9

High Risk and Lower Risk Youth's Substance Use and Self-Reported Delinquency During 3-Month Follow-Up Period

	Youth Group				
	High Risk (n=53)		Lower Risk (n=45)		
Follow-Up Measure	**Mean**	**S.E.**	**Mean**	**S.E.**	**Chi-Square p-value**
Alcohol/Other Drug Use					
Drank alcohol to the point felt buzzed or intoxicated	0.262	0.061	0.110	0.049	0.057
Drank alcohol five times or more to the point of feeling buzzed or intoxicated	0.150	0.049	0.020	0.023	0.019
Proportion of days in past 3 months used marijuana	0.085	0.024	0.029	0.018	.064
Marijuana positive at follow-up interview	0.461	0.079	0.222	0.072	.031
Substance use diagnosis	1.389	0.090	1.067	0.039	.001
Total self-reported delinquency	0.104	0.148	−0.603	0.110	<.001