MONTANA BACK ON TRACK (BOT):

DEVELOPING A RISK ASSESSMENT SCREENER AND UTILIZING THE BOT TO ASSIST IN SERVICE PLACEMENT

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INTRODUCTION

The current investigation's primary research objective is to determine if a brief screening risk assessment instrument can be created from risk factors found on the full Back on Track (BOT) that maintains, if not increases, prediction accuracy from the current pre-screen BOT. While the pre-screen BOT has been validated as an accurate predictor of recidivism, it is comprised of approximately 40 questions and requires a considerable amount of time to complete. A shorter screening instrument could increase fidelity to screening and aid in probation officer decision-making. This report also investigates how other states have used needs assessments similar to the full BOT to help inform service placement decisions for youth. Information presented in this report will provide recommendations to increase BOT utility as a tool for assisting probation staff in service placement decisions.

METHODOLOGY

The following six steps are followed in the analysis to create and validate a new screening risk assessment instrument:

Step 1- Outcome and terminology: Operationalize an outcome variable (recidivism) and define relevant terminology.

Step 2 - Risk factors: Determine a set of possible risk factors to include in the new risk assessment.

Step 3 - Sample: Collect data on a sample of youth and create estimation and validation samples.

Step 4 - Reduce risk factors: Reduce the set of possible risk factors to only include those most important for predicting juvenile recidivism. This analysis utilizes bivariate regression using Pearson's r correlation and logistic regression.

Step 5 - Create a new risk assessment: Create new risk screener using a reduced set of risk factors. Add weight to the factors included in the screener and validate the prediction accuracy of the new risk screener.

Step 6 - Risk assessment utility: Determine the utility of a new risk screener instrument based on juvenile probation officer opinions.

STEP 1: OUTCOME AND TERMINOLOGY

Recidivism: a new technical violation, criminal contempt, misdemeanor or felony citation within the risk period.

Risk Period: The risk period is a one-year span of time starting the day after the youth's initial intake date.

Outcome under investigation: Success versus Failure:

- Success: A youth does not have a recidivating offenses during the risk period.
- Failure: A youth does have a recidivating offense during the risk period.

STEP 2: RISK FACTORS

All risk factors identified in this analysis come from the full BOT risk assessment instrument. A total of 246 risk factors from 11 domains on the full BOT were initially included. The 11 domains include:

(1) Record referrals
(2) School history/Current school status
(3) Historic/Current use of free time
(4) Employment history/Current employment
(5) Relationships history/Current relationships
(6) Family history/Current living arrangements
(7) Alcohol and drug history/Current alcohol and drug use
(8) Mental health history/ Current mental health status
(9) Attitudes/Behaviors
(10) Aggression
(11) Skills

STEP 3: SAMPLE

All youth who had an intake from January 1st, 2010 to December 31st, 2015 and received a pre-screen BOT or a full BOT risk assessment were included in the initial data set. A total of 7,109 youth were included in the initial query. Youth who did not receive a Full-BOT or were not eligible to be included in the sample (over the age of 18) were removed. The final eligible sample contained 3,121 youth.

The final sample of 3,121 youth is randomly divided into two groups: estimation sample and validation sample.

- Estimation Sample = 2,621 youth
- Validation Sample = 500 youth

The estimation sample is used to determine which risk factors on the full BOT are most predictive of recidivism and to create a new short screening instrument. The validation sample is then used for a retrospective test of validity on the newly created risk screener.

Both estimation sample and validation sample were similar in terms of demographic information, initial, and recidivism frequencies (See Table 2 and Table 3 in the body of the report for these frequencies). The failure rate for the estimation sample is 38.43% (n=1,007 youth) and the validation sample is 39.00% (n=195 youth).

STEP 4: REDUCING RISK FACTORS

1. Reducing risk factors with bivariate regression (Pearson's r correlations):
   - Removed 94 risk factors that presented multicollinearity or collinearity with other risk factors.
   - Removed 61 risk factors that are not correlated with recidivism.
   - Eighty-one risk factors are kept for the logistic regression analysis.
2. Reducing risk factors with BOT domain specific logistic regression models:
   - Removed 33 risk factors that are not statistically significant predictors of recidivism when placed in domain logistic regression models.
   - Forty-eight risk factors are kept for the full logistic regression model.
3. Reducing risk factors with a full logistic regression model and backward step logistic regression:
   - Six risk factors are found to be significant predictors of recidivism in a full logistic regression model.
   - Ten risk factors are found to be significant predictors of recidivism in the backward step logistic regression model.
   - One risk factor in the full logistic regression model was not identified in the backward step logistic model providing a total of eleven risk factors for the final logistic regression model.
4. Reducing risk factors with final logistic regression model.
   - Seven risk factors are found to be significant predictors of recidivism in the final logistic regression model and are used to create the new risk screener.

STEP 5.1 CREATING A RISK ASSESSMENT SCREENER

Two hundred and forty risk factors are analyzed and then reduced to seven in the final logistic regression model to predict juvenile recidivism one year from initial intake. The seven risk factors are:

1. First offense under the age of 13
2. More than one total number of misdemeanor referrals
3. Youth does not have a positive adult relationship (not including relationships in family, school, or employment)
4. Youth believes fighting is sometimes or often appropriate
5. Youth does not apply appropriate solutions, nor think of solutions for problem behavior
6. Youth has antisocial friends
7. Youth has history of running away or being kicked out of the home

The Burgess Method of weighting risk factors is used to add risk scores for each risk factor in the new screener. The Burgess Method produces a simple cumulative risk score by adding one point to the total risk score for each risk factor that applies to a youth. All seven risk factors were coded in the same direction to ensure there is a positive correlation with recidivism. All seven risk factors are dichotomously coded so the youth either has the risk factor (+1) or the youth does not have the risk factor (+0).

A risk score is calculated for each youth in both the estimation sample and validation sample to test the validity of the screener. The risk score for each youth is calculated with the following formula:

Risk Score = Youth's first offense was under the age of 13 (0 or 1)

+

Youth currently has anti-social friends (0 or 1)

+

Youth does not have a history of non-family adult relationships (0 or 1)

+

Youth has a history of running away or has been kicked out of house (0 or 1)

+

Youth believes in fighting (0 or 1)

+

Youth does not problem solve (0 or 1)

+

Youth has more than one misdemeanor offense (0 or 1)

STEP 5.2: MEASURING ACCURACY

Three tests are run to measure accuracy in this analysis. The analysis begins by examining the percentage of youth within each of the three risk levels, including low, moderate, and high risk, that had a recidivating offense. This is a simple analysis, yet it presents a meaningful output. If the instrument is an accurate predictor of recidivism, recidivism rates will increase with each category rise in risk level. Next, receiver operator characteristic (ROC) analysis is run. The statistic derived from ROC analysis, known as the area under the ROC curve (AUC), allows for a simple accuracy reading. An AUC score of .7 or above indicates strong prediction performance, between .6 and .7 indicates moderate performance, and anything below .6 indicates poor performance. Finally, logistic regression analysis is used as the final test of accuracy. Odds ratios, derived from logistic regression estimates, describe whether there is an increased or decreased likelihood of correctly predicting if a youth will recidivate when their overall risk score is known holding all other variables in the model constant (Race and Gender).

STEP 5.3 ACCURACY FINDINGS

1. Distribution of risk scores and recidivism:

Findings presented below show an increase in failure rate as risk increases for both the estimation sample and the validation sample, an indication of an accurate measurement of recidivism risk:

- Estimation sample:
    a. Low Risk: 19.7% Failure Rate 80.3% Success Rate
    b. Medium Risk: 44.9% Failure Rate 55.1% Success Rate

c. High Risk: 65.9% Failure Rate 34.1% Success Rate

- Validation sample:
  a. Low Risk: 21.8% Failure Rate 78.2% Success Rate
  b. Medium Risk: 51.9% Failure Rate 48.1% Success Rate
  c. High Risk: 60.6% Failure Rate 39.4% Success Rate

2. Receiver Operator Characteristic (ROC) Analysis:

Findings from ROC analysis consistently show higher accuracy readings (AUCs) for the new screener instrument over the old pre-screen BOT for both the analysis sample and the validation sample. The screener instrument is also an accurate predictor of recidivism for the four subsamples analyzed. These include White youth, American Indian youth, female, and male. All AUCs are significant at the P≤.001 level (**).

- Analysis Sample:
  a) Old pre-screen BOT: AUC = .688**
  b) New Screener instrument: AUC = .729**

- Validation Sample:
  a) Old pre-screen BOT:
     - Full Sample (n= 500) AUC = .688**
     - White Sample (n=396) AUC = .658**
     - A/I Sample (n=56) AUC = .723**
     - Female Sample (n=199) AUC = .666**
     - Male Sample (n=301) AUC = .698**

  b) New Screener instrument:
     - Full Sample (n= 500) AUC = .729**
     - White Sample (n=396) AUC = .726**
     - A/I Sample (n=56) AUC = .754**
     - Female Sample (n=199) AUC = .742**
     - Male Sample (n=301) AUC = .717**

3. Logistic Regression Analysis:

The new risk screener score receives a larger odds ratio over the pre-screen BOT, evidence of an increase in prediction accuracy for the new risk screener even when controlling for race and gender. These findings mirror those from the ROC analysis above.

- Pre-screen BOT:
  a) Risk Score Odds Ratio: 2.34**
  b) Non-White Odds Ratio: 1.71**
  c) Male Odds Ratio: 1.35

- New Screener instrument:
  a) Risk Score Odds Ratio: 3.06**
  b) Non-White Odds Ratio: 2.03**

c) Male Odds Ratio: 1.47

Through each test of validity, the new screener's risk score demonstrates an increase in prediction accuracy over the pre-screen BOT risk score. This provides evidence that the newly created screener's risk score is a valid predictor of risk and maintains, if not increases, prediction accuracy over the pre-screen BOT in a retrospective analysis.

STEP 6: UTILITY OF RISK SCREENER AND RISK FACTOR DISCUSSION

Questions were sent to 10 probation departments across the state seeking information about how information on the BOT is collected and to gauge probation officer perceptions about the potential introduction of a seven-item screening risk assessment.

Probation officer comments highlight the need for a standardized approach for BOT use. Ideally, a youth would be given the pre-screen BOT risk assessment to determine their risk level of committing a subsequent offense. Then, if the youth is found to be moderate or high risk for a recidivating offense, they would receive the full BOT to help determine what services the probation officer should consider placing them into. At this point, it does not appear that the BOT is being utilized this way. Without a standardized approach capable of garnering buy-in from probation officers, the new risk assessment may not have utility in practice.

All risk factors are backed by prior literature on risk factors that predict recidivism.

1. First offense under the age of 13:
    a. This information is collected in the JCATS or by asking the youth/parents. If the youth comes from a different state, probation staff may have to call probation departments from the state the youth comes from.

2. More than one total number of misdemeanor referrals
    a. This information is collected the same as first offense under the age of 13.
    b. Probation officers are skeptical about not including felony offenses in this risk screener. As described in more detail below, felony offenses can be included with only a slight reduction in prediction accuracy.

3. Youth does not have a positive adult relationship (not including relationships in family, school, or employment)
    a. This information is collected by asking both youth and family.
    b. This question can be difficult to accurately collect as there is no definition for "positive adult relationships."

4. Youth has antisocial friends
    a. This information is collected by asking the youth, family, or school.
    b. Concerns about how to define this question have been raised. The term "friends" and "anti-social" are subjective and largely based on probation officer discretion from past experience.

5. Youth has history of running away or being kicked out of the home

a. Probation officer's notes that this factor reflects the amount of respect the youth has for parental authority and to what extent parents control their child's behavior.
b. Can suggest abuse, neglect and safety issues.
c. Information is collected by asking youth about home life, in addition to questions of the youth's parent.

6. Youth believes fighting is sometimes or often appropriate
    a. Information is collected by asking youth, parents, or school representatives. Fighting often results in a ticket or a part of a ticket and can be seen in JCATS.
    b. This question helps determine whether the youth poses a public safety risk.
    c. Probation officers are skeptical of having this question as one of the seven risk factors in a new assessment.

7. Youth does not apply appropriate solutions, nor think of solutions for problem behavior
    a. Probation officers gather this information by asking youth about the current offense for which they have been cited and how they could have gone about the situation in a different way.
    b. Probation officers are skeptical of having this question as one of the seven risk factors in a new assessment.
    c. This is the most abstract of the risk factors and it is important to determine exactly how to define this variable.

OVERVIEW OF NEW RISK SCREENER

Pros:

1. The tool is an accurate, objective predictor of recidivism for male, female, White, and American Indian youth
2. It is significantly shorter than the pre-screen BOT
3. Each factor on the screener has been validated and found as predictors of recidivism in the prior literature on risk factors
4. Each factor on the screener is measuring a different aspect of the youth, there are no duplicate questions. Aspects of the youth measured for each factor are itemized below:

    a. First offense under the age of 13
        i. How the youth perceives or defines themselves, or to what extent their delinquent behavior is ingrained.
    b. More than one total number of misdemeanor referrals
        i. The youth's propensity to continue committing delinquent behavior, even after discipline measures have been taken.
    c. Youth does not have a positive adult relationship (not including relationships in family, school, or employment)
        i. Support systems and positive role models in the youth's life.
    d. Youth believes fighting is sometimes or often appropriate
        i. The youth's propensity for aggression and mindset on aggressive actions.
    e. Youth does not apply appropriate solutions, nor think of solutions for problem behavior

        i. Youth decision-making skills, how the youth thinks and acts when placed in different situations.
    f. Youth has antisocial friends
        i. How the youth learns delinquent behavior, or if the youth has peers that will be impressed by delinquent behavior.
    g. Youth has history of running away or being kicked out of home.
        i. Measuring the youth's family and home life.

Cons:

1. Face validity is an issue. Some factors are included in the screener that are not commonly found on risk assessments, and some factors that are commonly included on risk assessments are not included on the new screener. Face validity questions can cause skepticism from practitioners about validity.
2. Need for a standardized process for when it's appropriate to use the screener, versus when to administer the full BOT.
3. Several districts do not see the need for a shorter risk screener.
4. Certain factors on the screener are difficult to define and accurately collect. This can cause an issue with inter-rater reliability. Inter-rater reliability is the ability for different practitioners to calculate the same risk score with the screener on the same youth. For example, one probation officer might decide that a youth does not have anti-social friends because their friends are not in the JCATS system, while another probation officer might decide that the youth does have anti-social friends because the youth's parents say they hang out with anti-social friends. Setting up a protocol to collect this information could help decrease inter-rater reliability which in turn increases the accuracy and face validity of the instrument.
5. The screener has not been validated proactively and findings may differ from the retroactive test of validity.

BACK ON TRACK NEEDS ASSESSMENT

The full Montana Back on Track needs assessment instrument was designed to assist in decisions about service placement for youth in the juvenile justice system. This is done by investigating a variety of areas in the youth's life that may attribute to delinquent behavior. Problem areas can then be addressed with services tailored to meet specific needs. Because individual youth have different strengths and weaknesses, they cannot be placed in a one-size-fits-all service approach. Youth who experience family problems should receive services reflective of the family dysfunction, and youth substance abusers should receive help designed to meet that need. A standardized process for using the BOT can aid decision-making about service placements capable of successfully rehabilitating youth and thereby reduce future recidivism.

The Washington State Juvenile Court Assessment (WSJCA) and the Structured Assessment of Violence Risk in Youth (SAVRY) are similar instruments to the Full-BOT. These instruments utilize a 'Service Referral Matrix" to assist in service placement. The Service Referral Matrix is a guide to help match youth needs to effective services. A Full-BOT matrix referral template was created based on those matrices used by the WSJCA and the SAVRY. The template is presented in the body of the report, Table 15.

The BOT Service Referral Matrix is to be used as a template and not as a final product. Each probation office across Montana has different services available to assist youth. A matrix will need to be created for each district for it to be useful. Creating a service inventory would assist in the usability of this matrix. Additionally, the matrix is to be used as a tool to assist in professional discretion, not as a mandate for final decision-making. Once employed in the field, the tool can be monitored and changed to be more helpful.

RECOMMENDATIONS

Findings from this investigation prompt two primary recommendations. A pilot test of the newly created risk screener should be conducted, and a survey of probation departments across Montana should be performed. The statewide survey would help determine how the screener and BOT could work more effectively for probation officers. The survey would also assist with creation of a service inventory. These two recommendations are described more in detail below.

As discussed earlier in this document, validation of the new screening instrument completed for this analysis is a retrospective test. A prospective test with pilot sites would provide a greater understanding of screening instrument utility and accuracy. Through a pilot test, probation staff could also provide insight into the process associated with screener use to determine if it is something that should be employed statewide. Probation department buy-in constitutes a crucial step for successfully implementing the new assessment into the field. If pilot sites legitimize the instrument, other departments are more likely to see its utility.

A service referral inventory would be beneficial for determining what resources are available for juvenile probation to provide to youth across Montana. Such an inventory would allow probation staff to share knowledge about existing services for youth. It would also provide insight into services voids where districts lack needed resources. A statewide survey administered to probation offices across Montana would provide a starting point for understanding service availability, demand, and unmet need. Additional information about social services could be collected from agencies such as the Montana Department of Public Health and Human Services. Growing the knowledge base of statewide service availability and need for existing services would also assist with securing help for youth who travel across counties.

In addition to the creation of an inventory and growing a greater understanding of youth service and delinquency data at the state level, maps using GIS technology could be created to assist with service identification and youth placement in to services. To illustrate the value of mapping for this type of endeavor, three maps were created for this analysis. They are provided in Appendix C through Appendix F as examples of different strategies to display spatial data in the juvenile justice system.

CONCLUSION

The Montana Back on Track risk and needs assessment instrument was created to assist in service placement for youth on probation. In a prior investigation, evidence from work performed by the Criminology Research Group supports the pre-screen BOT as a valid predictor of risk for first time offending youth in Montana. However, due to the lack of buy-in from many districts, the majority of youth are neither administered a pre-screen BOT nor a full BOT, and many districts do not see the

value of using these instruments. One goal of this investigation was to simplify the screening process by creating a shorter instrument that would allow probation officers to determine the risk level a youth poses in a shorter amount of time. A shorter instrument that maintains risk prediction accuracy could increase buy-in from probation officers and, in turn, increase fidelity and consistency. This inquiry's goal was largely accomplished. Out of the 246 risk factors on the full BOT, seven were found to be the most important for determining youth risk of recidivism. With these seven risk factors, the brief screener was found to improve prediction accuracy when compared to the pre-screen BOT.

The second goal of this investigation was to investigate how other states use similar instruments like the full BOT to help determine youth service placement. While limited information is available on this topic, the literature reviewed for this study encourages use of a service referral matrix. Such a matrix matches BOT items and youth risk level to services available to youth in each district. For a service referral matrix system to be successful, a service inventory must be created for each district to determine area resources available for youth.

Based on the past and current analyses, it is recommended that if the BOT is a strategy that Montana's Office of the Court Administrator for the Supreme Court wishes to pursue, a standardized process of administering the new screener risk assessment and full BOT should be put into place and used with fidelity. Before this can be accomplished, it is recommended that the new screener risk assessment instrument be prospectively tested at pilot sites in Montana to determine its validity and usability. Creation of a service inventory for youth across Montana to assist in service placement decisions with the full BOT should occur, and a statewide survey of probation departments across Montana should be undertaken to determine if this strategy could be useful.

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INTRODUCTION

The current investigation's primary research objective is to determine if a brief screening risk assessment instrument can be created from risk factors found on the full Back on Track (BOT) that maintains, if not increases, prediction accuracy from the current pre-screen BOT. While the pre-screen BOT has been validated as an accurate predictor of recidivism, it is comprised of approximately 40 questions and requires a considerable amount of time to complete. A shorter screening instrument could increase fidelity to screening and aid in probation officer decision-making. This report also investigates how other states have used needs assessments similar to the full BOT to help inform service placement decisions for youth. Information presented in this report will provide recommendations to increase BOT utility as a tool for assisting probation staff in service placement decisions.

This report is the result of a contract between Montana's Office of the Court Administrator for the Supreme Court and the University of Montana Criminology Research Group. The University of Montana via the Social Sciences Research Laboratory provided the services of Department of Sociology Professor Dusten Hollist, Research Associate Patrick McKay, and graduate Research Assistant Mackenzie Ranger.

BACKGROUND SUMMARY

The Back on Track was created in 1998 by the Washington State Institute for Public Policy and the Washington Association of Juvenile Court Administrators and Assessments. When the BOT was created, it was known as the Washington State Juvenile Court Assessment (WSJCA). Florida's Positive Achievement Change Tool (PACT), Vermont's Youth Assessment and Screening Instrument (YASI), and Montana's Back on Track (BOT) are adaptations of Washington State's instrument. All of the above-itemized instruments are comprised of a pre-screen assessment and a full assessment. The pre-screen assessment is a shortened version of the full assessment. It indicates whether a youth is at low, moderate, or high risk to reoffend. Youth who receive a moderate or high-risk score are given the full assessment. The full assessment is meant to identify risk and protective factors capable of guiding decisions about which services are provided for rehabilitation.

In May 2015, a report titled "The Montana Back on Track Risk Assessment Instrument: an Assessment and Validation Study" was completed (see McKay, Hollist, Bunch, Acton, Tillman, and Harris 2015). This report analyzed Montana pre-screen BOT accuracy for predicting recidivism on a variety of subsamples. Subsamples analyzed included gender, race, and offense severity. The 2015 analysis found the pre-screen BOT a valid and accurate predictor of juvenile recidivism for youth who had committed a first offense. Further, the BOT assessment and validation report investigated why certain youth received the BOT while others did not. Differences in administering the BOT were found based on race, age, and, most notably, district. Districts varied in their use of the BOT. For example, one district administered it 82.4 percent of the time, while another delivered it with only 12 percent of juvenile intakes. These findings indicated the BOT was not used by probation officers with fidelity and consistency. Recommendations in the assessment and validation report included calling for an analysis of additional factors on the full BOT for potential inclusion in the pre-screen BOT. Another recommendation was to determine how the full BOT can be used as a needs assessment instrument to create a more comprehensive treatment plan for youth in need of

services. The primary objective of this report is to investigate those two primary areas of inquiry recommended in the 2015 analysis.

LITERATURE REVIEW

Researchers have been studying formal prediction methodologies for more than 80 years. In 1928, Ernest W. Burgess created one of the first risk assessment instruments using what would later be called the Burgess Method (Burgess 1928). This is a linear additive model that looks at several risk-predicting variables. For each risk variable that applies to an individual, one point is added to their total score. Thus, the more points an individual scores on the instrument, the more likely the individual is to act out the risk behavior being predicted (e.g., recidivate). Since creation of the Burgess Method, researchers have been examining ways to increase the predictability of risk behavior by finding both alternate models that predict risk and ways to add meaningful weight to risk-predicting variables.

Andrews, Bonta, and Wormith (2006) describe four generations of risk assessment. The first generation is now commonly called "clinical judgment," or "clinical assessment." This generation relied on experience, knowledge, and intuition to assess the risk a youth may pose. The second generation was marked by creation of the actuarial risk assessment instrument (Burgess Method). The Burgess instrument facilitates consideration of a series of risk factors to determine the amount of risk, instead of relying on professional judgment alone. An actuarial instrument is preferable with clinical judgment, because it allows for more reliable, consistent, and unbiased judgment (Hilton, Harris and Rice 2006; Bishop and Trout 2002; Wilcox, Beech, Markall, and Blacker 2009).

The first actuarial risk assessment instrument almost exclusively weighed static risk factors. Static risk factors are historical characteristics of the youth that cannot be changed, such as age at first offense and gender. First-generation risk assessment instruments were able to discern high and low risk, but, because they allowed for an evaluation of only static risk factors, they were unable to help facilitate an exploration of intervention strategies.

Third generation risk-assessment methodology includes both static and dynamic risk factors in the actuarial risk assessment instrument. Dynamic risk factors are factors that can potentially be changed with intervention. Examples of dynamic risk factors are friends, school performance, and activities the youth takes part in (Van der Put, Dekovic, Stams, Van der Laan, Hoeve, and Amelsfort 2011). Including dynamic risk factors in the actuarial risk assessment instrument opens the door to insights about potential intervention strategies that could lower a youth's risk. An intervention strategy for a high-risk youth with a significant amount of unstructured free time, for instance, could be a program similar to Big Brothers Big Sisters.

Fourth generation risk-assessment instruments include protective factors. Protective factors are positive factors in a youth's life that are negatively correlated to youth recidivism. Examples of protective factors are positive healthy neighborhood, family or friend influences, structured activities, and academic success. All youth have risk and protective factors that push and pull them into delinquency. Both are important to recognize when determining the risk that a youth may pose. In addition to the inclusion of protective factors, the fourth-generation risk assessment is designed to link youth with a case management plan capable of addressing specific needs (Andrews, Bonta, and Wormith 2006).

Montana's pre-screen BOT, complete with static, dynamic, and protective factors and with the ability to guide intervention strategies, is a model example of a fourth-generation risk assessment instrument. The pre-screen BOT stands for improvement, however. It's long, and it doesn't assist with decision-making about intervention, that is where the full BOT comes into play. In comparison to the pre-screen-BOT, a more useful instrument would be a brief screening risk assessment that can be used prior to administration of the full BOT needs assessment, if a full BOT is deemed necessary.

This project detailed in this document was inspired by research on the Ohio Youth Assessment System (OYAS). The OYAS contains five different risk assessment instruments. Each instrument is used at a different stage of the juvenile justice system. The first two assessments (OYAS-Diversion and OYAS-Detention) are used pre-adjudication to assist professionals in selecting the type of interventions appropriate for addressing youth risk level. The other three risk assessment instruments (OYAS-Disposition, OYAS-Residential, and OYAS-Reentry) were created to serve youth once adjudicated. The OYAS-Diversion instrument is the inspiration behind the research detailed in this report, because it is a short (six questions) screening instrument that has been validated and used by probation officers to assist in probation decisions. In their report, Latessa, Lovins and Ostrowksi, (2009) describe the process of creating and validating the OYAS instruments. In their analysis of 60 potential risk factors, Latessa and colleagues were able to reduce these factors down to six significantly correlated risk factors of recidivism. The OYAS-Diversion contains the following six risk factors:

- Any prior offense
- Current charge either status, misdemeanor, or felony
- First contact with the juvenile justice system at age 15 or younger
- Any prior probation
- Family arrested
- Parents have difficult time supervising youth

The OYAS instruments were created based on three primary principles of effective classification. The first, called the "risk principle," maintains that the intensity of the service should be matched to offender risk level. High-risk youth should be matched with high-intensity services, for instance, low-risk youth should be matched with minimal services (Andrews, Bonta, and Hoge, 1990; Latessa et al., 2009). The "needs principle," meanwhile, focuses on targeting appropriate criminogenic factors, referred to as dynamic factors. OYAS principles hold that dynamic risk factors should be the focus of intervention. The third OYAS category, the "responsivity principle," holds that treatment delivered to youth must be in a manner in which the offender can learn (Latessa et al. 2009).

It should be noted also that authors highlight the importance of professional discretion. As stated in that analysis, "Assessment tools are designed to consider offenders in the aggregate, and it is not possible for instrument of this nature to anticipate the risk and needs of every individual offender. As a result, allowing for professional override in certain circumstances is a key component of any assessment system." (Latessa et al. 2009 p.5).

Steinhart's 2006 best practice manual for creating juvenile risk assessment instruments describes the process of selecting risk factors for inclusion on a new assessment. As discussed in Steinhart's work, risk factors should be objective, so youth are not unfairly targeted. They should be drawn from model instruments or peer-reviewed literature on risk assessment and also tailored to the

state in which the risk assessment is used. Once risk factors have been selected for a new assessment, they should be tested retrospectively (on past youth data) and also prospectively (with youth currently coming into the system) (Steinhart 2006). To begin the investigation into risk factors, literature on those predictive of juvenile recidivism is reviewed. These factors are summarized in the table below.

This review's purpose is to examine what factors are commonly referenced in recent published literature as predictive of recidivism. While not exhaustive, risk factors listed below provide insights into items that could be useful when constructing a new risk assessment instrument. Each risk factor in Table 1 has been shown to be a significant predictor of recidivism. Across the 17 studies examined for this analysis, primary risk factor categories include: 1) Youth age; 2) Demographics such as gender and race; 3) Past delinquency; 4) Current delinquency; 5) Drug and Alcohol use; 6) Educational factors; 7) Mental health; 8) Victimization history; and 9) Youth's family.

Table 1: Previous Studies of Predictors of Recidivism in Juveniles

Study Coded	Sample, Risk Period (Recidivism Rate)	Predictors of Recidivism	Study	Category
(1) Archwamety and Katsiyannis (1998)	238 females, Three Years (40.3%)	Age at First Offense	1,2,4,6,7,15,16,17	Age
(2) Benda et al. (2001)	414, Two Years (65.2%)	Age at First Expulsion	15	
(3) Dembo et al. (1998)	9,176, ? (40%)	Age at Substance Use (alc/drug)	2	
(4)Katsiyannis and Archwamety (1997)	294 males, Three Years, (50%)	Age	3,9,11,12,13	
(5) McMackin et al. (2004)	162, One Year, (?)	Gender	2, 3, 6, 11,12,16,17	Demographics
(6) Minor et al. (1997)	475 first time offenders, Two years (33.1%)	Race	3,9,10,13	
(7) Myner et al (1998)	138 males, ?, (?)	Delinquent History	3, 5, 8, 11,13,15,16	Past Delinquency
(8) Niarhos and Routh (1992)	234 males, One Year (49.6%)	Past Behavior Problems	2,16,17	
(9) Ryan and Yang (2005)	90 males, 2.64 Years (36%)	Prosecuted for First Offense	17	
(10) Stoolmiller and Blenchman (2005)	505, 872 day follow up, (?)	Prior Incarceration	2	
(11) Trulson et al. (2005)	2,436 serious offenders, Five Years (85%)	Length of Facility Stay	1,4,5,7	
(12) Minor et al. (2016)	580, 18 Months, (52%)	Gang Affiliation	1,2,4,11,15	
(13) Mallet et al. (2013)	433, ?, (16.4% placed back in detention)	Type of Offense	4,7,14,15,17	Current Delinquency
(14) Galley (2012)	173 males, Two Years, (23.9%)	Destroying Property/Stealing	15	
(15) Williams et al. (2014)	1,987, One Year, (33.4%)	Firearm Use	15	
(16) McKinlay et al. (2015)	936, One Year, (58%)	Drug Use/Abuse	2, 8, 10	Drug and Alcohol Use
(17) Barret et al. (2015)	100,000, ? (?)	Alcohol Use/Abuse	7,10	
		Academic Achievement	8	Educational Factors
		Educational Deficits	1,4,17	
		School Suspensions	15	
		Special Ed. Background	4,12	
		Mental Health Problems	2,11,17	Mental Health
		Conduct Disorder Diagnosis	13	
		Suicide Attempts	13	
		Abuse History	1,3	History of victimization
		Victimization History	12	
		Family Contact	9	Family Factors
		Parent Incarceration History	15	
		Running Away	15	
		Group Home Placement	7,12	
		Poverty	11,17	
		Location of Residence	1	
		Custodial Arrangement	6	
		Birth Order	7	

METHODOLOGY

PLAN OF ANALYSIS: OVERVIEW

As discussed by Williams, LeCroy, and Vivian (2014); Gottfredson & Snyder, (2005); and Krysik & LeCroy, (2002), six steps are necessary for successfully developing and validating risk assessment tools. The methodology employed in this analysis follows that guidance. Each step is discussed below:

Step 1- Outcome and terminology: Operationalize an outcome variable (recidivism) and define relevant terminology.

Step 2 - Risk factors: Determine a set of possible risk factors to include in the new risk assessment.

Step 3 - Sample: Collect data on a sample of youth and create estimation and validation samples.

Step 4 - Reduce risk factors: Reduce the set of possible risk factors to only include those most important for predicting juvenile recidivism. This analysis utilizes bivariate regression using Pearson's r correlation and logistic regression.

Step 5 - Create a new risk assessment: Create new assessment using a reduced set of risk factors. Add weight to the factors included in the assessment, validate the prediction accuracy of the new risk assessment.

Step 6 - Risk assessment utility: Determine the utility of a new risk assessment instrument based on juvenile probation officer opinions.

ANALYSIS

STEP 1: OUTCOME AND TERMINOLOGY

The outcome of interest for this analysis is recidivism. Recidivism is operationalized as a new citation within the risk period. The risk period is a one-year span of time starting the day after the youth's initial intake date. The outcome variable is dichotomously coded as '1,' meaning youth has a qualifying recidivating offense. This is referred to as a 'failure.' The second variable, '0,' indicates the youth did not have a qualifying recidivating offense. This is referred to as a 'success.' Qualifying recidivating offenses include technical violations, criminal contempt, misdemeanor, and felony offenses. Status and city ordinance offenses are not included as recidivating offenses in this report. Youth who commit a recidivating offense after the risk period are included in the 'success' group. Up to three recidivating intakes are collected on all youth. The most serious recidivating offense during the risk period was classified in the data as the youth's primary recidivating offense. It is common for youth to have multiple offenses listed on their initial intake, so the youth's "initial offense" is based on the most serious offenses listed on the initial intake.

STEP 2: RISK FACTORS

All risk factors identified in this analysis come from the full BOT risk assessment instrument. A total of 246 risk factors from 11 domains on the full BOT were initially included. The 11 domains include:

(1) Record referrals
(2) School history/Current school status
(3) Historic/Current use of free time
(4) Employment history/Current employment

(5) Relationships history/Current relationships
(6) Family history/Current living arrangements
(7) Alcohol and drug history/Current alcohol and drug use
(8) Mental health history/ Current mental health status
(9) Attitudes/Behaviors
(10) Aggression
(11) Skills

For all risk factors on the full BOT where the option of "select all that apply" is available, each of the option choices were built as dichotomous "Yes" or "No" responses. Nuanced questions were broken down into several individual risk factors. For example, in Domain 7A, "Family history," youth are asked whether anyone living in their household had been jailed or imprisoned within the previous three months. Answer options to this question include: 1) Mother/female caretaker; 2) Father/male caretaker; 3) Older sibling; 4) Younger sibling; 5) Other family member; and 6) No jail/imprisonment history in family. Because this is a 'select all that apply' question, the six options were dichotomized in to separate variables, each with a "Yes" =1 or "No"=0 response (e.g. mother jail/imprisonment history, "Yes"/"No;" father jail/imprisonment history, "Yes"/"No," etc.).

STEP 3: SAMPLE

The initial dataset used for this inquiry was queried by Montana's Office of the Court Administrator for the Supreme Court and provided to the University of Montana Criminology Research Group for analysis. The data are from the Montana Juvenile Court Assessment Tracking System (JCATS). JCATS is Montana's juvenile justice data repository. All youth who had an intake from January 1, 2010 to December 31, 2015 and received a pre-screen BOT or a full BOT Risk assessment were included in the initial dataset. A total of 7,109 youth were included in the initial query. A determination was made at the onset of the investigation to include duplicate youth in the dataset. The logic behind this decision was that a risk assessment instrument should be valid on all youth entering probation, regardless of their number of offenses.

From this initial sample, 3,978 youth were removed because they were not administered a full BOT. full BOT data was necessary to examine factors not found on the pre-screen BOT for possible inclusion on the risk assessment screener. Five cases were removed because the information pertained to individuals over the age of 18. Nine additional cases were removed because they did not contain any full or pre-screen BOT data. The final eligible sample contained 3,121 youth, all included in the analysis.

The eligible sample is randomly divided into two groups, an estimation sample and a validation sample. To randomize group selection, all youth are assigned a number through a number generator. Five hundred youth are then randomly selected based on their generated number and placed into the validation dataset. The remaining 2,621 youth are placed into the estimation sample. The estimation sample is used for the analysis detailed here and for creation of the new risk screener. The validation sample, meanwhile, is called upon to determine the new risk screener's validity consistent with the literature. Table 2 below presents the demographic information for the two samples.

Table 2: Background Characteristics Across the Estimation and Validation Sample			
Demographic Indicators		**Estimation Sample**	**Validation Sample**
Age	**At Offense**	14.99 (SD=1.63)	15.042 (SD=1.56)
Gender			
	Female	884 (33.7%)	199 (39.8%)
	Male	1737 (66.3%)	301 (60.2%)
Race/Ethnicity			
	White	2076 (79.2%)	396 (79.2%)
	American Indian	229 (11.4%)	56 (11.2%)
	Asian	9 (0.3%)	0 (0.0%)
	African American	52 (2%)	11 (2.2)
	Hispanic/Latino	84 (3.2%)	22 (4.4)
	Other	101 (3.9%)	15 (3.0%)
Intake Year			
	2010	426 (16.3%)	67 (13.4%)
	2011	112 (17%)	90 (18%)
	2012	366 (14%)	70 (14%)
	2013	347 (13.2%)	50 (10%)
	2014	520 (19.8%)	110 (22%)
	2015	517 (19.7%)	113 (22.6%)

Overall, the two samples (estimation and validation) appear to have similar demographics. Age and race for both the estimation and validation sample are approximately equal. The validation sample has a slightly higher percentage of females (39.8 percent) than the estimation sample (33.7 percent). The mean age for youth in both samples is approximately 15. The majority of youth are male (estimation sample = 66.3 percent; validation sample = 60.2 percent), and the majority of youth are white (79.2 percent for both samples). American Indians are the largest minority group with 11.4 percent representation in the estimation sample and 11.2 percent in the validation sample. Intake years are similar for both samples, the highest percent of youth come from 2014 intakes (e = 19.8 percent; v = 22 percent) and also 2015 intakes (e = 22 percent; v = 22.6 percent).

Table 3 below presents the initial offense and recidivating offense frequencies for both the estimation sample and the validation sample. Status and city ordinance offenses are included in Table 3 but are not included in the analysis as recidivating offenses, as discussed above.

Both samples show similar offense frequencies. The majority of youth are cited with misdemeanor offenses (estimation = 68.3 percent; validation = 74 percent), followed by status offenses (e = 16.8 percent; v = 14.8 percent), and felony offenses (e = 10.5 percent; v = 7.4 percent). The remaining youth are cited with a city ordinance, other non-misdemeanor, or technical/criminal contempt offense (e = 4.4 percent; v = 3.8 percent). One youth included in the sample had initial offense data that was unavailable.

Table 3: Initial and Recidiviating Offense				
Initial Offense	**Estimation Sample (n=2621)**		**Validation Sample (n=500)**	
	Freq.	**%**	**Freq.**	**%**
City Ordinance	7	0.3%	1	0.2%
Status	441	16.8%	74	14.8%
Other Non-Misdemeanor	2	0.1%	2	0.4%
Technical/Criminal Contempt	105	4.0%	16	3.2%
Misdemeanor	1789	68.3%	370	74.0%
Felony	276	10.5%	37	7.4%
Most Serious Recidivism (1 Year)	**1146**	**43.7%**	**221**	**44.2%**
City Ordinance	1	0.1%	1	0.5%
Status	137	12.0%	25	11.3%
Other Non-Misdemeanor	1	0.1%	0	0.0%
Technical/Criminal Contempt	84	7.3%	12	5.4%
Misdemeanor	797	69.5%	157	71.0%
Felony	126	11.0%	26	11.8%

Both the estimation and validation samples show similar failure rates. In the estimation sample, 43.7 percent (1,146) of the youth had a recidivating offense during the risk period. In the validation sample, 44.2 percent (221) of the youth had a recidivating offense during the risk period. The majority of these recidivating offenses were misdemeanors (e = 69.5 percent; v = 71 percent), followed by status offenses (e = 12.0 percent; v = 11.3 percent), and felony offenses (e = 11 percent; v = 11.8 percent). The remaining youth were cited for a city ordinance, other non-misdemeanor, or technical/criminal contempt offense (e = 7.5 percent; v = 5.9 percent). When only qualifying recidivating offenses are kept in the analysis, the estimation sample has a failure rate of 38.43 percent (1007), and the validation sample has a failure rate of 39 percent (195).

STEP 4: REDUCING RISK FACTORS

Using only the estimation sample, bivariate relationships between individual risk factors and recidivism are investigated using Pearson's r correlation coefficients. Only risk factors showing statistical significance ($p \leq .05$) related to recidivism are kept for analysis. Correlation matrices based on domains are examined to assess the possibility of multicollinearity. Multicollinearity (or collinearity) means that two or more items are too strongly correlated with each other. It is expected that risk factors are highly correlated to the outcome variables (recidivism) but independent of each of the other risk factors. A risk factor that is highly correlated to another risk factor is an indication that both are measuring the same phenomenon and will not contribute uniquely to the overall risk score. Upon examination, 94 risk factors are found to be too strongly correlated to another risk factor, prompting them to be removed from the analysis. The determination of which risk factor is to be removed is based on an analysis of items with a lower bivariate correlation to the outcome variable. An example of this is the variable "Not a victim of physical abuse," with a Pearson's r correlation coefficient of -.881 to the variable "History of physical abuse by family member." The variable, "History of physical abuse by family member," is then removed, because it has a lower correlation to recidivism than "Not a victim of physical abuse." Removing redundant risk factors through the process described here is key to the creation of a successful risk assessment (Steinhart 2009).

Table 4 below presents the findings from the bivariate investigation. The first column, "Domain," specifies which domain each risk factor belongs to in the full BOT. The second column, "Bivariate Sig. Predictors," present all risk factors demonstrating statistically significant correlations to recidivism (see codebook for risk factor variable names). The third column, "r," presents the

Pearson's r correlation coefficient. The correlation coefficient statistic ranges from -1 to +1. Correlation coefficient statistics closer to -1 or +1 are indicative of stronger links between the risk factor and recidivism. A negative coefficient means the risk factor decreases the likelihood of recidivism, and a positive coefficient means the risk factor increases the likelihood of recidivism. Eighty-one of the risk factors on the full BOT are found to have statistically significant correlations at the bivariate level with recidivism. All non-statistically significant risk factors (61) are removed before proceeding with analysis. Logistic regression is then used to further reduce the set of risk factors.

Tabel 4: Bivariate Regression: Pedictors of Recidivism

Domain	Bivariate Sig Predictors	r
Record Referrals	TOTALMISD	.320**
	AGEFIRST	-.223**
	ConfinedDetention	.203**
	MisdPerson	.188**
	TOTALFEL	.081**
	TOTALWEAP	.076**
	FailureToAppear	0.058
School	PERFORMANCE	-.263**
	LikelihoodStaying	-.257**
	CONDUCT	-.235**
	YouthInvolv	-.227**
	ATTENDANCE	-.221**
	YouthCloseWith	-.218**
	ExpulsionSuspension	.180**
	NoSpecialEd	-.072**
	Alternative	.069**
	LearningDis	.064**
	CogDel	-.057**
	GED	.044*
	College	-.044*
Free Time	CurrentUnstrucActivity	-.219**
	CurrentStucActivity	-.214**
	HobbyGroup	-.112**
	Volunteer	-.094**
	CommCulture	-.072**
Employment	HistorySuccessEmploy	-.231**
	HistoryPosWorkRel	-.257**
	UnderstandsJob	-.220**
	CurrentPosWorkRel	-.179**
Relationships	AdmiresAntiPeers	.263**
	CurAntiSocFriends	.217**
	CurrentCommunityTies	-.188**
	HistNonFamRelationship	-.168**
	RomaticRelationship	.077**
	ProSocFriends	-.125**
Current Living Situation	ParentalAuthority	.268**
	RunawayKickedOut	.242**
	ApprPunishment	.204**
	FamAcitivity	-.202**
	FamilyConflict	.188**
	Income	-.180**
	OutHomePlacement	.178**
	ParentalSupervision	.177**
	NoOneJail3Months	-.176**
	SupportNetwork	-.170**
	NoProbParents	-.166**
	FamilySupport	-.170**
	CloseDad	-.111**
	LiveWithFather	-.101**

Domain	Bivariate Sig Predictors	r
Drug/Alc	NoHistDrugProbs	-.185**
	Treatment	.182**
	CurrentDrugEduProb	.161**
	NoHistAlcoholProb	-.156**
	CurrentDrugFriendProb	.151**
	CurrentAlcEduProb	.146**
	CurrentDrugUse	.144**
	DrugAlcAssessment	.142**
	CurrentDrugFamilyProb	.137**
	CurrentDrugCrimeProb	.134**
Mental Health	MentalHealthStatus	.161**
	HistoryMentalHealth	.122**
	HealthInsurance	-.110**
	VicNeglect	.107**
	NoPysicalAbuse	-.088**
	AbuseByOther	.048*
Attitudes Behaviors	ATTITUDE	-.306**
	RespectProperty	.266**
	Optimism	.264**
	BeliefInConditions	.250**
	Impulsive	.248**
	Control	.231**
	Emotions	.203**
Aggression	BeliefFighting	.279**
	BeliefYelling	.273**
	Frustration	.257**
	ViewOfIntentions	.222**
	NoReportsViolence	-.164**
Skills	GoalSetting	-.301**
	ProblemSolving	-.281**
	DealingWithFeelings	-.257**
	DealingWithOthers	-.244**
	InternalTriggers	-.223**
	Thinking	-.208**

As Williams et al. note in their 2014 work, logistic regression "is the preferred statistical procedure to use when attempting to predict a discrete outcome such as recidivism versus non-recidivism from a set of predictor variables that may be continuous, discrete, dichotomous, or a mixture (p.

322).” Unlike bivariate regression, logistic regression presents effect sizes for each risk factor while holding constant the effect of all other risk factors in the model.

At this stage in the analysis, each domain on the full BOT has been reduced to only risk factors correlated to recidivism and also those demonstrating a low correlation to other risk factors. To further reduce the number of items, logistic regression is run on each domain. Table 5 below presents factors that are statistically significant predictors of recidivism based upon a logistic regression analysis within each BOT domain.

The third and final column in Table 5 “Exp (B),” contains the odds ratios obtained in the logistic regression analysis. An odds ratio of 1 indicates the risk factor does not predict recidivism. Any odds ratio above or below one indicates the youth is more (above 1) or less (below 1) likely to commit a recidivating offense with the risk factor holding all other factors in the model constant. For example, the TOTALMISD (total misdemeanors) risk factor has an odds ratio of 1.55. This can be interpreted to mean that youth are 1.55 times more likely to commit a recidivating offense for each point increase in the total misdemeanors variable, holding all other risk factors in the model constant. An odds ratio below 1 indicates the youth is less likely to commit a recidivating offense for each point increase in that risk factor. A logistic regression model was estimated for each of the 11 domains. Forty-eight risk factors maintained statistical significance in the domain logistic regression models, prompting them to be kept in the analysis.

Table 5: Logistic Regression: Predictors of Recidivism					
Domain	**Sig Logistic Predictors**	**Exp(B)**	**Domain**	**Sig Logistic Sig Predictors**	**Exp(B)**
Record Referrals	TOTALMISD	1.55	**Drug/Alc**	NoHistDrugProbs	0.52
	AGEFIRST	0.79		Treatment	1.35
	ConfinedDetention	1.25		-	-
	-	-		-	-
	-	-		CurrentDrugFriendProb	1.36
	TOTALWEAP	1.78		CurrentAlcEduProb	2.02
	-	-		-	-
School	PERFORMANCE	0.81		-	-
	LikelihoodStaying	0.86		-	-
	CONDUCT	0.84		-	-
	YouthInvolv	0.86	**Mental Health**	MentalHealthStatus	1.87
	-	-		-	-
	YouthCloseWith	0.87		HealthInsurance	0.69
	ExpulsionSuspension	1.10		VicNeglect	1.42
	-	-		-	-
	-	-		-	-
	-	-	**Attitudes Behaviors**	ATTITUDE	0.70
	CogDel	0.11		RespectProperty	1.10
	-	-		Optimism	1.23
	-	-		-	-
Free Time	CurrentUnstrucActivity	0.77		Impulsive	1.16
	CurrentStucActivity	0.80		-	-
	HobbyGroup	0.71		Emotions	1.16
	Volunteer	0.54	**Aggression**	BeliefFighting	1.40
	-	-		BeliefYelling	1.28
	-	-		Frustration	1.44
Employment	HistoryPosWorkRel	0.67		-	-
	-	-		-	-
	CurrentPosWorkRel	0.03	**Skills**	GoalSetting	0.74
Relationships	AdmiresAntiPeers	1.53		ProblemSolving	0.86
	CurAntiSocFriends	1.90		DealingWithFeelings	0.82
	CurrentCommunityTies	0.81		-	-
	HistNonFamRelationship	0.87		-	-
	-	-		Thinking	0.77
	ProSocFriends	0.70			
Current Living Situation	ParentalAuthority	1.53			
	RunawayKickedOut	1.20			
	ApprPunishment	1.11			
	FamAcitivity	0.78			
	-	-			
	Income	0.81			
	-	-			
	-	-			
	NoOneJail3Months	0.72			
	-	-			
	-	-			
	FamilySupport	0.79			
	-	-			
	-	-			

Using another logistic regression analysis, the 48 risk factors found from the domain logistic models are placed into a single logistic regression model. Table 6 below presents the findings from this logistic regression model in the column titled "All Domain Logistic Reg." After running this regression, six risk factors maintained statistical significance. To confirm the findings, an additional logistic regression model was run using backward-step logistic regression. This strategy is employed by Williams et al. in their 2014 work. Backward-step logistic regression is a technique performed with statistical software. The process for this analysis started by including all 48 risk factors into a single model. The backward-step logistic process automatically removes one risk factor at a time and determines if the removed risk factor had any effect on the model. If it does impact the model, the software puts the risk factor back into the model and removes the next risk factor, evaluating the impact of removal again. This exercise is performed with each risk factor until all of those that do not impact that model have been removed. The findings from this analysis are shown in Table 6 below under the column header "Backward Step Logistic." When using backward-step logistic regression for this inquiry, 10 risk factors are found to be significant predictors of recidivism

The 11 total risk factors discovered during the all domain logistic regression and the backward-step logistic regression were compiled and included in a final logistic regression model. The final column in table 6 below titled "Final Logistic" presents the final model. Seven risk factors remained statistically significant: AGEFIRST, CurAntiSocFriends, HistNonFamRelationship, RunawayKickedOut, BelievFighting, ProblemSolving, and TOTALMISD. These seven risk factors will comprise the new risk assessment screener instrument.

Table 6: Logistic Models to Reduce Predictors

All Domain Logistic Reg	Exp(B)	Backward Step Logistic	Exp(B)	Final Logistic	Exp(B)
AGEFIRST	0.79	-	-	AGEFIRST	0.826
CurAntiSocFriends	1.71	CurAntiSocFriends	1.49	CurAntiSocFriends	1.34
HistNonFamRelationship	0.88	HistNonFamRelationship	0.86	HistNonFamRelationship	0.88
RunawayKickedOut	1.20	RunawayKickedOut	1.1	RunawayKickedOut	1.14
BeliefFighting	1.36	BeliefFighting	1.23	BeliefFighting	1.3
ProblemSolving	0.76	ProblemSolving	0.685	ProblemSolving	0.79
-	-	TOTALMISD	1.51	TOTALMISD	1.34
-	-	VicNeglect	1.07	-	-
-	-	CurrentStrucActivity	0.95	-	-
-	-	MentalHealthStatus	1.15	-	-
-	-	Impulsive	1.07	-	-

Appendix A presents a table demonstrating the entire risk factor reduction process from bivariate regression through the logistic regression models.

STEP 5.1: CREATING A RISK ASSESSMENT SCREENER

Two hundred and forty six risk factors were analyzed and then reduced to seven in the new model to predict juvenile recidivism one year from initial intake. The seven risk factors are:

1. First offense under the age of 13
2. More than one total number of misdemeanor referrals
3. Youth does not have a positive adult relationship (not including relationships in family, school, or employment)
4. Youth believes fighting is sometimes or often appropriate
5. Youth does not apply appropriate solutions, nor think of solutions for problem behavior
6. Youth has antisocial friends
7. Youth has history of running away or being kicked out of the home

The Burgess Method of weighting risk factors is used to add risk scores for each risk factor in the new screener. The Burgess Method produces a simple cumulative risk score by adding one point to the total risk score for each risk factor that applies to a youth.

As discussed in the literature, a variety of techniques have been employed to maximize risk assessment accuracy by obtaining meaningful weights for risk factors. For example, one common technique is to use the factor's standardized regression coefficient obtained in logistic regression to inform risk factor weights (Williams, et al., 2014; Silver, smith, and Banks, 2000; Gottfredson and Snyder 2005). It has been found, however, that advanced techniques do not significantly outperform simple strategies such as the Burgess Method (Gottfredson and Snyder 2005; McKay, 2012; Simon 1972, Silver, Smith, and Banks, 2000). The Burgess Method was chosen for this analysis because it is logical and provides users with the easiest form of scoring.

To create risk scores for the new screener using the Burgess Method, all risk factors are dichotomously coded, meaning the youth either has the risk factor (1) or the youth does not have the risk factor (0). Additionally, all risk factors are coded in the same direction so that all correlations are positively associated with recidivism. Table 7 below presents the cross tabulations of all risk factors and recidivism and their bivariate Pearson's r correlation coefficient. This table simply confirms that the risk factors maintain their correlations to recidivism after being dichotomously coded.

Table 7: Frequencies of Predictors and Recidivism

Predictors	Recidivism		
	No	Yes	r
One or Less Past Misdemeanors	75.1% (1068)	24.9% (355)	0.302
More than One Misdemeanor	45.6% (546)	54.4% (652)	
Problem Solver	77.3% (813)	22.7% (239)	0.264
Does Not Problem Solve	51.1% (801)	48.9% (768)	
No Runaway or Kicked Out	70.4% (1168)	29.6% (492)	0.237
Runaway or Kicked Out	46.4% (446)	52.6% (515)	
Does Not Believe in Fighting	69.8% (1204)	30.2% (521)	0.234
Does Believe in Fighting	45.8% (410)	54.2% (486)	
No Anti-Social Friends	74.4% (789)	25.6% (272)	0.217
Anti-Social Friends	52.9% (825)	47.1% (735)	
First Offense 13 or Older	67.5% (1313)	32.5% (632)	0.207
First Offense Under 13	44.5% (301)	55.5% (375)	
Adult Role Models	65.0% (1277)	35.0% (688)	0.121
No Adult Role Models	51.4% (337)	48.6% (319)	

A risk score is calculated for each youth in both the estimation sample and validation sample to test its validity. The risk score for each youth is calculated with the following formula:

Risk Score = Youth's first offense was under the age of 13 (0 or 1)

+

Youth currently has anti-social friends (0 or 1)

+

Youth does not have a history of non-family adult relationships (0 or 1)

+

Youth has a history of running away or has been kicked out of house (0 or 1)

+

Youth believes in fighting (0 or 1)

+

Youth does not problem solve (0 or 1)

+

Youth has more than one misdemeanor offense (0 or 1)

Table 8 below presents the distribution of the newly created risk scores in the estimation sample and the validation sample. Risk scores range from 0, for youth without risk factors, to 7, for youth that have all seven risk factors. There is a relatively even distribution of scores from 0 to 7 for both samples with the exception of 6 and 7, which garnered a lower number of youth. The estimation sample and validation sample have similar risk score distributions. This is the first indication that findings from the estimation sample can be generalized to the validation sample.

Table 8: Risk Score Distribution (Estimation Sample)			Risk Score Distribution (Validation Sample)		
Risk Score	n	%	Risk Score	n	%
0	331	12.63	0	63	12.60
1	436	16.63	1	80	16.00
2	402	15.34	2	100	20.00
3	417	15.91	3	74	14.80
4	439	16.75	4	84	16.80
5	346	13.20	5	60	12.00
6	211	8.05	6	32	6.40
7	39	1.49	7	7	1.40
Total	2621	100.00	Total	500	100.00

STEP 5.2: MEASURING ACCURACY

Risk assessment accuracy is an imperfect measurement and must be considered in a relative context. A risk assessment may be determined as "accurate" in the justice system, while not considered "accurate" in the medical sciences. At the same time, one catch-all measurement capable of determining accuracy does not exist. For this reason, it is important to run a variety of tests examining accuracy and also comparisons among samples and findings from similar instruments. The following strategy provides the ability to effectively determine accuracy on a relative scale in the justice system.

The first step in measuring the accuracy of the new screener is to examine the percentage of youth within each of the three risk levels, including low, moderate, and high, that had a recidivating offense. This is a simple analysis, yet it presents a meaningful output. If the instrument is an accurate predictor of recidivism, recidivism rates will increase with each unit increase in risk level.

The second step for measuring predictive accuracy is a technique common in risk assessment validation known as receiver operator characteristic (ROC) analysis. The statistic derived from ROC analysis, known as the area under the ROC curve (AUC), allows for a simple accuracy reading. The AUC statistic answers the question, "If we randomly select one youth from the recidivist group and one youth from the non-recidivist group, what is the probability that the risk assessment instrument would have assigned a higher risk level to the youth from the recidivist group?" (Mossman 2013 p. 30). An AUC of 0 indicates perfect negative prediction, .5 indicates no better than chance prediction, and an AUC of 1 indicates perfect positive prediction (Van der Put, Van Vugt, Stams, and Van der Laan 2013). AUC interpretations vary based on the field they are used in. It is common in the criminology and psychology risk assessment literature that an AUC score of .7 or above indicates strong prediction performance, between .6 and .7 indicates moderate performance,

and anything below .6 indicates poor performance (Barnoski 2004: Douglas and Reeves 2010; Mossman 2013). ROC analysis also provides a test of statistical significance. This statistic determines if the AUC derived in ROC analysis is statistically different from chance performance in the population.

The final step in investigating new risk assessment accuracy incorporates the use of logistic regression. (Baglivio and Jackowski 2013; Baglivio 2009; Conley, Spurzem, Marsh, and Hazlett 2009). In this analysis, the overall risk score, determined by the risk assessment screener, is the independent variable and the dependent variable is whether the youth committed a recidivating offense (coded as 1) or not (coded as 0). Race and gender are also included as independent variables in these models to hold their impact on recidivism constant. Together, these three statistical techniques provide a thorough analysis of an instrument's predictive abilities. They also allow for a comparison of findings between the old pre-screen BOT risk score and the new risk screener score.

STEP 5.3: ACCURACY FINDINGS

Table 9 below presents the distribution of risk scores for the estimation sample and whether or not the youth had a recidivating offense. The table shows an increase in recidivism rate as risk scores increase. With each point increase in risk score, there is an almost 10 percentage point increase in recidivism for all risk score categories. To make the scoring process more consistent with other risk assessment instruments, the risk score is divided into three categories: (Low risk = risk scores ranging from 0 to 2; Medium risk = risk scores ranging from 3 to 4; and High risk = risk scores ranging from 5 to 7). Youth who received a low risk score show a 19.7 percent failure rate and an 80.3 percent success rate. Out of the 1,169 youth to receive a low risk score, only 230 (19.7 percent) had a recidivating offense in one year. Youth who received a medium risk score show a 44.9 percent failure rate and a 55.1 percent success rate. Approximately half the youth in the medium risk group had a recidivating offense in one year. Finally, those youth who received a high risk score show a failure rate of 65.9 percent and a success rate of 34.1 percent. Out of 596 youth who received a high risk score, 393 had a recidivating offense in one year.

Table 9: Distribution of Risk Scores and Recidivism (Estimation sample)

Risk Score	Recidivism (1 Year) No		Yes		Total	Risk Level	Failure Rate	Success Rate
0	295	89.1%	36	10.9%	331			
1	356	81.7%	80	18.3%	436	**Low**	19.7%	80.3%
2	288	71.6%	114	28.4%	402			
3	258	61.9%	159	38.1%	417			
4	214	48.7%	225	51.3%	439	**Medium**	44.9%	55.1%
5	127	36.7%	219	63.3%	346			
6	63	29.9%	148	70.1%	211	**High**	65.9%	34.1%
7	13	33.3%	26	66.7%	39			

The validation sample is important because the youth in the validation sample were not included in the analysis to create the risk assessment screener. As such, the validation sample can be used as a retrospective test of the new screener's risk score validity. It can be used to provide evidence of tool effectivness when the tool is employed in the future.

Table 10 below presents the distribution of risk scores and data indicative of whether the youth committed a recidivating offense for the validation sample. Similar to the estimation sample, the validation sample shows an increasing recidivism rate as the risk score increases. Those youth who received a low risk score had a failure rate of 21.8 percent and a success rate of 78.2 percent. Those youth who received a medium risk score show a failure rate of 51.9 percent and a success rate of 48.1 percent. Finally, those youth who received a high risk score show a failure rate of 60.6 percent and a success rate of 39.4 percent. This is the first piece of evidence that the risk score is valid beyond the sample used to create the risk screener.

Table 10: Distribution of Risk Scores and Recidivism (Validation sample)

Risk Score	Recidivism (1 Year) No		Yes		Total	Risk Level	Failure Rate	Success Rate
0	58	92.1%	5	7.9%	63			
1	64	80.0%	16	20.0%	80	**Low**	21.8%	78.2%
2	68	68.0%	32	32.0%	100			
3	46	62.2%	28	37.8%	74			
4	30	35.7%	54	64.3%	84	**Medium**	51.9%	48.1%
5	26	43.3%	34	56.7%	60			
6	10	31.3%	22	68.8%	32	**High**	60.6%	39.4%
7	3	42.9%	4	57.1%	7			

As previously discussed, the pre-screen BOT risk score has been validated as an accurate predictor of risk (see McKay et al. 2015). The main issue with the pre-screen BOT is it requires probation staff to answer approximately 40 questions to determine a youth's recidivism risk. It is expected that if the new risk assessment screener analyzed in this report is valid, it would be highly correlated to the pre-screen BOT risk score. Table 11 below presents the bivariate correlation of the old pre-screen BOT risk score to the new risk screener score. As expected, there is a strong and statistically significant correlation between the old pre-Screen BOT risk score and the newly created risk screener score for both the estimation sample (.729) and the validation sample (.707). This finding provides evidence that using the old pre-screen BOT risk score with 40 questions would result in a similar conclusion of risk as the newly created risk screener instrument that only contains seven risk factors. Table 11 below also shows the bivariate correlations for the old BOT risk assessment and recidivism and the new risk screener and recidivism. For both the estimation sample and the validation sample, the new risk screener score has slightly higher bivariate correlations (.398 and .385 respectively).

Table 11: Bivariate Correlations (Analysis Sample)

Bivariate Correlations	Pearson's r	
	Estimation Sample	Validation Sample
Pre-screen BOT Risk Score & Screener Risk Score	.729**	.707**
Pre-screen BOT Risk Score Recidivism	.334**	.358**
Screener Risk Score Recidivism	.398**	.385**

Table 12 below present the findings from ROC analysis. These findings are similar to the findings above and show a consistent increase in prediction accuracy from the old pre-screen BOT risk score to the new risk screener score. In the estimation sample, the old pre-screen BOT risk score results in an AUC of .685 and the new risk screener score have a calculated AUC of .735 a .05 increase in AUC prediction accuracy.

Table 12: Accuracy Analysis			
Analysis Sample	Pre-Screen BOT Risk Score AUC	Screener Risk Score AUC	AUC Improvement
Full (n=2621)	.685	.735	+.05
Validation Sample	Pre-Screen BOT Risk Score AUC	Screener Risk Score AUC	AUC Improvement
Full (n=500)	.688	.729	+.041
White (n=396)	.658	.726	+.068
American Indian (n=56)	.723	.754	+.031
Female (n=199)	.666	.742	+.076
Male (n=301)	.698	.717	+.019

all AUCs significant at $P \leq .001$

To further investigate the new screener's risk score capabilities, the validation sample is broken down into four subsamples: White youth, American Indian youth, female, and male. As indicated in table 12 above, the new screener's prediction accuracy increases for the full sample and all subsamples over the accuracy of the old pre-screen BOT. The new screener's risk score consistently shows AUCs in the .7 range, this indicates it will be a strong predictor of recidivism. All AUCs were found to be statistically significant, which means the prediction accuracy is better than chance performance in the population for male, female, White, and American Indian youth.

The final procedure used to test validity is logistic regression. For this analysis, two logistic regression models are run on the validation sample. One model is constructed for the pre-screen BOT risk score and another for the new risk screener score. Each model consists of three variables: risk score, race, and sex. This procedure allows for an accuracy analysis of each risk score while holding constant the effects of race and sex.

The odds ratios for each variable in the model are presented below in Table 13. Patterns for both models are similar. The risk score (new screener and pre-screen BOT) is a statistically significant predictor of recidivism. Race (non-white youth) is a statistically significant predictor. Sex is not a statistically significant predictor of recidivism when holding all variables in the model constant. The new risk screener score presents a larger odds ratio than the pre-screen BOT, evidence of an increase in prediction accuracy for the new risk screener over the pre-screen BOT. These findings mirror those from the ROC analysis above.

Table 13: Overall Risk and Recidivism (Validation Sample)		
Logistic Regression Model	**Pre-Screen BOT Risk Score**	**Screener Risk Score**
	Exp(B)	**Exp(B)**
Risk Score (low, Medium, High)	2.34**	3.06**
Race: (Non-White)	1.71*	2.03**
Sex (Male)	1.35	1.47

* $p \leq .05$; ** $p \leq .01$

Through each test of validity, the new screener's risk score demonstrates an increase in prediction accuracy over the pre-screen BOT risk score. This provides sufficient evidence that the newly

created screener's risk score is a valid predictor of risk and maintains, if not increases, prediction accuracy over the pre-screen BOT in a retrospective analysis.

STEP 6.1: RISK SCREENER UTILITY

Questions were sent to 10 probation departments across the state seeking information about how information on the BOT is collected and probation officer perceptions about the potential introduction of a seven-item screening risk assessment.

As discussed in the BOT Validation Report (McKay et al. 2015), probation districts vary in the frequency with which they use the BOT. BOT use ranged from a low of 12 percent of the time for first-time offending youth to a high of 82.4 percent for first-time offending youth. The average district utilized the BOT 40.1 percent of the time for first-time offending youth. District was the largest determining factor as to which youth received the BOT. Consistent with these findings, several probation officers who responded to our questions explained they rarely if ever use the BOT as a risk assessment instrument. Many departments responded that they employ the instrument, but do not utilize the risk score. For example, one probation officer said:

- "I don't believe you can use the instrument to decide how to handle a case, otherwise it will be skewed to manipulate the outcome. Knowledge of the instrument and the issues involved helps you make a decision in your head how to proceed. The instrument helps in developing a case plan on how to positively impact the youth and family."

Similarly, other probation officers indicated that they only utilize the full BOT, for example:

- "We don't use the pre-screen (BOT). These questions are addressed in the full BOT. I think it is overkill and the same questions are addressed in the BOT and with just talking to the kid."

It is apparent that there is no standardized approach to using the pre-screen BOT or full instrument. This is a significant issue to weigh while considering utilization of a new tool.

We asked probation officers if a new shorter instrument that maintained prediction accuracy would be beneficial. Responses to this question varied. Some probation officers saw a shorter instrument as beneficial. Each of the response below comes from a different probation staff member:

- "Absolutely, the full screen is very long and cumbersome. Much of the information is important and can help case planning, but doesn't need to be part of the tool we use to measure risk level."

- "Yes, a shorter assessment would be beneficial, because it would be completed more often and would be completed with more fidelity. And we all know that fidelity and consistency are both big keys to these assessment tools."

- "Yes, there are less questions that are easily talked about with a youth and that can be gathered in one or two sessions with them."

- "If the data suggest that we can get an equal picture or better picture with a shorter assessment, we will use it. As anything, if we can be efficient in our assessment, we can be more efficient in brokering resources to prevent recidivism."

Other probation officers were skeptical of a new shorter risk assessment:

- "The short (pre-screen) BOT is very easy to complete so I have no problem filling it out with each youth."

- "If the accuracy can be improved, of course it will be beneficial. However, I don't think the BOT pre-screen is unduly long, so it doesn't matter if it's shorter or not (really).

- "I think the short (pre-screen) BOT does a decent job, and (I'm) not sure how another shorter version would improve outcome."

- "It is difficult for me to see the full risk factors in the seven (factors) addressed."

- "A shorter instrument would be beneficial in that it would be quicker and easier to complete. But (it) may not be able to provide the kind of detail in the full BOT. So, to the extent that the instrument would be predictive and not simply reflective, it could be very beneficial."

Probation officer comments highlight the need for a standardized approach for BOT use. Ideally, a youth would be given the pre-screen BOT risk assessment to determine their risk level of committing a subsequent offense. Then, if the youth is found to be moderate or high risk of recidivating, they would receive the full BOT to help determine what services the probation officer should consider placing them into. At this point, it does not appear that the BOT is being utilized this way. Without a standardized approach capable of garnering buy-in from probation officers, the new risk assessment may not have utility in practice.

STEP 6.2: RISK FACTOR DISCUSSION

Detailed information on the risk factors proposed to be included in the new screening instrument and how that information may be gathered is included below. Probation officers through a brief survey, provided their insights on how best to gather data for the new instrument. Excerpts from that survey are also detailed here.

1. **Age at first offense:** This variable represents age at the time of the offense for which the youth was referred to juvenile court for the first time on a non-traffic offense resulting in an admission, conviction, diversion, deferred adjudication, or deferred disposition. Does not include status offenses.
    - 13 or Older
    - Under 13

    Comments from probation staff:

    Probation staff discussed different ways to collect this data. First, they noted that first offense information can be obtained in the JCATS for in-state youth. If the youth has come from a different state, probation officers explain that they will ask the youth and or parents

if they have had past offenses. They may also call the probation office from the state the juvenile comes from to determine if the youth has past offenses.

Literature: age at first offense:

Archwamety and Katsiyannis, 1998; Benda et al., 2001; Katsiyannis and Archwamety, 1997; Minor et al. 1997; Williams et al., 2014; Mckinlay et al, 2015; and Barret et al., 2015.

2. **Misdemeanor referrals:** This variable represents the total number of referrals for which the most serious offense was a non-traffic misdemeanor that resulted in an admission, a conviction, diversion, deferred adjudication, or deferred disposition (regardless of whether the deferred final adjudication was successfully completed). Multiple offenses occurring within a 24-hour period are to be considered a single referral. Do not include status offenses.
    - None or one
    - More than one

Comments from Probation Staff:

Probation officers indicated that they can obtain information on misdemeanor referrals in the same way as they do for age at first offense data. They expressed concern, however, that the JCATS would not reflect the youth's past referrals correctly, since data is not gathered on youth that come from outside of Montana or youth from tribal reservations. Using additional resources other than JCATS may be important for gaining comprehensive information. One probation officer's comment in particular draws attention to this issue as it relates to the new screener's exclusion of felony offenses:

- "I don't like that felonies aren't included, if just these seven questions are going to be all that is included on the BOT pre-screen."

The officer's comment above highlights an important predicament. Not including past felony offenses is an issue of face validity or the extent that practitioners trust in the tool's predictive ability. The reason felonies are not included in the new screener is that past felony offenses have consistently been shown to be a poor predictor of recidivism. There is a slight positive bivariate correlation between recidivism and past felony offenses (.081), but when included in a logistic regression model, the risk factors present a non-statistically significant negative coefficient. This means that youth with past felony offenses are actually less likely to commit a recidivating offense when other factors in the model are held constant. Below is the logistic regression model that includes felony offenses:

Table 14: Logistic Regression Model

Risk Factors	B	S.E.	Sig.	Exp(B)
FirstOffenseBelow13	0.468	0.103	0.000	1.597
More1Misd	0.672	.098	0.000	1.958
NoHistNonFamilyRelationships	0.332	0.099	0.000	1.394
BeliefFighting	0.365	0.10	0.000	1.44
CannotProblemSolve	0.519	0.103	0.000	1.68
CurrAntiSocialFriends	0.484	0.096	0.000	1.623
RunawayOrKickedOutOneOrMoreTimes	0.469	0.095	0.000	1.599
TotalFel	-0.056	0.076	0.459	0.945
Constant	-1.953	0.098	0.000	0.142

The last variable in the logistic model "TOTALFEL" is the risk factor measuring past felony offenses. First, the table above shows that the risk factor is not statistically significant (p=.459). This indicates that the risk factor is not likely to predict recidivism in the population. Second, the coefficient is negative (B = -.056). This again demonstrates that there is a negative association between past felony offenses and recidivism when holding the influence of all other risk factors in the model constant.

One possible resolution to maintain face validity is to include past felony offenses into the past misdemeanor variable. To explore this option, a variable was created that counted youth with more than one misdemeanor or at least one felony offense as a new risk factor (PastMisdOrFelony). Then a new risk score was calculated and ROC analysis was performed. The findings show that when the new risk factor is included in the model that takes into account past felony offenses, the accuracy is very similar to the new seven-item screener, but causes a slight reduction in the AUC. The seven-item risk score's AUC is .735 and the risk score including felony offenses has an AUC of .732. Because face validity is important when constructing a risk assessment instrument, including felonies into the proposed new seven-item screener may be worth the slight reduction in predictability. This compromise should be discussed further before the tool is finalized.

Literature on youth delinquency history:

Dembo et al. 1998; McMackin et al. 2004; Niarhos and Routh, 1992; Trulson et al 2005; Mallet et al., 2013; Williams et al., 2014; and Latessa et al., 2009.

3. **History of positive adult non-family relationships not connected to school or employment**: This category includes adults who are not teachers and not part of the youth's family and can provide support and model pro-social behavior, such as religious leader, club member, mentor, etc.
    - One or more positive adult relationships
    - No positive adult relationships

Comments from probation staff:

Probation officers indicated that this information is typically collected by asking both the youth and family about the juvenile's positive relationships with adults or authority figures outside of school and family. Probation officers explained that this definition is often broad and can be difficult to determine exactly who counts as a positive adult non-family relationship. Probation officers said that they typically try to get the youth to be specific about who they consider to be positive adult role models and whether they have counselors, extra-curricular activities they partake in, or other supportive resources.

Literature on positive adult non-family member mentors:

Positive adult non-family mentors have consistently been linked to positive youth outcomes for delinquent juveniles: Britner, Balcazar, Blenchman, Blinn-Pike, and Larose 2006; Aos, Lieb, Mayfield, Miller, and Pennucci 2004; Hall 2003; DuBois et al. 2002; DuBois, Portillo, Rhodes, Silverthorn, and Valentine 2011; Rhodes 2002; Rhodes, Bogat, Roffman, Edelman, and Galasso 2002; Lipsey and Wilson 1998; Wilson, Gottfredson, and Najaka 2001; Tolan et al. 2014; James, Stams, Asscher, De Roo, and Laan 2013;

4. **Current friends/companions youth actually spends time with:**
    - No antisocial friends
    - Has antisocial friends

    Comments from probation staff:

    Probation officers gather this information by asking the youth and family about the youth's friends. This information can also be gathered by calling the school. Additionally, in sparsely populated towns, probation officers often know a juvenile offender's friends if they are also in the system. The term "antisocial friends" can be ambiguous, however. Probation officers raised questions about this, such as, do the friends need a formal delinquent history or just to be noted as delinquent by others? They asked also, how is the term 'friend' defined? These definitions are largely based on probation officer discretion from past experience.

    Literature on antisocial peers:

    Association with antisocial peers is one of the strongest predictors of delinquency in criminology (See social learning theory by Ronald Akers) Baglivio (2009) found that antisocial friends are more predictive of recidivism for males than females and van der put et al., (2011) found that antisocial friends are stronger predictors of recidivism for older adolescents. Also see: Moffitt, 1993; Elliot, 1994; and Ageton, 1983.

5. **History of running away or getting kicked out of the home:** This factor includes times the youth did not voluntarily return within 24 hours and incidents not reported by, or to, law enforcement:
    - No history of running away or being kicked out
    - History of at least one instance of running away or being kicked out

    Comments from probation staff:

    Probation officers noted that this factor reflects the amount of respect the youth has for parental authority and to what extent parents control their child's behavior. Affirmative findings for this factor can also suggest abuse, neglect and safety issues. Information about housing is commonly gathered through questions of the juvenile about their home life, in addition to questions of the youth's parents.

    Literature on poor family interactions:

    Williams, LeCroy, and Vivian, 2014; Poor family management: Capaldi and Patterson, 1996; Hawkins, Arthur and Catalano, 1995; Low levels of parental involvement: Williams 1994; Farrington 1989; Poor family bonding and conflict; Elliot, 1994; Foshee and Bauman, 1992;

6. **Belief in fighting and physical aggression to resolve a disagreement or conflict:**
    - Youth believes that physical aggression is never or rarely appropriate
    - Youth believes physical aggression is sometimes or often appropriate

    Comments from probation staff:

    Probation officers gather this information by asking youth, parents, or school representatives about whether the juvenile is aggressive. Fighting often results in a ticket or a part of a ticket and can be seen in JCATS. Others find this information indirectly by asking

youth if there is fighting in the home and why they think this occurs. Probation staff explain that such questioning helps them to determine whether the youth poses a public safety risk. Some officers expressed skepticism, however, about placing this question as it can be difficult to collect accurately and terms such as "rarely, "sometimes," and "often" are ambiguous.

Literature on youth aggression and recidivism:

Loeber 1990,1996; Olweus, 1979; Stattin and Magnusson, 1989; Farrington, 1991; Piper 1985; Thornberry, Huizinga, and Loeber, 1995; Tolan and Thomas, 1995.

7. **Problem-solving:**
    - Youth thinks of solutions for problem behaviors, and or applies appropriate solutions to problem behaviors.
    - Youth can/cannot identify problem behaviors but does not think of solutions or apply solutions to problem behavior

Comments from probation staff:

Probation officers gather this information by asking youth about the current offense for which they have been cited and how they could have gone about the situation in a different way. Officers have also indicated that asking school counselors and teachers can assist in gathering this information. Several probation officers raised concern with the question about problem solving being included as a risk factor. Some officers have stated that this variable should not be a predictor if only seven predictors will be used while others said the question is awkward and difficult to define.

The seventh question is the most abstract of the risk factors included in the new risk assessment screener. It is important to determine exactly what is being measured and how to obtain this information. This question seeks to measure the youth's internal ability to handle different real-world situations or the youth's propensity to commit delinquent acts. It seeks also an understanding of whether or not they are capable of resisting delinquent acts, whether they grasp that there are alternate routes to take. Information for this question will be best obtained by school faculty or by the probation officer's professional opinion.

Literature on problem solving and delinquency:

Poor problem solving and hostility and aggression: Perry et al., 1986; Slaby and Guerra, 1988; Akhtar and Bradley 1991. Problem-solving deficits found in offender population: Biggam and Power, 1999; McMurran et al., 1999, 2001).

OVERVIEW OF NEW RISK SCREENER:

Pros:

5. The tool is an accurate, objective predictor of recidivism for male, female, white, and American Indian youth
6. It is significantly shorter than the pre-screen BOT
7. Each factor on the screener has been validated, as discussed in the literature

8. Each factor on the screener is measuring a different aspect of the youth, there are no duplicate questions. Aspects of the youth measured for each factor are itemized below:

    a. First offense under the age of 13
        i. How the youth perceives or defines themselves, or to what extent their delinquent behavior is ingrained.
    b. More than one total number of misdemeanor referrals
        i. The youth's propensity to continue committing delinquent behavior, even after discipline measures have been taken.
    c. Youth does not have a positive adult relationship (not including relationships in family, school, or employment)
        i. Support systems and positive role models in the youth's life.
    d. Youth believes fighting is sometimes or often appropriate
        i. The youth's propensity for aggression and mindset on aggressive actions.
    e. Youth does not apply appropriate solutions, nor think of solutions for problem behavior
        i. Youth decision-making skills, how the youth thinks and acts when placed in different situations.
    f. Youth has antisocial friends
        i. How the youth learns delinquent behavior, or if the youth has peers that will be impressed by delinquent behavior.
    g. Youth has history of running away or being kicked out of home
        i. Measuring the youth's family and home life.

Cons:

6. Face validity is an issue. Some factors are included in the screener that are not commonly found on risk assessments, and some factors that are commonly included on risk assessments are not included on the new screener. Face validity questions can cause skepticism from practitioners about validity
7. Need for a standardized process for when it's appropriate to use the screener, versus when to administer the full BOT
8. Several districts do not see the need for a shorter risk screener
9. Certain factors on the screener are difficult to define and accurately collect. This can cause an issue with inter-rater reliability. Inter-rater reliability is the ability for different practitioners to calculate the same risk score on the same youth. For example, one probation officer might decide that a youth does not have anti-social friends because their friends are not in the JCATS system, while another probation officer might decide that the youth does have anti-social friends because the youth's parents say they hang out with anti-social friends. Setting up a protocol to collect this information could help decrease inter-rater reliability which in turn increases the accuracy and face validity of the instrument.
10. The screener has not been validated proactively and findings may differ from the retroactive test of validity.

BACK ON TRACK NEEDS ASSESSMENT

The full Montana Back on Track needs assessment instrument was designed to assist in decisions about service placement for youth in the juvenile justice system. This is done by investigating a variety of areas in the youth's life that may attribute to delinquent behavior. Problem areas can then be addressed with services tailored to meet specific needs. Because individual youth have different strengths and weaknesses, they cannot be placed in a one-size-fits-all service approach. Youth who experience family problems should receive services reflective of the family dysfunction, and youth substance abusers should receive help designed to meet that need. A standardized process for using the BOT can aid decision-making about service placements capable of successfully rehabilitating youth and thereby reduce future recidivism.

The Montana BOT was created almost verbatim from the successfully implemented Washington State Juvenile Court Assessment (WSJCA). WSJCA validation report authors explain, "The courts have refocused their resources on moderate and high-risk youth by assigning low risk youth to minimum supervision caseloads. These caseloads have a large number of youth report to a single probation officer where supervision is primarily by telephone. As a result of these savings in resources, more effort is directed toward the highest-risk youth" (Barnoski, 2004, p.4). Moderate to high-risk youth are then placed into programs that reflect needs identified during administration of the full needs assessment instrument. Five programs are recommended in the report for youth with moderate to high-risk levels: Aggression Replacement Training (ART); Functional Family Therapy (FFT); Multi-Systemic Therapy (MST); Coordination of Services (COS), and Family Integrated Therapy (FIT). See Appendix B for summaries of these services. "To be assigned to one of these programs, a youth's assessment profile must match the risk factors that are addressed by the program. The program developers helped identify relevant risk profile criteria" (p. 4). The WSJCA report found that by addressing low, moderate and high-risk youth differently through appropriate evidence-based programs, the WSJCA can reduce recidivism among juveniles and increase successful outcomes.

Similar recommendations were made in the report titled "Risk Assessment in Juvenile Justice: A Guidebook for Implementation" (Vicent, Guy, and Grisso 2012). This report focuses on another risk assessment similar to the BOT and the WSJCA called the Structured Assessment of Violence Risk in Youth (SAVRY). Authors of the 2012 guidebook recommend that youth with the highest overall risk level for reoffending should receive the most intensive services. Juveniles with the lowest risk, meanwhile, should receive the least intensive services. Vincent et al. discuss an approach used in conjunction with the SAVRY called the 'Service Referral Matrix.' The Service Referral Matrix categorizes services according to low, moderate, or high levels of intensity within each criminogenic need area (p. 70). If the youth has low, moderate, or high needs, "the matrix reflects an increased intensity of services that would be appropriate for referral (p. 70)." Authors of the 2012 guidebook further advise, "Each agency or individuals trying to implement a service referral matrix will need to conduct an inventory of their services with the specific programs and agencies available locally (p. 70)."

The Service Referral Matrix is a guide to help match youth needs to effective services. The Example Service Referral Matrix created for the MacArthur Models for Change Initiative provides an outline for creation of an easy-to-use table designed to match needs with effective services:

> The columns represent the youth's need areas and the rows represent the level of risk. Each cell provides a description of the type of services probation officers or case managers should consider for youth whose risk and needs assessment places them in that "box" on the matrix. For example, for a youth with moderate risk whose greatest needs are in the area of "Family Issues," the matrix highlights for the probation officer the recommendation to assign some sort of community-based, evidence-based family-oriented program, such as Functional Family Therapy. This youth may have strong needs in other domains as well, which may require additional services (Vincent et. al, 2012, pg. 71).

The Service Referral Matrix has low, moderate and high classification of needs. Appropriate services are listed for each level of need, "As risk or need increases, the matrix reflects an increased intensity of services that would be appropriate for referral. Thus the matrix can be used to identify proper services based on the individual youth's criminogenic need areas (Vincent et al, 2012, pg. 70)." By following the Service Referral Matrix example used by the Rapides Parish Department of Juvenile Justice, the BOT Service Referral Matrix was created. (The BOT Service Referral Matrix is presented in Table 15 below). In the Rapides Parish Department Matrix, they suggest using relevant items on the SAVRY manual in conjunction with each need area. For example, if a youth's need area is substance abuse, then the relevant item on the SAVRY would be item 19, "Substance use difficulties (Lodewijks, 2008, pg. 3)."

The SAVRY and BOT use similar scoring categories to assess youth risk. When a youth scored low, moderate, or high in a category, such as in the Education or Employment categories, then questions in the BOT manual addressing education or employment were listed alongside relevant items in the Service Referral Matrix.

The "Relevant Items on full BOT" row within the matrix describes which factors found on the full BOT could be used to identify youth needs. The domains are coded as: A) Record referrals, B) School history, C) Use of free time, D) Employment history, E) Family and relationships, F) Alcohol and drugs, G) Mental health history, H) Attitudes, I) Aggression, and J), Skills. Items in these categories were numbered in consecutive order from the first to the last question in each domain. For example, the factor A12 is referring to the 'record referral' domain and the 12th question within that domain. This provides a template for using the BOT to locate problem areas in the youth's life and to link these problem areas to appropriate services. Services included in the BOT matrix below were borrowed from the SAVRY report and may not reflect the services available to youth in Montana.

Table 15: BOT Service Referral Matrix

BOT Key: A:Record Referrals; B:School History; C:Use of Free Time; D: Employment History; E: Family and Relationships; F:Alcohol and Drugs; G:Mental Health History; H:Attitudes; I:Agression; J:Skills

BOT Key: The number after the domain letter represents the individual question found on that domain. Example: A12 = Record Referral Domain, 12th question

	Disruptive Behavior Problems	**Mental Health/Emotional Stability**	**Substance Abuse**	**Family and Relationships**	**Education/ Employment**	**Peer Pro-Social Activities**	**Community**	**Sexual Misconduct**
Relevant Items on Full BOT	A12, A11, E73, G9, G14, H1-H11 (domain 10), I1-I18, J1-J11	B3, G1, G9, G10, G12, G13, G14, G18, J6-J9	F1-F47 (Domain 8A)	E1-E14, E42-E76, G3, G6	B4-B6, B9, B18-B26, D1-D8, G9, G14	C1-C10, E1-E14, E61	E7	A7, A8, G6, G7, I12-I18
Description	Negative Attitudes, Risk Taking/ Impulsivity, Anger Management Problems, Low Empathy/ Remorse, Attention Deficit/ Hyperactivity Difficulties, Poor Compliance	History of Self Harm or Suicide, Stress and Poor Coping, Anger Management, Attention Deficit/ Hyperactivity Difficulties	Substance Use	Exposure to Violence in the Home, Childhood History of Maltreatment, Parental/ Caregiver Criminality, Poor Parental Management	Poor School Achievement, Attention Deficit/ Hyperactivity Difficulties, Low Interest/ Commitment to School	Peer Delinquency, Peer Rejection, Lack of Personal/ Social Support	Community Disorganization	Sexual Abuse History, Sexual Abuse, Sexual Misuse
Low	Low Risk indicates low probability of future violence and/ or delinquent behavior. Enhance protective factors by actively recognizing strengths and strategically building upon pre-existing strengths. Increased exposure to the juvenile justice system increases risk of low risk juveniles.							
Low	Promote parent supervision and support adult role models/mentors working with child. Refer for parenting skills training/support if needed. Refer to Community Service Worker (CSW). Recommend/Require pro-social activity (sports teams, church groups, community programs).	Recommend/Require pro-social activity (sports teams, church groups, community programs).	Promote parent supervision and support adult role models/mentors working with child. Refer for parenting skills training/support if needed. Recommend pro-social activity (sports teams, church groups, community programs) Have youth inform guardian of SA/use, with who, when, and how achieved to increase ability to supervise.	Promote parent supervision and support adult role models/mentors working with child. Refer for parenting skills (FINS) training/support if needed. Recommend daily activity with parent(s) / mentor (meal, supervised homework, games).	Parent is to maintain contact with teachers & school. P.O. to check with school/school administrators/work.	Recommend pro-social activity (sports teams, church groups, community programs, scouts). Reduce affiliation with delinquent peers by increasing opportunities with non-delinquent peers. Continue to support pro-social activity reducing barriers to participation within the community.	Community Service: Manna House, Goodwill Boys/Girls Club.	Individual Therapy, Cognitive Behavioral Therapy focused on sexual perpetrators (not recommend for intensive sexual perpetrator treatment). If less than 16 years old consider family therapy. (Ryals, 2013, pg. 18) *Needs more research, it should be noted that this column was added for the BOT matrix
Moderate	Refer for behavioral assessment (e.g. Court Mental Health Advocate). Possible Cognitive-Behavioral treatment to target specific behaviors and include the youth's parent/family or school-based interventions for behavior management, skills development. Parent skills training and supervised practice. Consider using FFT or MST. Family education and develop parent advocacy for treatment services. Service referral to cognitive-behavioral based tx with strong family component. (JWRAP).	Indicates need for a psychosocial assessment and plan targeting both mental health and delinquency risk facts. If diagnosed with mental illness, refer to a psychiatric rehabilitation provider, or MST. Combine any psychopharmacological intervention with indiv/family cognitive-behavioral based treatment (medication alone will have limited effectiveness) If outpatient services fail, refer to inpatient/residential services with strong aftercare/reintegration components.	Refer to Substance Abuse Services for further substance abuse screening & assessment, and if needed referral to an appropriate level of treatment Drug Court or other individual/family, motivational engagement based treatment is recommended. AA/NA and peer group therapies are not particularly effective with adolescents. (CCDC) Conduct random/routine drug tests (if in treatment, Urine Drug Screen (UDS) results should be handled in consult with tx provider. Even with a positive UDS, youth may be progressing in tx). Refer to outpatient treatment provider, Assess to Recovery (ATR) service, or as a measure of last resort, inpatient tx with strong after care/ re-entry services.	Refer to Strengthening Families program or other similar evidence-based family/parent skills development program. Consider family therapy, such as MST or FFT, J-Wrap. Use FFT with high ratings on disruptive behaviors or mental health. Use MST for high ratings on disruptive behaviors, mental health, or substance abuse.	Obtain educational evaluations, if available. Recommend tutoring through community or school-based program. P.O. to monitor school behavior and attendance with disciplinarian, teacher, or school counselor. Consider using a daily behavior checklist. Refer to After-school tutoring program, obtain IEP, & speak/coordinate with Behavior Strategists. If out of school, refer to employment training and placement services, GED or Vocational Technical education.	Possible services include Life Skills and Mentoring. Increase leisure activities and pro-social activities. Strongly encourage or consider assigning parent/guardian to engage juvenile in community recreational opportunities, faith-based organizations, an after-school program, volunteerism, or other suitable pro- social activity. Increase positive social interactions by referring to faith-based organizations, youth groups, or youth community centers. If social skills issues and not peer associations, consider also referring to cognitive-behavioral treatment that can target interpersonal skills. Reduce barriers to participation by finding groups willing to supplement activities, etc. Assign a mentor if positive parent figure is unavailable or involve in mentored activities through the Boys/Girls Club or other such entities.	With high disruptive behavior scale and 16 years old or older, refer for individual therapy. If 15 years old or under, refer to family therapy or refer for mentoring. Increase exposure to opportunities outside immediate neighborhood, including Community Service Worker (CSW), jobs, sports and/or youth group activities.	Individual Therapy, Cognitive Behavioral Therapy focused on sexual perpetrators (not recommended for intensive sexual perpetrator treatment) or Trauma focused Cognitive-behavioral Therapy (if victim of abuse). If less than 16 years old consider family therapy. (Ryals, 2013, pg. 18) *Needs more research, it should be noted that this column was added for the BOT matrix
High	Indicates need for behavioral specific psychosocial evaluation if mental health scale is moderate. Use individual/family cognitive-behavioral therapy with strong contingency management, FFT, or MST. If community-based services fail, evaluate and consider out of home placement with a strong family and reintegration/aftercare component. (e.g. Crossroads).	Indicates need for behavioral specific psychosocial evaluation if mental health scale is moderate. Use individual/family cognitive-behavioral therapy with strong contingency management, FFT, or MST. If community-based services fail, evaluate and consider out-of-home placement with a strong family and reintegration/aftercare component. (e.g. Crossroads).	Refer to Substance Abuse Services for substance abuse assessment, and referral to an appropriate level of treatment (Drug Court, MI/CBT/RP tx provider. Conduct random/routine drug tests (if in treatment, UDS results should be handled in consult with tx provider. Even with a positive UDS, youth may be progressing in tx.	Refer for FFT or MST. If services ineffective, consider an evaluation assessing the level of violence, abuse, neglect that might necessitate out of home placement.	Engage youth in school-related services to target improving learning, study, classroom skills. Consider possible changes in classroom and/or school settings. After hour treatment for mod/high scores in other risk areas may interfere with completion of homework, so be mindful in referring. Consider adult ed., Youth Challenge Program (YCP), and/or alternative schools. Assist in managing admissions and other processes that may be a barrier to the youth and family. Consider: Adult Ed., AMI Kids, Slocum, Aiken, 504 Classification/ Homebound Job.	Consider more intensive services such as FFT, MST or other cognitive-behavioral or systems treatment to target social skills and improve interpersonal relationships. For girls, be particularly aware of delinquent boyfriends. This is a particular risk factor for females. Require increased structured pro-social activities. Establish a mentor for the youth. Link to after-school activities when possible to increase access when available through the community.	Engage parent/guardian in housing assistance programs, when available. Facilitate community programs that can do outreach to the family. Involve the family in community services beyond their neighborhood.	Individual Therapy, Cognitive Behavioral Therapy focused on sexual perpetrators (not recommended for intensive sexual perpetrator treatment) or Trauma focused Cognitive-behavioral Therapy (if victim of abuse). If less than 16 years old consider family therapy. (Ryals, 2013, pg. 18) Consider referral for FFT or MST. If services ineffective, consider an evaluation assessing the level of violence, abuse, neglect that might necessitate out of home placement. *Needs more research, it should be noted that this column was added for the BOT matrix
Acronyms	CSW - Community Service Worker, FINS - Families in Need of Services, FFT - Functional Family Therapy , MST - Multi-Systemic Therapy, JWRAP - Juvenile Wellness Recovery Action Plan, AA - Alcoholic Anonymous, NA - Narcotics Anonymous, CCDC - Certified Chemical Dependency Counselor, UDS - Urine Drug Screen, ATR - Assesses to Recovery, IEP - Individualized Education Program, GED - General Education Diploma, MI - Motivational Interviewing, CBT - Cognitive Behavioral Therapy, RP - Relapse Prevention, YCP - Youth							

The BOT Service Referral Matrix above is to be used as a template and not as a final product. Each probation office across Montana has different services available to assist youth, so a matrix would need to be created for each district for it to be useful. Additionally, the matrix is to be used as a tool

to assist in professional discretion, not as a mandate for final decision-making. Once employed in the field, the tool can be monitored and changed to be more helpful.

A similar matrix was created for the WSCJA that may be easier to use. The following matrix comes from Barnoski 2009. This table simply lists all services available to youth in an area and describes when a youth would be eligible to receive this service based on risk level and needs discovered on the WSCJA.

Evidence-Based Program Eligibility Criteria

Evidence-Based Program	Eligibility Criteria
ART: Aggression Replacement Training	Moderate- or high-risk, and at least one of the following: • score of at least 1 for a weapon, violent misdemeanor, or felony conviction; or • dynamic risk factor score of at least 2 out of 13 on aggression; or • dynamic risk factor score of at least 7 out of 28 on attitudes/ behavior; or • dynamic risk factor score of at least 9 out of 36 on skills.
COS: Coordination of Services	Low-risk
FFT : Functional Family Therapy	Moderate- or high-risk and a dynamic risk factor score of at least 6 out of 24 on current family.
FIT: Family Integrated Transitions Program	High-risk and a dynamic risk factor score of at least 6 out of 24 on current family, substance abuse or dependence disorder, and one of the following: • any Axis 1 disorder (excluding those youth who have only a diagnosis of Conduct Disorder, Oppositional Defiant Disorder, Paraphilia, or Pedophilia); or • currently prescribed psychotropic medication; or • demonstrated suicidal behavior within last three months.
MST: Multi-Systemic Therapy	High-risk and dynamic risk factor score of at least 6 out of 24 on current family.

Literature on using needs assessments for assistance with service placement is limited. Most information in this analysis is from technical reports created by different state agencies. A common conclusion among agency reports is that approaches must be tailored for each state and district. Montana, with limited services and large distances to travel, is very different from most states. That can make the process of evaluating the feasibility of using needs assessments as a basis for referrals more difficult. A service inventory of each district could be a starting place to create a useful BOT and service referral matrix..

Several probation officers who responded to the questionnaire about the BOT and the new screener during this inquiry stated that they use alternate resources other than the BOT for service planning. Other resources used include professional evaluations, school personnel, family interactions, and spending time with the youth. This finding indicates that some probation departments do not see the utility of the BOT as a tool for assisting with service placements. Creation of a strategy for systematically using the BOT and a service referral matrix to assist with placement may increase buy-in from probation officers who do not already see the utility of the instrument.

RECOMMENDATIONS

Findings from this investigation prompt two primary recommendations. A pilot test of the newly created risk screener should be conducted, and a survey of probation departments across Montana should be performed. The statewide survey would help determine how the screener and BOT could work more effectively for probation officers. The survey would also assist with creation of a service inventory. These two recommendations are described more in detail below.

SCREENING RISK AND BOT NEEDS ASSESSMENT

As discussed earlier in this document, validation of the new screening instrument completed for this analysis is a retrospective test. A prospective test with pilot sites would provide a greater understanding of instrument utility and accuracy. Through a pilot test, probation staff could also provide insight into the process associated with screener use to determine if it is something that should be employed statewide. Districts, including Ravalli and Cascade counties, have already expressed interest in participating in such a pilot. Probation department buy-in constitutes a crucial step for successfully implementing the new assessment into the field. If pilot sites legitimize the instrument, other departments are more likely to see its utility.

The full BOT is a data-driven evidence-based practice, but it is not useful without a standardized process to employ it. It is important to determine if this process, both a shorter screener and standardized process of administering the BOT would be useful for Montana Juvenile Probation. While current data shows that some departments do not use the risk assessment instrument to help determine juvenile risk of recidivism, several departments appear to be willing to use the full BOT to assist with service placement. The following steps comprise the ideal standardized process of using the new screening tool, the full BOT, and the service referral matrix:

> Step 1: A youth is brought into probation on a new citation. Their recidivism risk is measured using the new screener risk assessment described above (seven risk factors).
>
> Step 2: After administering the new screening instrument, probation staff will have complete discretion on whether to use the full BOT with low-risk youth. If the youth was brought in for a minor non-violent offense, they may not need a full BOT administered. Instead, as explained by Barnoski (2004), youth may be diverted from the juvenile justice system to other rehabilitation programs. If the youth is low risk but cited for a more severe offense, or when probation feels it is necessary, the youth can have a full BOT administered and possibly have minimal supervision by probation.
>
> Step 3: Depending on the current offense and probation staff discretion, it is recommended that moderate or high-risk youth receive the full BOT.
>
> Step 4: If the full BOT is administered, probation staff can investigate problem areas in the youth's life. Using the service referral matrix, probation can find problem areas in the BOT and match these areas with services to address specific problems.
>
> Step 5: The youth is placed into a service reflective of their individual needs.

Step 6: It is recommended that data be collected on which service the youth was placed in and why the youth was placed in that service. This protocol allows outcomes to be investigated at a later date, so the process may be improved.

A standardized process to utilize these tools is intended to determine recidivism risk quickly and easily, while also assisting probation staff with service placement decisions. If probation officers do not see utility in this process, however, then it may be best to find an alternate strategy. During this investigation, only a handful of probation officers were asked about their experiences with the pre-screen and the full BOT. Surveying all probation departments across Montana may provide a better understanding of BOT use and to what extent the tool could be modified to make the process more user friendly.

SERVICE INVENTORY

A service referral inventory would be beneficial for determining what resources are available to youth across Montana. Such an inventory would allow probation staff to locate services available to youth served. It would also provide insight into what districts lack needed resources. A statewide survey administered to probation offices across Montana would provide a starting point for understanding service supply and demand. Additional information about social services could be collected from agencies such as the Montana Department of Public Health and Human Services. Growing the knowledge base of statewide service availability would also assist with securing help for youth who travel across counties.

In addition to creation of an inventory and growing a greater understanding of youth service and delinquency data at the state level, maps using GIS technology could be created to assist with service identification and placement. To illustrate the value of mapping for this type of endeavor, three maps were created for this analysis. They are provided in Appendix C through Appendix F as examples and are described below:

Map 1: Dot Density (Appendix C)

Map 1 displays all substance abuse facilities available for youth across Montana. Facilities are represented by circles created to illustrate who in Montana has convenient access to them. The darker circles show areas with more than one substance abuse facility. Lighter circles indicate areas with only one service available.

Each red or black dot on the map represents one youth who was initially cited for a drug or alcohol offense between 2010 and 2015. The red dots are youth that had a drug or alcohol recidivating offense in one year, the black dots are youth who did not have a recidivating offense. The location of these dots is only accurate at the county level. There was no data reflective of which youth went to services, so these are approximate representations of youth served by each substance abuse facility.

Services mapped are listed on the bottom right corner of Map 1, gridlines and numeric labels are utilized for easier location identification.

Data on Map 1 represents only youth who received a pre-screen or a full BOT. As a result, it is not representative of all youth cited. This is most apparent when looking at Ravalli County. It appears there are more drug offenses in Ravalli County than there are in

Missoula. But, in reality, Ravalli County fills out BOTs at a greater rate than Missoula. Ravalli County had the highest BOT completion rate (82.4 percent) of any county in the state.

Dot density maps are beneficial, because they allow the audience to see the number of individual youth in each county struggling with substance abuse. They also help measure the extent to which services are needed.

Map 2: Choropleth Map (Appendix D)

Choropleth maps use color to present data, as opposed to dots, like the first map. Map 2 displays the same substance abuse facilities and 20-mile buffers as Map 1. Map 2 data differs, however, in that they were queried from JCATS rather than taken from BOT administration records. As such, Map 2 is representative of all youth initially cited for a drug or alcohol offense in Montana between 2010 and 2015. The darker the county, the higher percent of youth drug offenses based on census population data. Recidivism data was not available for these youth, so only their initial offense is presented.

Choropleth maps are useful for visualizing percentages or crime and recidivism rates on a countywide basis, which can aid in locating regional problem areas.

Map 3: Basic Point Location Map (Appendix E)

Map 3 displays all of the Comprehensive School and Community Treatment (CSCT) providers across Montana. The website for Western Montana Mental Health Center, which facilitates regional CSCT programs in Montana, states the following about the CSCT program:

> "This program is designed to provide in school support for children with a serious emotional disturbance. The CSCT team, made up of a licensed clinical social worker and a behavioral specialist, offers individual and group therapy sessions, family therapy and supports, in class support, and advocacy for students in the program. The goal is to improve the student's skill set and support improved academic success and behavior (www.wmmhc.org)."

Data plotted on Map 3 includes only the location and number of CSCT providers. The color of the counties do not represent data, as with the choropleth map discussed in the section above.

An image similar to Map 3 would be beneficial for conducting a service inventory, as it is capable of helping to identify where in Montana certain services are located and where services are needed.

All maps were created using ArcGIS then edited in Adobe illustrator. The maps noted here are included to provide examples of how data can be displayed in a way that allows for a greater understanding of services available and how youth data can be displayed to investigate regional problem areas. Additional maps that could aid probation staff include interactive maps that display data on unique districts. Such interactive maps would allow probation staff to search their districts for available services, using point-and-click capabilities.

CAUTIONS AND LIMITATIONS

Data collected for the analysis is based solely on youth who had a full BOT administered to them. Because less than 50 percent of youth with JCATS-recorded intakes were administered a full BOT, this data is not representative of all youth in Montana who committed offenses during the investigation period. Since not all districts administer BOTs as systematically as others do, and there may be actual differences predicting recidivism at different locations across Montana, this issue could be interpreted as troublesome. While this is a limitation, the large sample size used for this analysis provides a certain level of confidence to support the validity of the new screening instrument. A prospective test of the new instrument would help determine if accuracy was maintained during tool use.

An additional limitation to this research is a lack of explanatory literature detailing how other states use tools similar to the BOT for assistance with service placement decisions. It may be beneficial for future research to reach out to other states using similar tools to discuss the process of using the BOT to assist with service placement.

The final limitation is the actual utility of the screener and the full BOT for Juvenile Probation in Montana. Implementation of the new tool will not work without probation buy-in. Several probation officers appear willing to use the BOT but others express hesitation in their willingness to use the screener. A focus on gaining buy-in from probation officers should be prioritized, if this is a strategy that Montana wishes to employ in the future. A potential remedy for the buy-in challenge is to allow probation officers to have direct say in how this new tool will be used and to employ it in pilot sites so other departments can make a decision based on evidence documenting the instrument's effectiveness or lack thereof.

CONCLUSION

The Montana Back on Track risk and needs assessment instrument was created to assist in service placement for youth on probation. Prior to the current investigation, it was discovered that the pre-screen BOT is a valid predictor of risk for first time offending youth in Montana. However, due to the lack of buy-in from many districts, the majority of youth are neither administered a pre-screen BOT nor a full BOT, and many districts do not see the utility of the instruments. One goal of this investigation was to simplify the screening process by creating a shorter instrument that would allow probation officers to determine the risk level a youth poses in a shorter amount of time. A shorter instrument that maintained risk prediction accuracy could increase buy-in from probation officers and, in turn, increase fidelity and consistency. This inquiry's goal was largely accomplished. Out of the 246 risk factors on the full BOT, seven were found to be the most important factors to determine youth risk of recidivism. With these seven risk factors, the brief screener was found to improve prediction accuracy in comparison to the pre-screen BOT.

The second goal of this investigation was to investigate how other states use similar instruments like the full BOT to help determine youth service placement. While limited information is available on this topic, the literature reviewed for this inquiry encourages use of a service referral matrix. Such a matrix matches BOT items and youth risk level to services available to youth in each district. For a service referral matrix system to be successful, a service inventory must be created for each district to determine area resources available for youth.

Based on the past and current analyses, it is recommended that if the BOT is a strategy that Montana's Office of the Court Administrator for the Supreme Court wishes to pursue, a standardized process of administering the new screener risk assessment and full BOT should be put into place and used with fidelity. Before this can be accomplished, it is recommended that the new screener risk assessment instrument be prospectively tested at pilot sites in Montana to determine its validity and usability. Creation of a service inventory for youth across Montana to assist in service placement decisions with the full BOT should occur, and a statewide survey of probation departments across Montana should be undertaken to determine if this strategy could be useful.

APPENDIX A

Reducing Risk Factors			
A) All Stat. Sig. Bivariate Correlations	**B) Domain Logistic Regression**	**C) Full and Stepwise Regression**	**D) Final Model**
TOTALMISD			
AGEFIRST			
ConfinedDetention	These variables remain statistically significant after individual domain logistic regression	These factors remain statistically significant after 1) full logistic regression of all variables in B, 2) All variables in B After Backward stepwise Regression	These are the remaining statistically significant factors when all factors in C are placed into logistic regression
MisdPerson			
TOTALFEL			
TOTALWEAP			
FailureToAppear			
PERFORMANCE			
LikelihoodStaying			
CONDUCT			
YouthInvolv			
ATTENDANCE			
YouthCloseWith			
ExpulsionSuspension			
NoSpecialEd			
Alternative			
LearningDis			
CogDel	TOTALMISD		
GED	AGEFIRST		
College	ConfinedDetention		
CurrentUnstrucActivity	TOTALWEAP		
CurrentStucActivity	PERFORMANCE		
HobbyGroup	LikelihoodStaying		
Volunteer	CONDUCT		
CommCulture	YouthInvolv		
HistorySuccessEmploy	YouthCloseWith		
HistoryPosWorkRel	ExpulsionSuspension		
UnderstandsJob	CogDel		
CurrentPosWorkRel	CurrentUnstrucActivity		
AdmiresAntiPeers	CurrentStucActivity		
CurAntiSocFriends	HobbyGroup		
CurrentCommunityTies	Volunteer		
HistNonFamRelationship	HistoryPosWorkRel		
RomaticRelationship	CurrentPosWorkRel		
ProSocFriends	AdmiresAntiPeers		
ParentalAuthority	CurAntiSocFriends	AGEFIRST	
RunawayKickedOut	CurrentCommunityTies	TOTALMISD	
ApprPunishment	HistNonFamRelationship	CurAntiSocFriends	AGEFIRST
FamAcitivity	ProSocFriends	HistNonFamRelationship	TOTALMISD
FamilyConflict	ParentalAuthority	RunawayKickedOut	CurAntiSocFriends
Income	RunawayKickedOut	BeliefFighting	HistNonFamRelationship
OutHomePlacement	ApprPunishment	ProblemSolving	RunawayKickedOut
ParentalSupervision	FamAcitivity	VicNeglect	BeliefFighting
NoOneJail3Months	Income	CurrentStrucActivity	ProblemSolving
SupportNetwork	NoOneJail3Months	MentalHealthStatus	
NoProbParents	FamilySupport	Impulsive	
FamilySupport	NoHistDrugProbs		
CloseDad	Treatment		
LiveWithFather	CurrentDrugFriendProb		
NoHistDrugProbs	CurrentAlcEduProb		
Treatment	MentalHealthStatus		
CurrentDrugEduProb	HealthInsurance		
NoHistAlcoholProb	VicNeglect		
CurrentDrugFriendProb	ATTITUDE		
CurrentAlcEduProb	RespectProperty		
CurrentDrugUse	Optimism		
DrugAlcAssessment	Impulsive		
CurrentDrugFamilyProb	Emotions		
CurrentDrugCrimeProb	BeliefFighting		
MentalHealthStatus	BeliefYelling		
HistoryMentalHealth	Frustration		
HealthInsurance	GoalSetting		
VicNeglect	ProblemSolving		
NoPysicalAbuse	DealingWithFeelings		
AbuseByOther	Thinking		
ATTITUDE			
RespectProperty			
Optimism			
BeliefInConditions			
Impulsive			
Control			
Emotions			
BeliefFighting			
BeliefYelling			
Frustration			
ViewOfIntentions			
NoReportsViolence			
GoalSetting			
ProblemSolving			
DealingWithFeelings			
DealingWithOthers			
InternalTriggers			

APPENDIX B

All service descriptions come from Barnoski (2009).

Aggression Replacement Training (ART): "ART is a 10-week, 30-hour intervention administered to groups of eight to 12 juvenile offenders three times per week. It can be implemented by court probation staff or private contractors, after they receive formal ART training. A juvenile offender is eligible for ART if it is determined—from the results of the formal assessment tool administered by the juvenile courts—the youth has a moderate to high risk for re-offense and is aggressive, or has social skills or attitudes and beliefs that lead to anti-social behavior." (pg. 15).

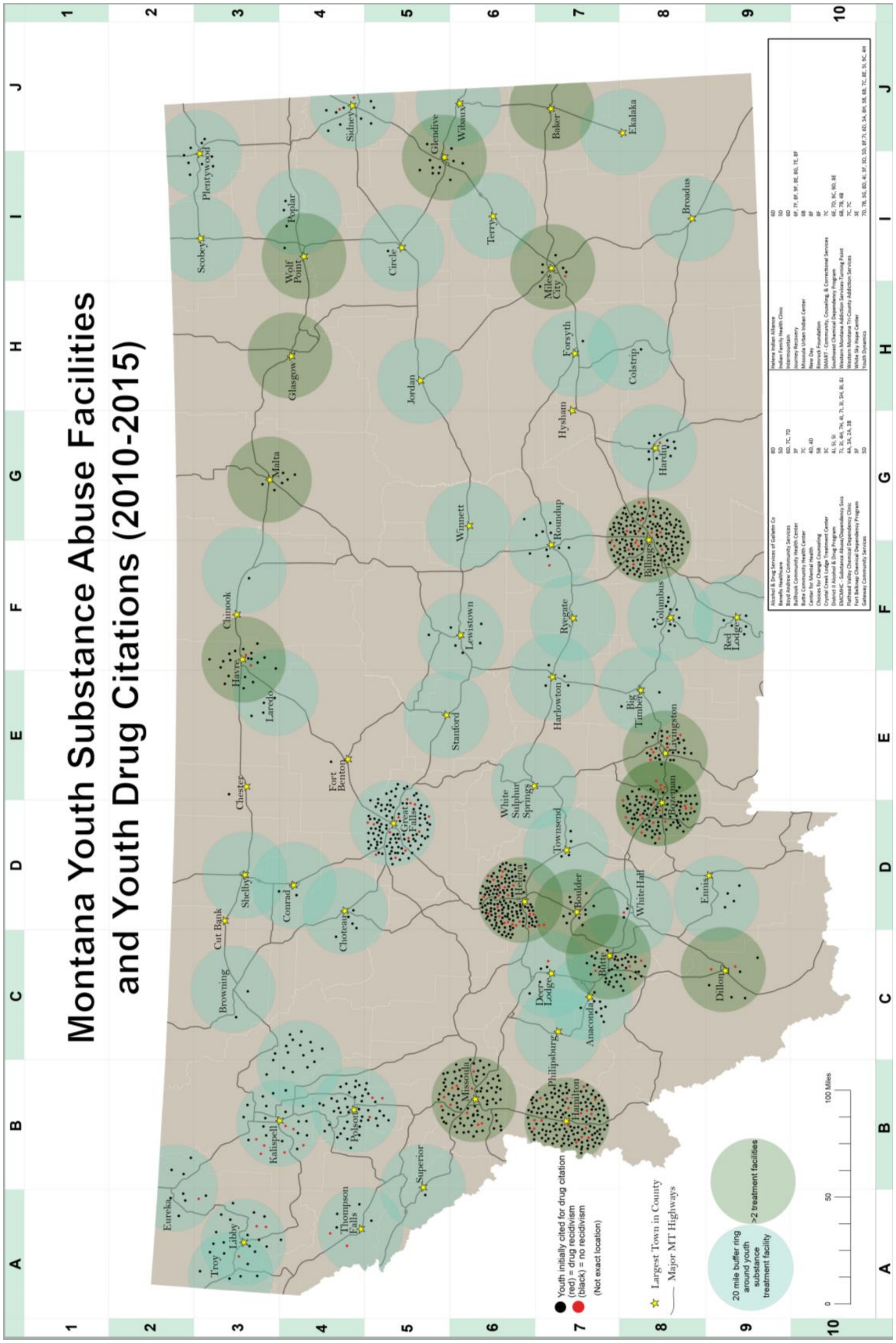
Coordination of Services (COS): "COS provides 13 hours of educational classes to groups of 10 low risk juvenile offenders and their parents. The program also has a community outreach component to enable coordination of the various community juvenile justice and service providers" (pg. 2). COS "involves youth and their parents in a class setting that describes the consequences of continued delinquent behavior, stimulates goal setting, reviews the strengths of the youth and family, and explains what resources are available for helping to achieve a positive pro-social future for the youth"(pg. 15).

Functional Family Therapy (FFT): "FFT is a structured home-based family intervention for moderate- to high-risk youth. Trained FFT therapists have a caseload of ten to 12 families, and the intervention involves 12 visits during a 12-week period. Therapists travel to the family's residence to provide FFT"(pg. 2). FFT "uses a multi-step approach of engagement and motivation to achieve specific, obtainable changes by youth and families" (pg. 15).

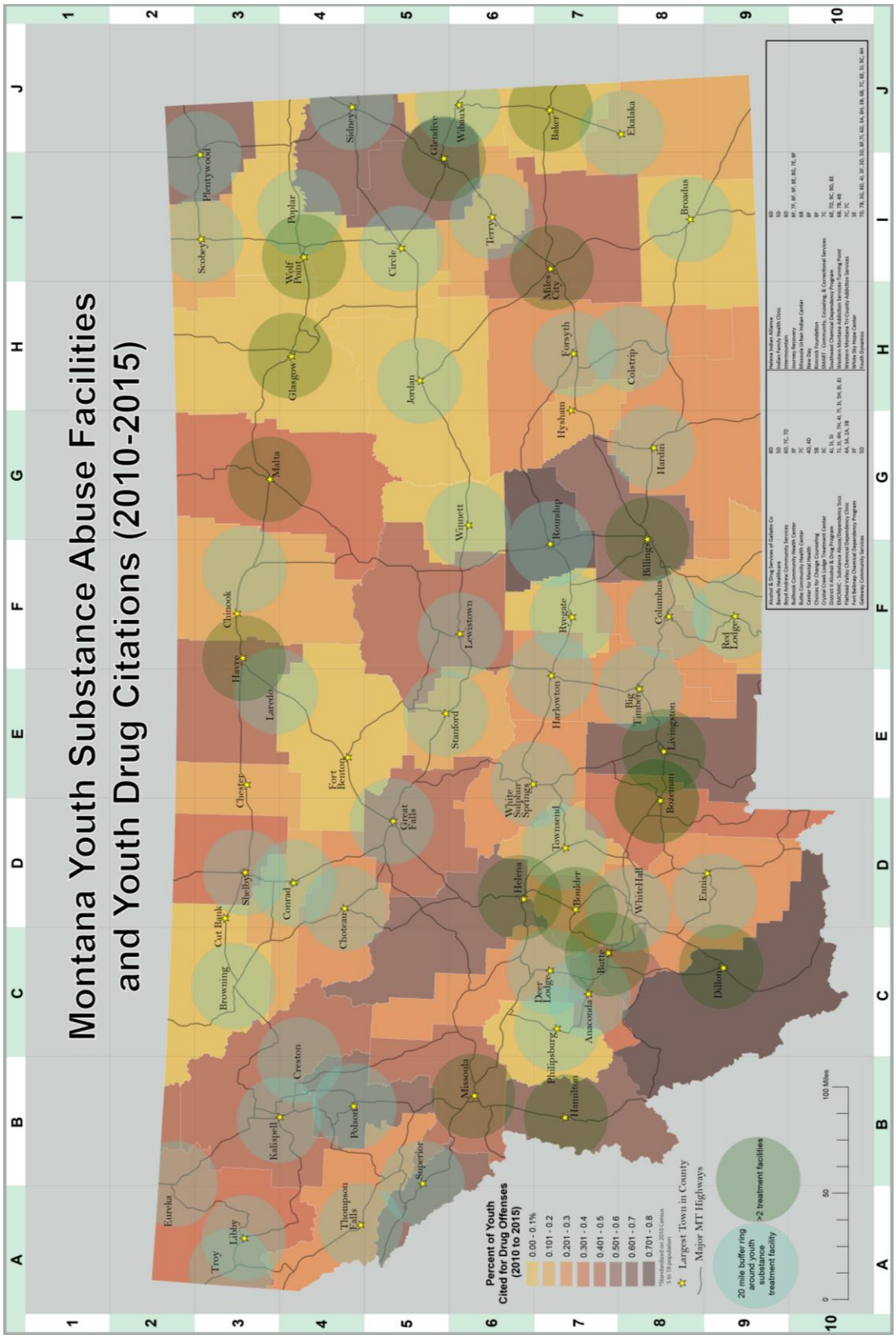
Family Integrated Therapy (FIT): "FIT is a structured home-based family intervention for high- risk youth with co-occurring mental illness and chemical dependency disorders. FIT therapists have caseloads of four to six families for a 20-week period and are available 24 hours per day, seven days per week." (pg. 2). FIT is "intended for high-risk juvenile offenders with co- occurring disorders of mental illness and chemical dependency. Youth receive intensive family and community-based treatment targeted at the multiple determinants of serious antisocial behavior. The first and most important task of the family-based intervention is to engage the family in treatment. The program strives to promote behavioral change in the youth's home environment, emphasizing the systemic strengths of family, peers, school, and neighborhoods to facilitate the change" (pg. 16).

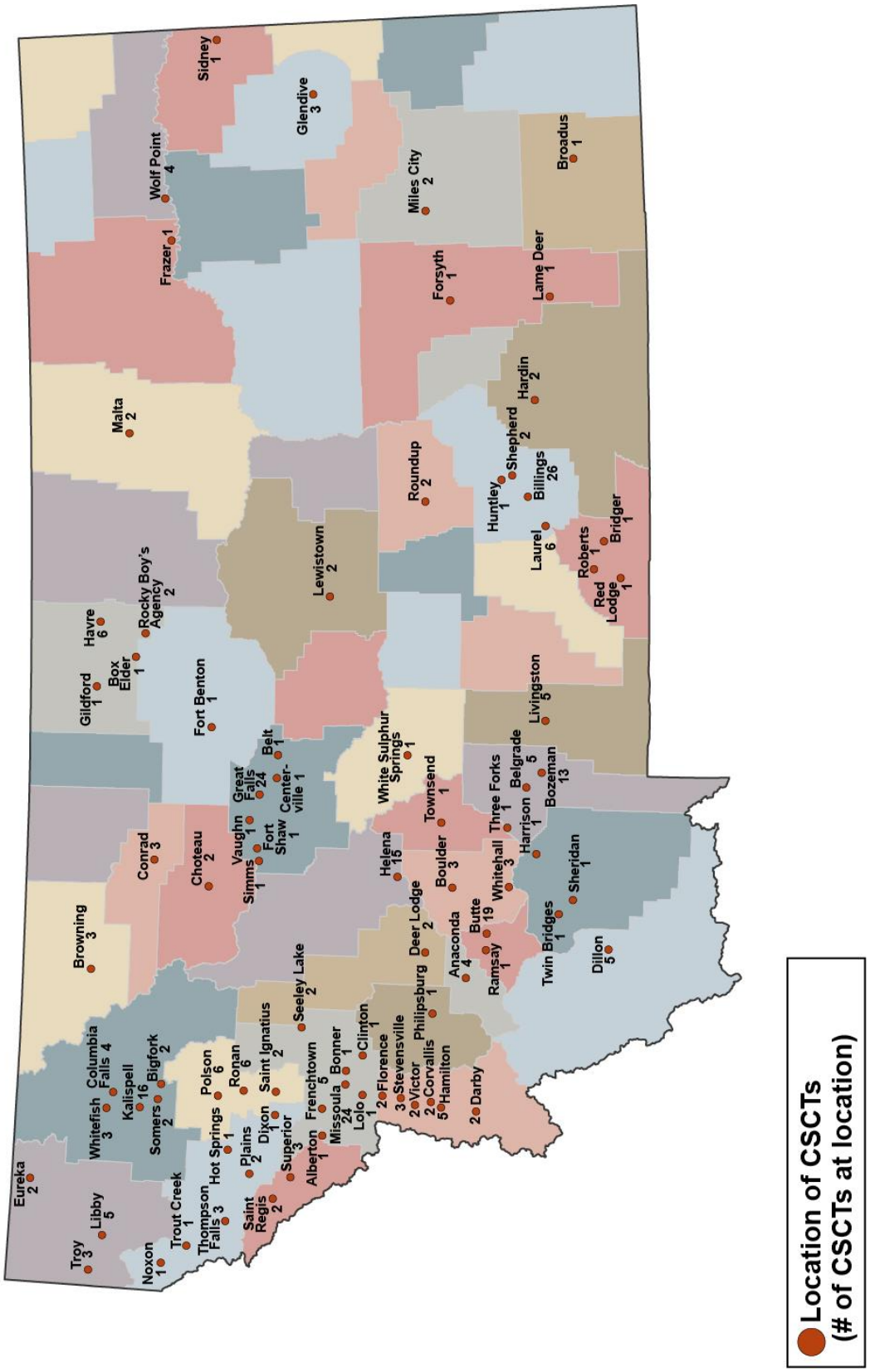
Multi-Systemic Therapy (MST): "MST is a structured home-based family intervention for high- risk youth. MST therapists have caseloads of four to six families for a 16-week period and are available 24 hours per day, seven days per week" (pg. 2). MST "is a structured family-oriented intervention that focuses on improving the family's capacity to overcome the known causes of juvenile delinquency. It promotes the parent's ability to monitor and discipline their children and replace deviant peer relationships with pro-social friendships" (pg. 16).

APPENDIX C


Montana Youth Substance Abuse Facilities
and Youth Drug Citations (2010-2015)
Youth initially cited for drug citation
(red) = drug recidivism
(black) = no recidivism
(Not exact location)
Largest Town in County
Major MT Highways
20 mile buffer ring around youth substance treatment facility
>2 treatment facilities
100 Miles

APPENDIX D


Montana Youth Substance Abuse Facilities
and Youth Drug Citations (2010-2015)
Percent of Youth
Cited for Drug Offenses
(2010 to 2015)
0.00 - 0.1%
0.101 - 0.2
0.201 - 0.3
0.301 - 0.4
0.401 - 0.5
0.501 - 0.6
0.601 - 0.7
0.701 - 0.8
Largest Town in County
Major MT Highways
20 mile buffer ring around youth substance treatment facility
>2 treatment facilities
0
50
100 Miles
Eureka
Troy
Libby
Thompson Falls
Kalispell
Creston
Polson
Superior
Missoula
Browning
Cut Bank
Shelby
Conrad
Choteau
Chester
Havre
Chinook
Laredo
Fort Benton
Great Falls
Malta
Glasgow
Scobey
Plentywood
Poplar
Wolf Point
Sidney
Circle
Jordan
Glendive
Wibaux
Terry
Miles City
Baker
Ekalaka
Broadus
Forsyth
Colstrip
Hysham
Hardin
Billings
Roundup
Winnett
Stanford
Lewistown
Ryegate
Columbus
Red Lodge
Harlowton
Big Timber
Livingston
Bozeman
White Sulphur Springs
Townsend
Helena
Boulder
Whitehall
Ennis
Butte
Deer Lodge
Anaconda
Philipsburg
Hamilton
Dillon


Comprehensive School and Community Treatment (CSCT) Providers in Montana
Location of CSCTs (# of CSCTs at location)
Eureka 2
Troy 3
Libby 5
Noxon 1
Trout Creek 1
Thompson Falls 3
Hot Springs 1
Saint Regis 2
Plains 2
Dixon 1
Superior 3
Alberton 1
Whitefish 3
Columbia Falls 4
Kalispell 16
Somers 2
Bigfork 2
Polson 6
Ronan 6
Saint Ignatius 2
Frenchtown 5
Missoula 24
Bonner 1
Lolo 1
Clinton 1
Florence 2
Stevensville 3
Victor 2
Corvallis 2
Hamilton 5
Darby 2
Seeley Lake 2
Browning 3
Conrad 3
Choteau 2
Simms 1
Vaughn 1
Great Falls 24
Fort Shaw 1
Center-ville 1
Belt 1
Gildford 1
Box Elder 1
Havre 6
Rocky Boy's Agency 2
Fort Benton 1
Malta 2
Frazer 1
Wolf Point 4
Sidney 1
Glendive 3
Lewistown 2
White Sulphur Springs 1
Helena 15
Townsend 1
Boulder 3
Deer Lodge 2
Philipsburg 1
Anaconda 4
Butte 19
Ramsay 1
Whitehall 3
Three Forks 1
Belgrade 5
Bozeman 13
Harrison 1
Livingston 5
Roundup 2
Huntley 1
Shepherd 2
Billings 26
Laurel 6
Hardin 2
Forsyth 1
Miles City 2
Lame Deer 1
Broadus 1
Roberts 1
Red Lodge 1
Bridger 1
Sheridan 1
Twin Bridges 1
Dillon 5

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