Predicting Risk for Recidivism: Improving the Delinquency Risk Assessment Scale

FINAL REPORT

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Angela Robertson

GOAL AND OBJECTIVES

The goal of this project was to increase the predictive validity of the Mississippi Delinquency Risk Assessment (DRA) scale. The initial objectives designed to accomplish this goal were:

1. To select a representative statewide sample of approximately 1,000 closed Youth Court cases.
2. To measure factors commonly associated with recidivism, including items on the MS DRA scale.
3. To randomly divide the sample in half; one half of the cases will be used to develop the prediction model, and the other half will be used to check the reliability of the prediction model and as further validation of the model.
4. Using statistical methods, to create a model that accurately predicts whether a juvenile offender will be re-arrested or otherwise referred back again to the Youth Court.
5. Results of this validation process, along with any recommendations for changing the DRA instrument, will be made to the Mississippi Division of Youth Services.

This report will detail the progress towards reaching the above mentioned objectives.

SAMPLING

The statewide sampling technique described below was employed to obtain a representative sample of juvenile offenders to allow generalizations from the sample to the population of Mississippi juvenile offenders. During the first stage of sampling, 20 counties were selected with probabilities proportionate to the number of officially reported youth court dispositions during 1997 (source: Division of Youth Services Annual Statistical Report). In 1997, there were 10,231 officially-handled case dispositions in Mississippi Youth Courts. Probability proportionate to size sampling gives Youth Courts with larger case loads a higher probability of selection. Six counties had selection probability greater than one and were selected with certainty (Hinds, Lauderdale, Washington, Warren, Harrison, and Pike). Systematic selection following a random start was used to select the remaining counties. The additional sampled counties were: Madison, Lowndes, Rankin, Pearl Municipal, Lincoln, Jones, Sunflower, DeSoto, Grenada, Scott, Yazoo, Union, Tunica, and Kemper.

The Institutional Review Board of Mississippi State University required that written permission from Youth Court Judges be obtained before data collection could begin. In the initial sampling of counties, some were not able to participate. Therefore, Marshall and Lee County Youth Courts were added to maintain a total of 20 courts.

The next stage of sampling involved setting quotas for each of the selected courts based upon gender and racial proportion of cases handled. Court clerks were informed of the number of white male cases, white female cases, nonwhite male cases, and nonwhite females cases that were needed and were asked to randomly pull 50 cases from closed files that met their particular quota. For example in Hinds County, 67.2 percent of Youth Court cases handled in 1998 were male and 86.4 percent were nonwhite. In order to select 50 cases based on race and gender, 5 white male cases, 2 white female cases, 29 nonwhite male cases, and

14 nonwhite females cases were needed. Each of the participating Youth Courts were informed of their quotas during September 1999.

DATA COLLECTION

The plan was for court clerks to pull 50 closed cases and for other Division of Youth Services personnel to complete a questionnaire on each selected case and mail the forms to Mississippi State University. This was not always possible due to manpower shortages and logistics. Data collection, therefore, took longer than originally anticipated and was completed by the end of November 1999. Information was available on 995 cases.

DELINQUENCY RISK PREDICTORS AND THE RECORDS REVIEW FORM

The first step in the development of a risk assessment instrument is to identify a limited number of factors known or believed to be relevant to predicting recidivism or some other failure criteria (Clear, 1988). Research has repeatedly identified the following predictors of recidivism: age at first referral or adjudication, number of prior referrals or arrests, number of out-of-home placements or institutional commitments, school behavior and attendance, substance abuse, family stability, parental control, and peer relationships, among others (Howell & Bilchik, 1995).

In developing a risk assessment instrument for the Model Case Management System for juveniles, Baird (1984) found that the factors noted above provided the best prediction model for a large sample of probationers and parolees in five different sites. The Division of Youth Services (DYS) Juvenile Classification Task Force examined juvenile delinquency risk instruments from several states, i.e., Wisconsin, Indiana, Oklahoma, New Hampshire, Maryland, Florida, Virginia, Louisiana, Vermont, and Ohio

and found variability in the predictive items selected by state juvenile justice agencies. Other factors that have been selected for inclusion of risk assessment instruments are current offense type, runaways from home, youth's involvement in structured activities in the past six months, parent's criminal record, father's attitude toward youth, youth employment, history of neglect, physical abuse or sexual abuse, youth's response to current adjudication, number of moves, sibling influence, prior assaults, and history of serious emotional problems.

The data collection instrument, called the Records Review Form (see appendix), was developed to collect demographic information, social and family history, and arrest/referral or other criminogenic data that could prove useful as predictors of risk for recidivism within the Mississippi juvenile justice system. The demographic, school and family data items on the Record Review Form were chosen based upon information routinely collected by DYS personnel. For example, race, gender, and birth date are recorded in the case record on the Face Sheet and other relevant information such as living arrangements of the child, marital status of natural parents, school and grade information, and employment status of the juvenile are documented on what is known as the Stat Card. All arrests/referrals are to be noted in the case record on a "rap sheet" by date of referral, reason for referral(s), and disposition.

Information necessary for the construction of other Delinquency Risk Assessment items may or may not be available in the case record. Information about a juvenile's use of alcohol and other drugs or whether the juvenile's friends are gang involved should be included in any thorough social summary or documented in probation counseling notes. However, there is no standardized format for court intake nor are DYS Youth Services Counselors required to keep detailed notes that would allow someone not familiar with the case to review the records and rate the youth's potential delinquency risk.

MISSING INFORMATION

Records Review Forms were completed on 995 juveniles in the 20 selected Youth Courts. The amount of missing data varies by questionnaire item and varies both across and within courts. Even those courts that did a very good job of providing the requested information, i.e. Marshall, Pike, Lauderdale, and Lee counties, did not provide complete data on all cases. Table 1 displays the percentage of missing data for just some of the factors that are included on delinquency risk scales.

Use of alcohol by minors is a delinquent offense in itself, and alcohol abuse is frequently associated with other crimes. Alcohol use is prevalent among juvenile offenders (Segal, Hobfoll, & Cromer, 1984). In a recently conducted study of 309 juvenile offenders in Mississippi, 77.1% admitted to some use of alcohol in the previous six months, and 30.4 % admitted to regular use (once per week or more often) (Robertson, 1999). There is considerable evidence of a relationship between alcohol abuse and criminal behavior (Collins, 1981). For example, the percentage of state inmates who reported drinking at the time of the offense that resulted in incarceration is 53% for homicide, 61% for assault, 47% for burglary, 38% for larceny, and 67% for arson (Roizen & Schneberk, 1977, p. 30).

There is overwhelming evidence of a relationship between drug use and criminal behavior (Greenberg & Adler 1974, Gandossy 1980, Ball, Shaffer, & Nurco, 1983; Wish & Johnson, 1986). Over half (51%) of inmates surveyed in state and federal correctional facilities reported the use of alcohol or drugs while committing their crimes (Mumola, 1999). Hair analysis for drug use revealed that 57 percent of juveniles arrested and detained in Cleveland during a two month period had used cocaine (Feucht, Stephens, & Walker, 1994). In the study of substance abusing juvenile offenders conducted in Mississippi, there were 134 positive results out of 287 urine specimens collected prior to the intervention (Robertson, 1999). Most (83.6%) of the positive drug tests were for marijuana,

Table 1: Percent Missing Data by County

County (number of cases)	AOD use by Juvenile	Parent with AOD Problem	Level of Parental Supervision	Family Criminality	School Attendance	Serious School Misbehavior	Overall Ranking
Hinds (48)	60.4	81.3	37.5	81.3	6.3	16.7	13
Lauderdale (50)	12.0	24.0	10.0	22.0	6.0	0.0	3
Washington (50)	90.0	90.0	90.0	90.0	8.0	6.0	15
Warren (50)	32.0	84.0	30.0	82.0	0.0	6.0	11
Harrison (50)	40.0	70.0	26.0	14.0	14.0	6.0	7
Pike (53)	9.4	5.7	7.5	3.8	9.4	3.8	1
Madison (49)	81.6	65.3	14.3	44.9	4.1	6.1	9
Lowndes (48)	14.6	39.6	16.7	33.3	18.8	12.5	6
Rankin (49)	55.1	89.8	57.1	91.8	42.9	6.1	14
Lincoln (50)	52.0	24.0	14.0	24.0	12.0	2.0	5
Jones (50)	38.0	86.0	32.0	82.0	12.0	8.0	12
Sunflower (50)	100	100	100	98.0	6.0	22.0	19
DeSoto (50)	100	100	100	100	4.0	0.0	17
Grenada (50)	100	100	100	100	0.0	28.0	20
Scott (50)	36.0	66.0	42.0	60.0	20.0	2.0	9
Union (49)	20.4	36.7	30.6	26.5	12.2	10.2	7
Tunica (50)	98.0	100	100	100	4.0	2.0	18
Marshall (50)	8.0	28.0	0.0	20.0	4.0	2.0	2
Lee (50)	6.0	42.0	2.0	42.0	4.0	2.0	4
Yazoo (49)	87.8	91.8	77.6	81.6	0.0	22.4	16
Entire Sample	51.9	66.0	44.3	59.7	9.3	8.7	

11.2% of the positive drug tests were for cocaine, and the remaining 5.2% of the positive drug tests were for amphetamines, barbiturates, benzodiazepines and opiates. Twenty-two drug tests were positive for two drugs and two drug tests were positive for three drugs.

Given the evidence of a relationship between substance abuse and delinquent activity, one would assume that a juvenile offender's use of alcohol and other drugs (AOD) would be assessed at intake. We found that three courts, i.e. Sunflower, DeSoto, and Grenada, have no documentation in the case record that would allow the coding of a juvenile's AOD use on an delinquency risk assessment scale. Of the courts that do collect this information, the three courts with the lowest amount of missing data (Lee, Marshall and Pike) still had no information on between 6 and 9 percent of the cases reviewed.

Common sense and the empirical literature agree that parenting practices influence youth behavior. Fifty years ago, the Gluecks identified supervision, attachment, and discipline as the most important family correlates of serious, persistent delinquency (Glueck & Glueck, 1950). In a review of the literature on the family context of juvenile delinquency, Loeber and Stouthamer-Loeber (1986) assert that the strongest predictors of youth conduct problems are lack of parental supervision, parental rejection, and parent-child involvement. In a re-analysis of the Gluecks famous longitudinal study of juvenile delinquency, Sampson and Laub (1993) demonstrated that the strongest predictor of both official delinquency (arrests) and unofficial delinquency (juvenile self-reports, parent reports, and teacher reports) was mother's supervision. "83 percent of those in the low supervision category were delinquent compared to only 10 percent of those in the high category..." (Sampson & Laub, 1993, p.77). They also found that both mother's and father's drinking and/or criminality were important in reducing effective monitoring of the juvenile. Therefore, knowing something about the family life, parental supervision, and discipline practices should be included in any prediction model for youth at risk for a variety of problematic behaviors from substance use to teen pregnancy. We attempted to collect information about parents' or other household adult's problematic use

of alcohol or other drugs, whether or not any family member has a criminal record, and the amount of supervision provided by the parent/guardian. As can be seen from Table 1, 44.3% to 66% of this information is missing from the entire sample.

Like the family, school is a socializing institution and there is empirical evidence that as school attachment and achievement increases, the likelihood of delinquency decreases (Gottfredson & Hirschi, 1990; Hirschi, 1969; Loeber & Dishion, 1983; Wiatrowski, Griswold, & Roberts, 1981). Table 1 also displays the percent of missing data with regards to school attendance and school misbehavior. This information should be recorded in the case record on the Face Sheet, and there is a question on the Stat Card that asks about school behavior. Consequently, only about 9% of court records were missing this information. There were glaring exceptions. In Rankin County, school attendance documentation was not found for 43% of the selected cases. This same information was missing from approximately 20% of the cases in Scott and Lowndes counties. As for evidence of serious or persistent school misbehavior, Lauderdale and DeSoto provided information on 100% of their cases, while the information was missing from 22% or more of the cases in Sunflower, Yazoo, and Grenada counties.

Finally, county courts are ranked on the amount of information available. A ranking of one indicates that, overall, the county provided most of the information needed to construct and evaluate a delinquency risk assessment scale. A ranking of one indicated very little missing data and a ranking of 20 indicated the most missing data. Pike, Marshall, and Lauderdale had the most complete documentation, and Tunica, Sunflower, and Grenada had the worst documentation of recidivism factors in the selected case records.

The issue of data quality is very important for accomplishing the objectives of this project. We needed a sufficiently large number of cases to randomly split the sample for DRA construction and validation purposes. Because so much data was systematically missing for some important predictor variables, we had to alter the proposed validation plan. Specifically, there were too few cases with complete

information to divide the sample in half. Instead, we used logistic regression techniques to identify the best predictors of recidivism based upon a subset of the sample with complete information.

CONSTRUCTION OF THE PREDICTION MODEL

The techniques of prediction developed by Glaser (1962) and Gottfredson (1967) have been used to develop risk classification instruments. As previously mentioned, the first step in the development of such an assessment instrument is to identify factors or predictors of recidivism. The next step is to select a sample and to create a model that is a combination of factors which, taken together, do the best job of indicating whether or not an offender will get arrested again or violate probation/parole. (Clear, 1988). The decision process involved the selection of factors for inclusion in the prediction model is described below.

Where ever possible, information taken from the Records Review Form was coded to match the corresponding item on the Delinquency Risk Assessment (DRA) instrument chosen by the Juvenile Classification Task Force (see appendix). For example, the age in years of first referral or arrest was coded as: 0 = 16 years of age or older, 1 = 15 years old, 2 = 12 to 14 years**,** and 3 = 11 years or younger. Thus, the younger the juvenile at the time of first referral to Youth Court, the higher the item score or weight. Some items on the DRA scale had to be modified to fit the available data. Item 8 "Offense severity within past year" was changed to "Any serious offenses at first referral" and was coded 0 = no, 1 = yes. Items from DRA scales used by other states were included on the Record Review Form. Several of these factors, such as use of tobacco and alternative school placement, were coded one for yes and zero for no.

In all, there were 17 possible predictor items that could be used to make a Delinquency Risk Assessment Scale. First, we regressed each possible predictor on the total number of referrals to Youth Court (see Table 2). The F statistic indicates whether the relationship between the factor and criterion is

statistically significant (p value less than .05). Also reported in Table 2 is R^2 , the coefficient of multiple determination. The interpretation of R^2 is similar to that of a correlation, the larger the value, the stronger the relationship. But in the case of R^2, it gives the proportion of the variation in the criterion variable that is explained by the regression equation.

Three factors did not meet the requirement of statistical significance, "serious or very serious offense at first referral," "drug use other than marijuana," and "number of abuse or neglect referrals." Although the F test was statistically significant for "below expected grade level" and "parental AOD problem," the explained variance is 1.7 percent and 2.2 percent, respectively. Factors with the strongest predictive power are "prior referrals," "out-of-home placements," and "delinquent friends." We would expect that "prior referrals" would have such a large R^2 because the variable was constructed by subtracting one from the total number of referrals then recoded as on the MS DRA (0 = none, 1 = one or two, 2 = three or four, and 3 = five or more). While "priors" should be included in any final DRA scale, we will not use it in the testing of the prediction model due to multicollinearity, that is, the prior referrals variable is too highly correlated with the variable it is supposed to predict, total number of referrals.

Table 2: Predictors of Total Referrals to Youth Court

Variables (Coding)	**R^2**	**n**	**F**	**p<**
Age at First Arrest (0-3)	.072	994	77.087	.001
Prior Referrals (0-3)	.756	994	3077.924	.001
Serious Offense at first referral (yes/no)	.000	994	0.015	ns
Out-of-Home Placements (actual number, 0-5)	.342	994	516.646	.001
Training School Commitments (actual number, 0-4)	.347	994	527.367	.000
Level of Parental Control (0-3)	.046	553	26.709	.001
Parental AOD Problem (yes/no)	.022	337	7.544	.01
Family Criminality (yes/no)	.042	400	17.392	.001
School Attendance (0-3)	.073	779	61.666	.001
Below Expected Grade Level (yes/no)	.017	966	17.106	.001
Serious or Persistent School Misbehavior (yes/no)	.061	907	58.880	.001
Alternative School Placements (yes/no)	.074	494	39.665	.001
Delinquent Friends (0-3)	.105	491	57.623	.001
Use of Alcohol/Drugs (0-3)	.075	420	34.061	.001
Drug use other than Marijuana (yes/no)	.000	481	0.197	ns
Use of Tobacco (yes/no)	.087	171	16.228	.001
Abuse or neglect referrals (actual number, 0 - 2)	.037	994	1.393	ns

The second step in the decision process was to examine more closely items on the Mississippi DRA, excluding prior referrals for the reason given above and serious offense at first referral because that factor did not predict total referrals. Also note that item five on the MS DRA "current school status" was divided into two factors, "school status" and "below expected grade level." We did not have enough cases with information about the number of grades failed, so we substituted an item from the Stat Card regarding grade placement in relation to age. Table 3 gives the bivariate relationships between six risk indicators and recidivism. Recidivism was collapsed into two categories to contrast youths with only a single referral to those with two or more referrals. Youths with multiple referrals are referred to as recidivists. Of the 995 total youths in the sample, 482 (48.4%) had only a single referral; the remaining 513 (51.6%) were observed to have multiple referrals.

The Pearson Chi-Square statistic was used to determine if the individual risk indicators were significant predictors of recidivism. All six of the risk indicators described in Table 3 were observed to be significant predictors of recidivism. The nature of the observed relationship can be described by examining differences in recidivism rates across categories of the risk indicators.

Youths whose first referral to Youth Court occurred at the age of 16 or older were observed to have the lowest recidivism rates (35.1%). In part, this may simply be a function of age, those who are older at first referral have less time in which to be re-referred to Youth Court. Those initially referred at age 15 and at the ages of 12 to 14 were observed to have very similar recidivism rates, 55.5% and 57.1%, respectively. Youths whose initial referral occurred at 11 years of age or younger were observed to have the highest recidivism rates (67.3%) and appear to be at the highest risk of continued involvement in the Youth Court system.

Table 3: Recidivism Rates by Risk Indicators

RISK INDICATOR	PERCENT RECIDIVISM	PEARSON P^2	p	VALID N
Age at 1st Referral		47.44	.000	995
16 or over	35.1%			
15	55.8%			
12 to 14	57.1%			
11 or Younger	67.3%			
Alcohol or Drug Use		38.72	.000	421
No Use	37.7%			
Occ. or Suspected	66.0%			
Some disrupted functioning	55.1%			
Major disrupted functioning	86.4%			
Placements Outside Home		142.80	.000	995
None	40.7%			
1 or 2	82.4%			
3 or 4	96.0%			
5 or more	100.0%			
Number of Delinquent Peers		51.19	.000	492
None	26.5%			
Some	46.5%			
Most	69.2%			
School Status		34.41	.000	780
Attending regularly	43.5%			
Dropped out	66.2%			
Expelled/major behavior Problems	65.4%			
Below Expected Grade Level		20.03	.000	967
At Expected Grade Level	43.3%			
Below	57.8%			

Youths with evidence of alcohol or drug use were observed to be at higher risk of recidivism. Only 37.7% of youths with no evidence of alcohol or drug use were observed to recidivate. By comparison, 66.0% of those for whom their was evidence of occasional or suspected alcohol or drug use were observed to recidivate, 55.1% of those for whom some disrupted functioning was reported were observed to recidivate, and 86.4% of youths for whom major disrupted functioning was reported were observed to recidivate. It should also be noted that only 22 youths were described as exhibiting evidence of major disruption to functioning due to alcohol or drug use. Evidence of alcohol or drug use at the time of first referral clearly appears predictive of continued involvement in the youth court system. Unfortunately, valid information on alcohol or drug use was available for only 421 (42.3%) of the 995 observations. More extensive and systematic screening for alcohol and drug use problems could potentially improve the ability of Youth Court officers to identify youths at high risk of involvement in the system.

Recidivism rates were observed to increase as the number of referrals outside the home increased. The largest observed differences in recidivism rates were observed between those with no out-of-home placements (40.7 percent) and those with one or two out-of-home placements (82.4 percent). While recidivism rates were slightly higher for those with three or more out-of-home placements, the actual number of youths in these categories was small, and generalizations may not be reliable. Only 25 youths were reported as having three or four out-of-home placements, and only four were reported to have five or more out-of-home placements.

Observed recidivism rates tended to increase with the number of reported delinquent peers. Only 26.5% of youths with peer relationships described as providing good support and influences were observed to recidivate. By comparison, about 46.5 percent of youths described as not being peer-oriented or having some companions with delinquent orientation recidivated, and 65.4 percent of those described as having most companions involved in delinquent behavior or gang involvement were observed to recidivate. While

this indicator clearly appears to be a useful predictor of continued involvement in the Youth Court system, valid information was available for only 492 (49.4 percent) of the sampled cases.

Current school status also appears to be a potentially useful predictor of continued involvement in the Youth Court System. Only about 43.5% of those who were attending school regularly or who had graduated from high school were observed to recidivate. By comparison, 66.2% of those who had dropped out of school, and 65.4% of those described as having been expelled or having major behavior problems in school were observed to recidivate. Valid information on current school status was available for only 780 (78.4%) of the sampled cases.

A second indicator of school performance, being at or below the expected grade level, was also observed to be a significant predictor of continued involvement in the youth court system. About 43.3% of youths who were at their expected grade level at their initial referral were observed to recidivate while about 57.8% of those below their expected grade level recidivated.

As noted earlier, the availability of systematically reported information on these, and other potential predictors of continued involvement in the Youth Court system, is essential for developing an effective assessment instrument which can be uniformly used on a statewide basis. Other indicators, such as tobacco use, appear predictive of recidivism, but are reported for such a small proportion of cases that their use in constructing a composite assessment instrument is not currently practical.

Based on our screening of available data, and the bivariate relationships described in Table 3, we developed a composite risk index. Prior risk assessment instruments have sometimes relied on complex coding schemes in which either the values of risk indicators are manipulated, or the indicators themselves are differentially weighted. After exploring the predictive efficacy of indexes constructed using alternative scoring and weighting schemes, we found that a very simple index performed as well as more complex

coding schemes. Additionally, the simplicity of the index construction has the advantage of making it more easily applied by Youth Services Counselors or other Youth Court personnel.

The index we constructed was based on the six indicators described in Table 3. Youths were assigned a score of zero if they were 16 or older, one if they were 12 to 15, and two if they were 11 years of age or younger. Youths were assigned a score of zero if there was no evidence of drug or alcohol use, and one if there was evidence of alcohol or drug use at the time of initial referral. Placement outside of the home was scored zero if there were no out of home placements, and one if there was one or more out-of-home placements. Number of delinquent peers was scored zero if there was no evidence of associating with delinquent peers, one if there was evidence the youth was not peer oriented or that some of their companions had delinquent orientations, and two if most of their companions were involved in delinquent behavior or gangs. School status was scored zero if the youth was attending school regularly (or had completed high school or a GED) and one if the youth had dropped out of school, had been expelled from school, or exhibited major behavioral problems in school. School performance was scored zero if the youth was at their expected grade level, and one if the youth was below their expected grade level. Scores on these six indicators were summed to form a composite measure of recidivism risk and scores ranged from zero to nine.

In constructing the index, cases were excluded if valid information was not available for all of the individual indicators. Valid information on all six indicators was available for only 249 (25.0%) of the sample cases. Valid information on at least one of the six indicators was not available for 75% of the sampled cases. We first evaluated the predictive efficacy of the index for the 249 cases for whom valid information was available on all six indicators. We then explored some alternative strategies for increasing the sample size.

Linear logistic regression analysis is a technique appropriate for predicting outcomes on a dichotomous response variable (recidivism versus non-recidivism) using information from one or more predictor variables. Linear logistic regression analysis indicated that the six-item risk assessment index was a statistically significant (Wald = 59.16, p = .0000) predictor of continued involvement in the youth court system. The substantive magnitude of the effect of a predictor variable is often described in terms of its effect on the odds of a specific outcome on the dichotomous response variable. In this case, the effect of an increase in risk index scores on the odds of continued involvement in the Youth Court system. The analysis indicates that for every one unit increase on the risk assessment instrument, the odds of recidivism increase by a factor of 1.7748. More simply, a youth with a risk index score of one, is 1.7748 times more likely to recidivate than a youth with a risk assessment score of zero. A youth with a risk index score of two is 1.7748 times more likely to recidivate than a youth with a risk assessment score of one. A youth with a risk assessment score of two is (1.7748*1.7748 = 3.15) about 3.15 times more likely to recidivate than a youth with a risk assessment score of zero. And a youth with a risk assessment score of nine is about 174.72 times more likely to recidivate than a youth with a risk assessment score of zero. The six-item risk assessment instrument appears to be a highly robust predictor of continued involvement in the Youth Court System.

Other summary measures also support the potential utility of the risk-assessment index. One measure often used to summarize the overall efficacy of assessment instruments in predicting dichotomous outcome is called the area under the operator receiver characteristic curve (ROC); we will use ROC to summarize this statistic. Consider randomly selecting one recidivist and one non-recidivist from their respective populations and then trying to guess which population they were selected from without knowing anything about them. It's a problem analogous to guessing heads or tails on coin flips; in the long run we would guess correctly 50 percent of the time, and incorrectly 50 percent of the time. By chance, we would

be correct 50 percent of the time even if we didn't know anything about youths other than that one was a recidivist, and one was not. The area under the operator receiver characteristic curve is a measure of the degree to which knowledge of a predictor variable reduces our error in correctly classifying randomly selected discordant pairs of observations (one randomly selected recidivist and one randomly selected non-recidivist). The statistic ROC varies from .5, indicating that the predictor variable provides no utility in reducing our ability to correctly predict outcomes over chance, to 1.0 indicating that the predictor variable allows us to predict discordant pairs of outcomes with perfect accuracy. For this analysis, the ROC statistic was .814, indicating that 81.4% of the discordant pairs of observations could be correctly classified, a substantial reduction in classification error over chance. Based on this analysis, the simple six-item risk assessment instrument appears to have considerable utility for predicting continued involvement in the Youth Court system.

There is yet another way of examining the relationship between scores on the six-item risk assessment instrument and recidivism which may be more useful to policy makers. In Table 4 we report the observed and predicted probabilities of recidivism for each observed score on the six-item risk assessment index. The predicted probabilities (reported as percentages) are estimates of recidivism rates in the population based on the logistic regression analysis. The observed recidivism rates are the actual rates of recidivism observed for the sample of 249 valid observations. These data clearly indicate that the risk of continued involvement in the Youth Court system increases as scores on the six-item risk assessment instrument increase. Such scores are of considerable value to decision makers in establishing risk categories. Youths scoring two or lower on the risk assessment instrument appear to be at relatively low risk of continued involvement in the Youth Court system. Youths with scores of 3 or 4 appear to be at moderate risk of continued involvement in the Youth

Table 4: Observed and Predicted Recidivism Rates at Risk Assessment Index Scores

INDEX SCORE	OBSERVED RECIDIVISM	PREDICTED RECIDIVISM
0	0.0%	8.7%
1	10.0%	14.4%
2	22.0%	23.0%
3	43.0%	34.6%
4	55.0%	48.4%
5	67.0%	62.5%
6	74.0%	74.7%
7	71.0%	84.0%
8	100.0%	90.3%
9	100.0%	94.3%

Court system. Youths with risk assessment scores of five or higher appear to be at high risk of continued involvement in the Youth Court system.

The relatively low proportion of cases for whom valid information was available on all six indicators included in the risk index poses potential limitations in the generalization of findings. There are no "good" solutions to this problem other than encouraging a more complete and systematic reporting of information by Youth Services Counselors. However, to determine potential sample selection biases, we explored the predictive validity of indexes constructed by attempting to incorporate information which was available in the sampled cases.

A simple strategy was simply to assign risk scores based on the valid information which was available. Using this strategy, index scores were constructed as previously described except that missing information was assigned a risk-score of 0 on the indicator. Thus, the 546 cases for whom valid information

was not available on the indicator of alcohol or drug use were simply assigned a score of zero on that indicator, the 503 cases for whom information on number of delinquent friends was not recorded were assigned a score of zero on that indicator, and so on. The advantage of this strategy is that risk scores can be readily obtained by summing across the indicators for whom valid information was available, and ignoring the indicators for whom valid information was not available, thus retaining all 995 observations for analysis. The problem is that missing information is treated as indicating low risk. Thus, an index constructed using this strategy sharply under-estimates the true risk of continued involvement in the youth court system. We'll call this measure the full information index. We do not recommend its use, but simply report our analysis to substantiate the generalization of findings based on the index constructed for cases for whom valid information was available on all six indicators.

Linear-logistic regression was again used to assess the predictive validity of the full-information index. The full-information index was a statistically significant (Wald = 102.71, p = .000) predictor of continued involvement in the Youth Court system. Given that this index under estimates the true risk of youths, it's not surprising that the predictive efficacy of the full-information index was not as strong as that observed for the index described previously. The ROC statistic was .693 for the full-information index (recall that it was .814 for the analysis based on cases for whom valid information was available on all indicators), indicating a substantial reduction in classification errors based on chance. The important point of this analysis is that it substantiates the generalization of the findings previously reported.

A second and more computationally complex strategy for handling missing cases is to construct estimate index scores based on the indicators for which valid information was obtained. This strategy would lack practical utility in the context of day-to-day use in Youth Courts, but provides an additional means of evaluating the results of our analyses. We will refer to this index as the estimated risk index. First, each of the six indicators was standardized to a mean of zero and a standard deviation of one. Next, we arbitrarily

required that valid information be available for four of the six indicators. Finally, we estimated index scores as the mean indicator score on the indicators for which valid information was available (requiring that valid information be available for at least four of the six indicators). Valid information was available for 890 cases on four or more of the indicators. Valid information was missing on three or more of the indicators for 85 cases; index scores were not estimated for these 85 cases. This index construction strategy is complex, relies on estimating overall risk index scores from available information, and is clearly not appropriate for use in Youth Courts. Nevertheless, the results obtained from linear logistic regression analysis again substantiate the potential predictive utility of the original index. The estimated risk index was a statistically significant predictor (Wald = 137.18, p = .000) of recidivism. The ROC statistic based on the estimated risk index score was .738, again indicating substantial reduction in classification error over chance.

In summary, these findings indicate the potential utility of a simple six-item risk assessment index. This simple index was observed to be a strong predictor of continued involvement in the Youth Court system. Unfortunately, sufficient information was not included in the case files to accurately assign scores to several of the indicators, thus limiting the practical utility of the index in the context of day-to-day Youth Court activities. Additional analyses suggested that other indicators could be useful adjuncts to those included in the index, but proportion of observations for which valid information on such indicators was highly restrictive.

CONCLUSION

Using the Delinquency Risk Assessment Scale selected by the Division of Youth Services Juvenile Classification Task Force and items culled from DRAs used by other states, we identified 17 possible items for construction of an instrument to predict risk of re-offending within the Mississippi juvenile justice system. The lack of valid information on some potential indicators of recidivism presented serious challenges to construction of an index to be uniformly applied in Youth Court settings. Nevertheless, we were able to construct a DRA scale with predictive power. One item from the selected DRA, "serious offense at first referral" was dropped because that factor did not predict total referrals to Youth Court. Another item "level of parental/guardian control and supervision" was dropped, despite the item's ability to significantly predict total referrals to Youth Court, because this information is not reliably being collected across Youth Courts in Mississippi. An item from the original instrument, "current school status," which is a combination of grades, attendance, and behavior, had to be modified to fit available data. This item was divided into two factors, "current school status" referring to attendance only and "school performance," which refers to whether the youth is at or below expected grade level. For the rest of the items taken from the selected DRA, the response choices and weights were determined based on each item's ability to distinguish between recidivists and non-recidivists. The proposed DRA scale for adoption statewide is included in the appendix.

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APPENDIX

Record Review Form

Task Force Recommended Version of Delinquency Risk Assessment

Proposed Version of Delinquency Risk Assessment Scale

DRA Validation Study
Records Review Form

County_____

I Personal and Family

year of birth _____

sex (check) ___ male ___female

race (check) ___White ___Black ___Asian ___American Indian ___Hispanic ___ other

Please collect the following information from Statistical Report Form. **Use codes for the Statistical Report Form. If the Statistical Report form is not available, please write out the answer. For example: "Lives with mother only" is coded 04 or write "mother only". Mark NA for not available if the information can not be found in the case record.**

Item # and name	First offense or latest offense for which there is information	Note only if there has been a change since the first offense
21. Living arrangements of child		
22. Marital status of natural parents		
26a. Presently enrolled in school		
26b. Grade completed		
26c. Grade placement in relation to age		
26d. Serious or persistent school misbehavior		
27. Employment status		

Grades failed or repeated (note all grades that failed) _____

Has this child been placed or currently placed in an alternative school program? ___yes ___no ___There is no documentation in case record.

School Attendance (Please review the case record and do not rely on intake form. Check all that apply.)
___attending regularly
___occasional truancy only
___habitually truant
___graduated/GED
___dropped out of school
___expelled
___There is no documentation in case record.

Criminality in Family : One or more family members in trouble with the law? ___yes ___no
___There is no documentation in case record about family criminal involvement.

Parental Alcohol or Drug History: Any parent or household adult with a drug or alcohol problem?
___yes ___no ___There is no documentation in case record regarding parents' or other adults' in household use of alcohol or other drugs.

Level of parental/guardian control and supervision (check)
___Child lives at home and parent(s) is/are not known to contribute to delinquency.

No supervision: ___Parent(s) are uninvolved and allow the minor to function on his/her own.
___Or parent is unable to supervise due to work schedule or some other reason.
___Or child refuses to submit to parental control.

___Contributes to delinquency: The family has a history of involvement in the justice system. Parents resist outside intervention from public agencies. Parents contribute to delinquency by being involved in antisocial behavior themselves. Parents are overprotective and blame others for the minor's delinquent behavior.

___There is not enough information in case record to rate parental control.

Peer relationships (check all that apply)
___good support and influence; associates with non-delinquent friends

___not peer oriented or some companions with delinquent orientation

___all or most friends use drugs

___half or more friends in trouble or delinquents

___There is not enough information in case record to rate peer relationships.

History of alcohol and/or drug use based on self report, parent report, or reports from community informants and/or child associates with alcohol/drug using peers (check all that apply)

___no use of alcohol or any drug in past six months

___occasional or suspected use

___10 or more drinks a week or marijuana use

___use of drugs other than marijuana during last year

___some disruption of functioning due to alcohol or drug use

___major disruption of functioning due to alcohol or drug use

___There is not enough information in case record to rate alcohol and/or other drug use.

Tobacco Use Does this juvenile use tobacco (smoke cigarettes or use chewing tobacco)?
___yes ____no ___There is no documentation in case record.

II Legal History - Please collect the following information from the "Rap sheet" or from Statistical Report form. Use the codes from "Reason Referred" from Statistical Report. For example: arson is coded 14. Or write out the charge if it is not an offense listed on the Statistical Report Form. For example instead of CCW write "carrying a concealed weapon." Also if the offense is violation of probation/parole, please note what youth did. For example: "failed drug screen." List all referrals, not just the primary referral. Please also note whether drugs or alcohol were involved in the referral and the disposition using Statistical Report codes or write out the disposition.

Age at first referral to juvenile court _____

Number of abuse/neglect referrals _____

Is there any evidence from case record that subject or any other child in the family has been neglected or abused? (Check all that apply)
___DHS child protective services have investigated this family
___yes, the juvenile has been neglected or abused
___yes, a sibling has been neglected or abuse
___custody of juvenile or a sibling has been temporarily removed
___There is no documentation in the case record to indicate abuse or neglect of any child in family.

Referrals/arrests to juvenile court

Date of referral/arrest	Reason for referral(s) or charge(s) List all - use code #s	Drugs involved	Alcohol involved	Disposition

Number of court ordered/referred out-of-home placements
Number of times committed to training school_____
Number of times placed in a shelter or foster care_____
Number of times placed in inpatient treatment or in a therapeutic group home or other residential treatment program _____

Date and reason case closed_____

Task Force Recommended Version
Delinquency Risk Assessment Scale
Mississippi Division of Youth Services

Youth's Name:_____ Child No. _____

Counselor's Name:_____ Date Completed:_____

___ 1. Age of first adjudication or informal sanction for a CHIN or delinquent offense
3 = 11 or under 2 = 12 - 14 1 = 15 0 = 16 or over

___ 2. Total number delinquent, status, and abuse/neglect of referrals to youth court prior to current referral
0 = none 1 = one or two 2 = three or more 3 = five or more

___ 3. Number of court ordered/referred out-of-home placements, including training school, shelter or foster care, group home, and residential treatment
0 =none 1 = one 2 = two or three 3 = four or more

___ 4. History of alcohol and/or drug use based on self report, parent report, or reports from community informants and/or child associates with alcohol/drug using peers
0 = no use in past six months
1 = occasional or suspected use
2 = regular use as defined as use of alcohol/drugs three or more times per month for the past six months

___ 5. Current school status
0 = attending regularly and no behavioral problems
1 = dropped out of school
2 = behind two or more grades or behavioral problems
3 = expelled or major behavioral problems

___ 6. Level of parental/guardian control and supervision
0 = Child lives at home and parent(s) is/are not known to contribute to delinquency.
2 = No supervision: Parent(s) are uninvolved and allow the minor to function on his/her own
3 = Contributes to delinquency: The family has a history of involvement in the justice system. Parents resist outside intervention from public agencies. Parents contribute to delinquency by being involved in antisocial behavior themselves. Parents are overprotective and blame others for the minor's delinquent behavior.

___ 7. Peer relationships
0 = good support and influence; associates with non-delinquent friends
2 = not peer oriented or some companions with delinquent orientation
3 = most companions involved in delinquent behavior or gang involvement

___ 8. Offense severity within past year
0 = none
1 = Category I or II
2 = Category I or II occurred within past 6 months
3 = Category III or IV

___ TOTAL RISK SCORE
Risk assessment: 0 - 6 = low risk: 7 - 12 = moderate risk; 13 - 23 = high risk

Proposed

Delinquency Risks Assessment Scale
Mississippi Division of Youth Services

Youth's Name:_____ Child No. _____

Counselor's Name:_____ Date Completed:_____

___ 1. Age of first adjudication or informal sanction for a CHIN or delinquent offense
2 = 11 or under 1 = 12 - 15 0 = 16 or over

___ 2. Total number of delinquent, status, and abuse/neglect referrals to youth court prior to current referral
0 = none 1 = one or two 2 = three or four 3 = five or more

___ 3. Number of out-of-home placements, including training school, group home, and residential treatment that result from court disposition.
0 = none 1 = one or more

___ 4. Evidence of tobacco, alcohol and/or drug use based on self report, parent report, or reports from community informants and/or child associates with alcohol/drug using peers
0 = no 1 = yes

___ 5. Current school status
0 = attending regularly and no behavioral problems
1 = dropped out of school, expelled from school or major behavioral problems in school

___ 6. School Performance
0 = at expected grade level
1 = below expected grade level

___ 7. Delinquent friends or peers
0 = no evidence of associating with delinquent peers
1 = not peer oriented or some companions with delinquent orientation
2 = half or more friends are delinquents or gang involved

___ TOTAL RISK SCORE

Risk assessment: 0 - 3 = low risk; 4 - 6 = moderate risk; 7 - 11 = high risk