



The unspecified residual category of the DSM-5: The challenges of a catch-all diagnosis

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Abstract

The past over-usage of the DSM-IV category of “not otherwise specified” (NOS) resulted in it becoming a vague, catch-all label. The new nomenclature in the DSM-5 is Unspecified Disruptive, Impulse-Control, and Conduct Disorder (UDICCD), however, there are little to no data available on the new nomenclature. The current article is aimed at examining the practical usage of the UDICCD diagnosis by mental health practitioners in the juvenile justice system (JJS). Among the findings, three were most notable. First, girls were more likely than boys to receive a specified diagnosis over UDICCD, in particular ODD. Second, two latent classes were identified within this sample based on various behavior and demographic risk correlates of disruptive behavior disorders. Third, animal cruelty, familial support, and alcohol/drug use predicted whether a youth would receive a UDICCD diagnosis. Results and implications are discussed.

Keywords Juvenile justice · Mental health · Delinquency · Latent class analysis · Gender differences

The DSM has received a multitude of criticisms over the years, with a frequent one being that it is too categorical (Lilienfeld & Treadway, 2016; Wakefield, 2016; Wright et al., 2013). While there are certain benefits to having a categorical diagnostic system, changes were implemented into the DSM-5 to help address that criticism. The DSM-IV category of “not otherwise specified,” or NOS, which had become a vague, catch-all label was specifically targeted and changed to “other specified and unspecified” (American Psychiatric Association, 2013b). The goal of removing the NOS diagnoses was four-fold: to significantly decrease their usage through better criteria specificity; add dimensional assessments to ap-

propriate diagnostic evaluations so that clinicians would be able to evaluate the severity and presence of symptoms; better align the DSM with the World Health Organization’s International Classification of Diseases (ICD); and ensure that both the definitions and diagnostic criteria for DSM disorders reflected the strongest scientific evidence (American Psychiatric Association, 2013b).

The goal was for the DSM-5 to allow for a more dimensional approach to assessment and diagnosis, as well as to limit the use of the catch-all net that the NOS diagnoses had become. However, there is limited research on unspecified diagnoses for any chapter of disorders, including eating

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disorders (Mustelin et al., 2016). Research on Unspecified Disruptive, Impulse-Control, and Conduct Disorder (UDICCD) is quite limited (or almost non-existent); very little is known about the prevalence of the diagnosis and the homogeneity/heterogeneity of individuals who receive that diagnosis. Given the past over-usage of the NOS category of diagnoses (American Psychiatric Association, 2013b), it is important to investigate the current usage and practical utility of UDICCD. The goal of the current study is to examine the utilization of the UDICCD diagnosis in practice, i.e., among mental health practitioners in the juvenile justice system (JJS), to characterize juvenile justice-involved youth diagnosed with UDICCD as compared to other specified disruptive behavior disorders (DBD), and to evaluate the degree of homogeneity versus heterogeneity among individuals within this residual category of the DSM-5.

UDICCD has been typically used for young children and groups of people who do not meet all of the qualifications for a DBD but are impaired in their day to day life due to the presence of the relevant symptoms (Frances, 2013; Lenz & Lancaster, 2016). It can be used as a temporary diagnosis in the face of diagnostic uncertainty, particularly when a fast, specific diagnosis may not be accurate. The vagueness of a UDICCD diagnosis and unclear implications for treatment are referred to as rather unhelpful, especially in forensics, which requires more precision, given the implications of a diagnosis in the legal system (Frances, 2013; Lenz & Lancaster, 2016). Research suggests that individuals with unspecified diagnoses fit less neatly into any particular diagnostic label of the DBD family (Frances, 2013; Lenz & Lancaster, 2016). To our knowledge, there is only one article utilizing a sample of youth involved with the JJS that identified individuals with the residual category diagnosis, NOS (Harzke et al., 2012), and none that have used the DSM-5 nomenclature of UDICCD. Past research has reported a number of individuals, 12.5% of the total sample, with the NOS diagnosis (how UDICCD was referred to prior to the DSM-5) in a Texas juvenile correctional facility, where the study took place. To our knowledge this would be the first article that uses the new nomenclature, UDICCD, and reports on the utilization of this category in the JJS.

Mental Health in the JJS

Prevalence of mental health problems among youth involved with the JJS has been well-documented, with disaggregated estimates by race/ethnicity, age, sex, and type of diagnosis. Harzke et al. (2012) examined a large sample of juveniles from the Texas Juvenile Correctional System and found that the majority of the individuals had a diagnosis of conduct disorder, CD (83%), substance use disorders, SUD (75.6%), a bipolar disorder (18.3%), or a depressive disorder (12.6%).

Another research team had observed a similar distribution in the Cook County, IL, JJS. Specifically, Teplin et al. (2002) worked with a sample of 1829 youth and established that slightly over 40% of males and females had a DBD, with the authors providing the percentile only for CD and oppositional defiant disorder (ODD), the two main categories of DBDs. The authors also found that 66.3% of males and 73.8% of females had at least one mental illness diagnosis, with 60% having a SUD and 40% a DBD diagnosis. Yet another study that recruited 292 youth established that only 32.5% of youth had a DBD diagnosis, with the majority of those being CD; SUD was observed at 50.3% (Wasserman et al., 2002).

As shown in the literature, DBDs are highly prevalent in youth within the JJS. Thus, it is important to examine risk correlates associated with children developing these disorders (Harzke et al., 2012; Wasserman et al., 2002). In the general population, comorbidity of DBD's with attention-deficit/hyperactivity disorder (ADHD), substance use, and internalizing problems has been demonstrated in numerous studies (Berkout et al., 2011; Henry et al., 1993; Loeber et al., 2000; Yampolskaya & Chuang, 2012; Yoshimasu et al., 2016). Callous-unemotional traits have also been linked to DBD's and go above and beyond having CD/ADHD in predicting antisocial outcomes (Frick & White, 2008; McMahon et al., 2010). Similarly, parent-child relationships have also been associated with delinquency (Gove & Crutchfield, 1982). An increased prevalence of trauma (sexual for girls, physical for boys) has been reported for youth involved with the JJS as well (Wasserman et al., 2005). In addition, prior involvement with the JJS predicts re-offending (Vincent et al., 2012). Higher rates of learning disabilities (LD) and overall lower academic achievement for JJS involved youth have also been reported (Burke et al., 2002; Grigorenko et al., 2019), as well as having a lower IQ than the standardization sample means (Werner et al., 2016). In addition, truancy is related to academic failure and later delinquent behavior (Zhang et al., 2010).

The overall goal of this study was to examine the prevalence and relations of DBD's in a Mental Health Unit (MHU) subsample of juveniles from the Harris County Juvenile Probation Department (HCJDP), the third largest juvenile probation department in the United States, which received 11,076 referrals in 2018 (Harris County Juvenile Probation Department, 2018). Specifically, the goal was to identify youth who received a UDICCD diagnosis and describe the youth labeled with it, based on a number of indicators that were made available to researchers (i.e., sociodemographic information, academic achievement, IQ, and mental health) as well as compare them to youth who received other DBD diagnoses. Thus, we had three specific aims. The first aim was to examine relations between different DBD diagnoses, including UDICCD, ODD, CD, and all other DBD's combined,

and demographic characteristics, including sex, age, and race/ethnicity. This aim was descriptive in its nature and intended to demographically characterize youth in custody of the HCJPD, as well as to investigate whether youth with different DBDs are likely to have different demographic characteristics. We expected to find some heterogeneity in the sample, specifically that individuals with distinct DBD diagnoses would differ based on sociodemographic characteristics.

The second aim was to determine whether a subsample of youth in custody of the HCJPD can be categorized to different latent classes based on known risk correlates of DBD's, such as comorbid mental disorders, low academic achievement and/or IQ, age of first truancy, animal cruelty (CU traits), exposure to trauma, prior involvement in the JJS, and familial support. We were particularly interested in whether the aforementioned set of variables would categorize youth with various DBD's, including UDICCD, to latent classes. Whereas a lot is known about ODD and CD, less is known about youth who were diagnosed with UDICCD, and researchers indicate that typically individuals with unspecified diagnoses do not fit a particular diagnostic label (Frances, 2013; Lenz & Lancaster, 2016). Because there are no comparable literature and data on these youth, this aim was exploratory and did not test specific hypotheses.

The third aim was to examine whether youth with UDICCD constitute a homogenous or heterogeneous group. The composition of UDICCD diagnosis in youth, to the best of our knowledge, has not been previously explored, thus the analyses associated with the last aim were also exploratory in nature and were intended to improve understanding of how to better characterize the aforementioned group using demographic, academic achievement, IQ, and the other relevant risk variables associated with delinquency that were described above.

Method

Location

This study was conducted in Harris County, Texas, in collaboration with the Harris County Juvenile Probation Department (HCJPD), which is the third largest juvenile probation department in the US and received 11,076 referrals in 2018 (Harris County Juvenile Probation Department, 2018). HCJPD also has four specialty courts to provide more individualized services to youth referred to the system, including gang court, drug court, mental health court, and CARE court (for victims of human trafficking). Specialty units and services are also heavily emphasized in HCJPD, including the Mental Health Unit (MHU). The MHU is for youth with severe mental

illnesses, to provide them with targeted interventions (Harris County Juvenile Probation Department, 2017).

A large number of youth goes through the probation department and juveniles placed into the MHU are typically screened for mental health problems, administered IQ and academic achievement testing, and asked to self-report other information, including family history, drug use, gang involvement, and other relevant indicators. Thus, data are available on thousands of youth who have been screened by HCJPD during their initial intake, including individuals placed in the MHU (with some having multiple intakes). The investigated sample is a unique sample and has the potential to provide insight into how youth are processed through the JJS and diagnosed in an administrative, rather than research study, setting. The MHU dataset is a subset of a larger JJS dataset provided by HCJPD and includes various information about this sample, such as distribution of psychiatric diagnoses, IQ, family structure, and academic achievement.

Participants

The current sample includes the youth referred to the MHU in HCJPD from 2014 to 2017. The youth were individuals processed by HCJPD and were placed pre-adjudication into the MHU. Data were collected for all individuals processed by HCJPD including pre-adjudicated youth, however, not all data are available for each youth, with missing data being prevalent, given timing and staffing limitations. In addition, some youth had multiple juvenile court referrals, resulting in certain youth having multiple assessment scores. Only a youth's first referral data were used in the current analyses resulting in cross-sectional data. The sample included 3536 participants ($M_{age} = 15.41$ years, $SD = 1.09$; 83.57% boys). Age of youth ranged from 10 to 17 years old. The majority of youth had multiple psychiatric diagnoses, up to six in certain cases. The DBD subgroup ($N = 3087$) included a large number of youth with UDICCD ($N = 2175$; $M_{age} = 15.43$ years, $SD = 1.08$; 85.93% boys). The distribution of sex and race was similar in youth with UDICCD to that of the entire sample (see Table 1 for details).

Table 1 Sample Demographics Information

| Sample | Sex | Race | | | | | |
|------------------------------------|-------|-------|-------|-------|-------|--------|-------|
| | | Black | % | White | % | Latino | % |
| Total <i>N</i> =3536 | Boys | 1553 | 43.92 | 821 | 23.22 | 581 | 16.43 |
| | Girls | 279 | 7.89 | 204 | 5.77 | 98 | 2.77 |
| Unspecified Only <i>N</i> =2175 | Boys | 1006 | 46.25 | 489 | 22.48 | 374 | 17.20 |
| | Girls | 131 | 6.02 | 112 | 5.15 | 63 | 2.90 |

Assessments

The data were collected through an unstructured interview conducted by Master- or PhD-level clinicians employed by HCJPD. The DSM-5 diagnoses were established at the completion of the interview by the HCJPD employees by consensus. Whereas there are other diagnoses included in the Disruptive, Impulse Control, and Conduct Disorders chapter of the DSM-5 (i.e. kleptomania, pyromania, intermittent explosive disorder, and other specified disruptive, impulse control, and conduct disorder), there were not enough youth to analyze those diagnoses separately; thus, those diagnoses were included in the overall DBD group. As a result, four diagnostic groups were differentiated: ODD, CD, UDICCD, and all other DBD groups, which were represented by a single, categorical variable with four levels. Information was obtained for any juvenile referred to the MHU of HCJPD, however, there were missing data for youth and not every child referred to the system will have all assessments and variables available. Family, academic, social, medical history, and behavioral data were collected through a computer-administrated self-report assessment. The following risk factors were pulled from the intake interview: age of first truancy, trauma (scored in a binary fashion for each type separately, including physical trauma, family trauma, community trauma, and sexual trauma [yes/no]), animal cruelty (yes/no), social history of gang involvement (yes/no), and self-reported substance use in the past 6 months (yes/no). Trauma variables were created by HCJPD and included information on whether the youth experienced physical/interpersonal violence, witnessed family violence, witnessed community violence, or experienced sexual abuse. Protective factors included good family support/good relationships with family (yes/no), prior involvement in the JJS (yes/no). See Table 2 for the descriptive statistics for the risk correlates of JJS involvement that were included in analyses.

Massachusetts Youth Screening Instrument, Second Version (MAYSI-2)

The MAYSI-2 is a 52 item, yes/no, self-report screening tool used to identify potential mental health concerns in the JJS. It is a well-validated and reliable tool primarily used by the JJS (Grisso et al., 2001). The MAYSI-2 has 7 subscales: Alcohol/Drug Use, Angry-Irritable, Depressed-Anxious, Somatic Complaints, Suicide Ideation, Traumatic Experiences, and Thought Disturbance (this subtest is assessed only in boys). The subscales have “Caution” and “Warning” cutoffs that indicate when youth are in need of further assessment (Grisso & Barnum, 2006). We were unable to compute the reliabilities in this study due to lack of item level data, however, the authors of the measure report that alpha coefficients for the MAYSI-2 were similar in range and averages to those

of other instruments used to evaluate adolescents’ mental health (Grisso et al., 2001).

Test of Nonverbal Intelligence, 4th Edition (TONI-4)

The TONI-4 (Brown et al., 2010) is designed for individuals aged 6–89 years. The test was created to assess problem-solving and abstract reasoning abilities without requiring reading or writing ability. Specifically, all instructions are provided in pantomime and participants answer by pointing, nodding, or blinking. Item stems are composed with a sequence of abstract figures and a missing figure in the sequence; items are scored dichotomously (Ritter et al., 2011). Authors of the TONI-4 report that in the general population internal consistencies range from .94 to .97, and correlation coefficients with other nonverbal intelligence tests range from .73 to .79 (Brown et al., 1990).

Wide Range Achievement Test 4 (WRAT4)

The WRAT4 is a measure used to assess basic academic skills of reading, spelling, and math in individuals aged 5 to 94 (Wilkinson & Robertson, 2006). The WRAT4 is a fast, simple, and psychometrically sound measure that can be used in diagnosing learning disabilities, assessing academic progress over time, and evaluating achievement/ability discrepancies. The WRAT4 has four subtests: Sentence Comprehension, Word Reading, Spelling, and Math Computation (Wilkinson & Robertson, 2006). Overall, the WRAT4 has high levels of internal consistency in the general population, ranging from .92 to .98 (Dell et al., 2008).

Data Analysis

The aims of the manuscript were three-fold, and each aim was addressed with separate analyses. The first aim examined the relations between different diagnoses (youth with UDICCD versus youth with specified DBD’s) and demographic characteristics (sex, age, race/ethnicity) using chi-square tests of independence. Statistically significant findings were followed up with post-hoc pairwise analyses. The experiment-wise error rate of .05 was maintained using the Bonferroni correction (Hays, 1994). The first aim was addressed using the PROC FREQ procedure in SAS software (version 9.4).

The second aim examined whether youth in HCJPD can be categorized into different latent classes based on known risk correlates of JJS involvement and DBD’s. The following variables were used to classify youth: MAYSI-2 scores, academic abilities (WRAT4 scores), IQ (TONI-4 scores), age of first truancy, trauma (physical, family, community, and/or sexual trauma), good family support/good relationships with family, prior involvement in the JJS, animal cruelty, social history of gang involvement, and self-reported substance use in the past

Table 2 Descriptive Statistics for Risk Correlates of JJS Involvement Included in Analyses

| Continuous Variables | <i>N</i> | <i>M</i> | <i>SD</i> | <i>Min</i> | <i>Max</i> |
|-----------------------------|------------------------|----------------------------------|-------------------------|------------------|------------|
| IQ (TONI-4) | 3077 | 90.60 | 7.16 | 67 | 127 |
| Reading (WRAT4) | 3075 | 89.46 | 12.19 | 55 | 145 |
| Spelling (WRAT4) | 3077 | 91.01 | 11.84 | 55 | 133 |
| Math (WRAT4) | 3079 | 85.73 | 11.80 | 55 | 137 |
| Age of First School Truancy | 2279 | 13.59 | 1.42 | 7 | 17 |
| MAYSI AD | 2109 | 1.75 | 2.12 | 0 | 8 |
| MAYSI AI | 2109 | 3.80 | 2.88 | 0 | 9 |
| MAYSI DA | 2109 | 2.17 | 2.20 | 0 | 9 |
| MAYSI SC | 2109 | 2.18 | 1.90 | 0 | 6 |
| MAYSI SI | 2109 | .69 | 1.37 | 0 | 5 |
| MAYSI TD | 2109 | .71 | 1.05 | 0 | 5 |
| MAYSI TE | 2109 | 1.50 | 1.47 | 0 | 5 |
| Binary Variables | | | | | |
| | <i>N</i> , full sample | Yes Category <i>Frequency</i> | No Category <i>%</i> | <i>Frequency</i> | <i>%</i> |
| Gang Involvement | 3079 | 290 | 9.42 | 2789 | 90.58 |
| Animal Cruelty | 3055 | 90 | 2.95 | 2965 | 97.05 |
| Current Substance Use | 3087 | 2252 | 72.95 | 835 | 27.05 |
| Physical Trauma | 3086 | 188 | 6.09 | 2898 | 93.91 |
| Family Trauma | 3086 | 83 | 2.69 | 3003 | 97.31 |
| Community Trauma | 3086 | 114 | 3.69 | 2972 | 96.31 |
| Sexual Trauma | 3086 | 96 | 3.11 | 2990 | 96.89 |
| Prior Involvement in JJS | 3087 | 333 | 10.79 | 2754 | 89.21 |
| Family Support | 3087 | 635 | 20.57 | 2452 | 79.43 |

Note. MAYSI AD = Alcohol/Drug Use, AI = Angry-Irritable, DA = Depressed-Anxious, SC = Somatic Complaints, SI = Suicide Ideation, TE = Traumatic Experiences, TD = Thought Disturbance

6 months. See Table 2 for descriptive statistics of the risk correlates. The following variables were used as covariates: age, sex, and race/ethnicity. Fits statistics, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), adjusted BIC, Lo-Mendell Rubin likelihood ratio tests (VLMR and LMR), were used to select a best fitting model. The cut-off number of possible latent classes was determined based on: (a) replicability/trustworthiness of the solution, and (b) first occurrence when the LMR was statistically non-significant (Petscher et al., 2013). The second aim was addressed using a mixture modeling approach in Mplus 7.2 (Muthén & Muthén, 1998-2015).

The third aim used a classification tree analysis (CTA) and examined whether youth with UDICCD constituted a homogeneous or heterogeneous group. In doing so, we used demographic variables (sex, race/ethnicity, and age) and the same risk correlates of JJS involvement that were used in the second aim (MAYSI-2 scores, academic abilities, IQ, age of first truancy, trauma variables, family support, prior involvement in the JJS, animal cruelty, social history of gang involvement, and self-reported substance use in the past 6 months) to predict

group membership using CTA. This aim was addressed using the *tree* package in R (Ripley, 2019).

Sample Size Variability across Aims

The administrative nature of the current dataset contributed to a differential pattern of missing data across variables/measures, and consequently across examined aims. There were fewer missing observations in the first aim as this aim utilized demographic and diagnostic information that was available for the majority of individuals in the MHU group. At the same time, aims two and three used a broader range of administered measures that were not completed for all individuals in the MHU group. Aims two and three also utilized the DBD sample specifically, with *N* = 3087. Consequently, the LCA and CTA analyses were based on a smaller subset of non-missing observations. Although missing data were present, we used the maximum likelihood (ML) using the expectation-maximization (EM) procedure to account for the presence of missing data in the LCA. Our statistical approach to missing data was consistent with the more relaxed missing at random

assumption (i.e., data are missing at random conditional on observed covariates).

Results

DBD Diagnoses and Demographic Characteristics

Diagnosis (UDICCD versus any other DBD) and sex (boys or girls) were significantly related, $X^2(1, N=3147)=16.63$, $p<.001$. A larger number of boys (59.87%) than girls (9.88%) received UDICCD relative to specified DBD diagnoses, $X^2(1, N=2195)=5.48$, $p=.02$. In addition, girls were more likely to receive a specified DBD, $X^2(1, N=952)=11.10$, $p<.001$, than a UDICCD diagnosis. Boys and girls differed significantly when comparing frequencies of UDICCD and ODD in the sample, $X^2(1, N=2978)=25.03$, $p<.001$. Specifically, girls ($X^2(1, N=482)=22.50$, $p<.001$) but not boys ($X^2(1, N=2496)=2.84$, $p=.09$) were more likely to receive a diagnosis of ODD rather than UDICCD. There were no statistically significant associations with race and type of DBD diagnosis, or for age type of DBD diagnosis.

Classification of Youth with UDICCD and Specified DBD

Model Comparison

Table 3 presents fits statistics for the latent class models (1-class to 3-class solution). Although we computed models with up to 5-classes using the LCA, we only reported models with up to the 3-classes because the addition of new classes

(beyond the 3-class solution) did not satisfy the class cut-off criteria discussed in the data analysis section. Fit statistics and model usefulness suggested that the 2-class solution had the best fit. Although (as expected) AIC, BIC, and adjusted BIC decreased with an increasing number of classes, the most meaningful/significant decline was observed up to the 2-class model. Examination of the VLMR and LMR and p value associated with those fit statistics suggested that the 2-class solution provided the best fit. Entropy suggested that the 2-class solution was useful for distinguishing groups of subjects that are distinct from each other relative to other computed models.

Description of 2 Classes Based on Juvenile Delinquency Risk Factors

Figure 1 suggested that Classes 1 (42%) and 2 (58%) had a similar pattern of responses to the binary variables used by HCJPD to assess the risk and protective factors. However, Class 1 had an overall higher pattern of responses on the risk correlates, such as gang involvement (risk difference, $RD=.05$), physical ($RD=.06$), sexual ($RD=.05$) and community ($RD=.03$) trauma. Youth in Class 1, on average, also had lower scores on the presence of family support ($RD=-.05$). Out of the HCJPD variables, the highest score for both classes was for the substance use self-report variable, with Class 1 having a slightly higher probability of endorsement ($RD=.06$). Class 1 also scored higher on all of the MAYSI-2 subscales than Class 2. The age of first truancy did not appear to differ between the two classes. Interestingly, Class 1 scored higher on academic achievement and IQ variables compared to Class 2 ($d_{IQ}=0.003$, $d_{reading}=0.004$, $d_{spelling}=$

Table 3 Fit Statistics for Latent Class Models (1-Class through 3-Class Solutions)

| Fit statistics | 1 Class | 2 Class | 3 Class |
|----------------------------|----------------|----------------|----------------|
| Loglikelihood | -95,349.648 | -85,520.542 | -84,469.729 |
| AIC | 190,771.295 | 171,155.084 | 169,111.457 |
| BIC | 190,988.554 | 171,499.076 | 169,630.463 |
| BIC (sample-size adjusted) | 190,874.167 | 171,317.964 | 169,357.206 |
| Entropy | N/A | 0.686 | 0.736 |
| Pearson (df) | 1299.983 (497) | 1235.857 (489) | 1298.504 (479) |
| P value | <0.001 | <0.001 | <0.001 |
| LMR test | N/A | 8727.436 | 2092.646 |
| LMR, p value | N/A | <0.001 | 0.1457 |
| VLMR test | N/A | -89,902.987 | -85,520.542 |
| VLMR, p value | N/A | <0.001 | 0.1440 |
| BLRT test | N/A | -89,902.987 | -85,520.542 |
| BLRT, p value | N/A | <0.001 | <0.001 |

Note. $N=3087$; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; LMR = Lo-Mendell-Rubin test; BLRT = Bootstrap Likelihood Ratio Test. N/A = not applicable for 1-class solution as there is no other model to compare it to; 3 class solution was not replicated

Two-class Model of Juvenile Delinquency Risk

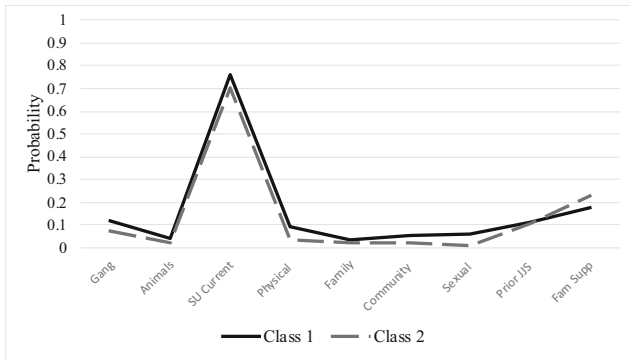


Fig. 1 Two-class Model of Juvenile Delinquency Risk. *Note.* Class 1 = High risk/High achievement, Class 2 = Low risk/Low achievement. Gang = gang involvement, Animals = animal cruelty, SU Current = current substance use (past 6 months), Physical = physical trauma, Family = family trauma, Community = community trauma, Sexual = sexual trauma, Prior JJS = no prior juvenile justice system involvement, Fam Supp = family support

0.004, $d_{\text{math}} = 0.003$). Class 1 scored in the Low Average to Average range on the IQ and WRAT subtests, while Class 2 only scored in the Low Average range. See Fig. 2 for the visual representation of the scores. The effect sizes were small, but interpretable and meaningful in this context; effect sizes and their meaningfulness differ across fields and the type of research being done (Bakker et al., 2019). Based on the registered effects and their magnitudes, Class 1 was named High Risk/High Achievement, and Class 2 was named Low Risk/Low Achievement. It is important to note that the risk scores are not absolute, rather they are relative between the two classes within the current sample.

Covariates helped to further describe the two classes. Specifically, boys were 63.9% less likely than girls to be in the High Risk/High Achievement class as compared to the Low Risk/Low Achievement. There were no race/ethnicity differences in class membership when controlling for sex and age. See Table 4 for distribution of sex and race/ethnicity by class.

Two-class Model of IQ and Academic Achievement Scores as Class Membership Correlates

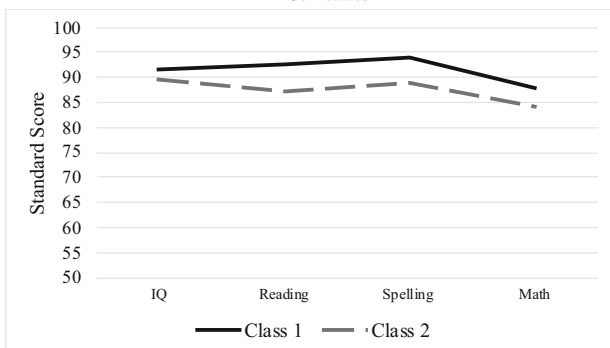


Fig. 2 Two-class Model of IQ and Academic Achievement Scores as Class Membership Correlates. *Note.* Class 1 = High risk/High achievement, Class 2 = Low risk/Low achievement

Characteristics of UDICCD Sample

Classification tree analysis was used to generate decision rules for identifying youth with the UDICCD diagnosis. Figure 3 represents obtained results. They suggested that indicators of animal cruelty, family support, and MAYSI-2 alcohol/drug use were utilized in the tree construction. Participants who were not cruel towards animals and had familial support were more likely to be classified as UDICCD. However, if non-cruel participants did not have a proper familial support and their score on MAYSI alcohol/drug use was greater than 4.5 (out of 8), they were more likely to be classified as having a specified DBD. The tree had four terminal nodes with the misclassification error rate equal to 0.28 (425 out of 3087 participants incorrectly/mistakenly classified as having a UDICCD diagnosis). The utility of the tree was examined by separating the study sample ($N = 3087$) to training and test data (75:25 split) and calculating the accuracy $(\frac{TN+TP}{TP+TN+FP+FN})^1$. The tree did a fairly good job classifying participants to UDICCD, with 73% correct predictions on the test data.

Discussion

The current study investigated a sample of an unexpectedly large number of youth who received the UDICCD diagnosis, a residual category of DSM-5. Given the results of this analyses, it appears that the goal of limiting the use of the DSM-IV NOS diagnosis as a catch-all net led to a creation of new catch-all net, simply under a different name. The specific aims of the study were to characterize and better understand the type of youth receiving the UDICCD diagnosis, to examine if they are a homogeneous or heterogeneous group, as well as to compare them to youth who received other DBD diagnoses. The poorly defined “unspecified” group of diagnoses poses some practical challenges that thus research hopes to address.

The results from the first aim suggested that boys were more likely to receive a UDICCD diagnosis than a specified DBD diagnosis, while girls were more likely to receive a specified diagnosis, rather than UDICCD, specifically ODD as compared to UDICCD. However, there were no statistically significant differences between girls and boys and any other specified DBD diagnosis (i.e., CD or the combined variable of all other DBD diagnoses). Most likely this is because a relatively small number of individuals had a specified DBD diagnosis in the sample. It appears that girls were more likely to receive a specified diagnosis, rather than UDICCD, because their externalizing behavior is not perceived as disruptive as that of boys unless it reaches certain high levels which warrant a specified diagnosis. This may be related to the gender

¹ TN = true negative, FN = false negative, FP = false positive, TP = true positive.

Table 4 Sex and Race/Ethnicity by Class Membership

| Class | Sex | Race/ethnicity | | | Total |
|--------------------------------------|-------|----------------|-------|--------|-------|
| | | Black | White | Latino | |
| High risk/High achievement (Class 1) | Boys | 446 | 316 | 187 | 1286 |
| | Girls | 149 | 127 | 61 | |
| Low risk/Low achievement (Class 2) | Boys | 923 | 392 | 331 | 1801 |
| | Girls | 89 | 42 | 24 | |
| Total | | 1607 | 877 | 603 | 3087 |

paradox, where girls may be overall less likely to receive a DBD diagnosis, but when they do, they have more severe problems with a less positive prognosis (Loeber & Keenan, 1994).

Last, there were no statistically significant relations between diagnosis with race/ethnicity or age, which may suggest that the psychologists at the detention center are unbiased in their diagnosing of youth. It could also entail that in the population there are no age or racial/ethnic differences in diagnosis prevalence. According to the DSM-5, ODD is fairly evenly spread across ethnicities and race, and while the gender gap is more prevalent at a younger age (boys are more frequently diagnosed with ODD in childhood), the male predominance is less consistently reported in adolescence and adulthood (American Psychiatric Association, 2013a). Information on CD, other specified, and unspecified with regard to gender, race/ethnicity, and age distribution are limited in the DSM-5 (American Psychiatric Association, 2013a). Last, it may be because the default diagnosis in the system is UDICCD, potentially due to the fact that juvenile probation officers may view those with CD as more likely to recidivate (Haney-Caron et al., 2016), or simply because mental health practitioners in the system are time-limited and cannot provide a more concrete diagnosis. Thus, few individuals qualify for a specified DBD diagnosis, leading it to be evenly distributed by age and race.

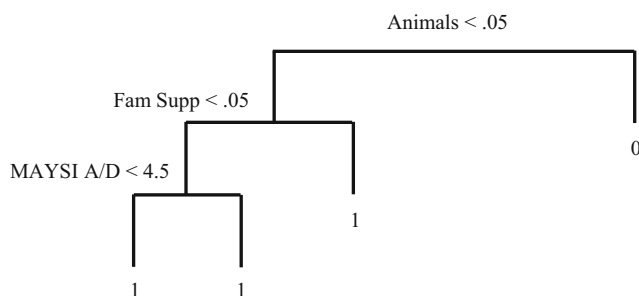
Classification Tree of the UDICCD Sample

Fig. 3 Classification Tree of the UDICCD Sample. *Note.* Animals = animal cruelty, Fam Supp = family support, MAYSI A/D = MAYSI alcohol/drug use subscale

The second aim identified two latent classes in the sample: The High risk/High achievement class and the Low risk/Low achievement class. Girls were more likely than boys to be in the High risk/High achievement class. The High risk/High achievement class had higher scores on both risk variables typically associated with JJS and academic achievement. The Low risk/Low achievement youth had slightly lower scores on the risk correlates frequently associated with JJS involvement, but also had lower scores on the IQ measure and achievement measures. Thus, in the current sample there appear to be two clusters of risk factors associated with JJS involvement: mental health concerns (higher scores on risk factors, lower scores on protective factors), or low IQ and achievement. While the effect sizes are fairly small, it provides some initial guidance for future research.

It has been established that youth involved with the JJS frequently have mental health concerns (Harzke et al., 2012; Shufelt & Coccozza, 2006). Girls with significant mental health concerns may be at particular risk for JJS involvement. Research suggests that girls in the JJS have higher rates of mental health disorder, including affective disorders, PTSD, and certain DBD's (Harzke et al., 2012; Teplin et al., 2002). Comorbid internalizing disorders (Henry et al., 1993; Yoshimasu et al., 2016) and trauma (Wasserman et al., 2005; Yampolskaya & Chuang, 2012) are often related to antisocial behavior and delinquency. In the current sample, girls were more likely to be in the High risk/High achievement class (i.e. Class 1, the mental health concerns cluster), which had higher reported traumatic experiences probabilities in addition to other risk factors.

The second cluster involves lower IQ and academic achievement. Low academic achievement, LD's, and possessing a lower IQ than the standardization sample means have frequently been reported for JJS youth (Burke et al., 2002; Grigorenko et al., 2019; Grigorenko et al., 2015; Werner et al., 2016). Research indicates that poor academic outcomes can adversely affect a child's behavior, and early behavioral problems can lead to poor academic outcomes (Katsiyannis et al., 2008). Recidivism rates have been found to be highly correlated with low levels of academic performance (Katsiyannis et al., 2008).

The two clusters identified with the LCA have implications for treatment, such as providing more school/tutoring services to the youth with lower achievement scores or providing more mental health services to youth who score high on the MAYSI-2 and endorse risk factor questions during the intake interviews. There is a large number of girls in the JJS that have suffered trauma and endorse many mental health concerns. This may suggest that girls need more specialized treatment in the facility, focusing on their mental health, specifically. Previous studies have not found sex differences in PTSD rates among girls and boys in a Texas Juvenile Probation Commission, TJPC (Wasserman et al., 2005), however, in the current study girls were more likely to be in the High risk/High achievement class which, in turn, has the highest trauma and mental health problems. It is of importance to examine why so many girls with trauma and mental disorders are present in JJS facilities and whether that is the correct placement for them. However, while girls are more prevalent in this class, there are also many boys who experience serious mental health concerns. Therefore, services should be based on assessment and screener scores, rather than on the “rule of thumb” that girls may more frequently present with mental health concerns.

Overall, targeting each individual’s needs may decrease the time they spend in the facility and/or the chances of them returning to the facility. For example, Foster et al. (2004) demonstrated that improved mental health services reduce the risk of JJS involvement and Katsiyannis et al. (2008) reported that academic interventions (specifically in reading) can effectively reduce rates of both delinquency and recidivism. Other research also suggests that early education interventions may achieve long-term prevention of antisocial behavior and delinquency (Yoshikawa, 1994). The youth with UDICCD contribute significantly to the current pattern of results due to that being the primary diagnosis in the sample. Thus, we can see that while the diagnosis does not provide much information, other aspects of the intake procedure can indicate which services to provide to which youth.

The results from the third aim suggested three variables were helpful in classifying youth as having UDICCD. Participants who were not cruel towards animals and had familial support were more likely to be classified as UDICCD. However, if non-cruel participants didn’t have proper familial support and their score on MAYSI alcohol/drug use was greater than 4.5, they were more likely to be classified as having a specified DBD. Animal cruelty is part of the diagnostic criteria in the DSM-5 for CD. Cruelty towards animals has been found to be predictive of future delinquency, potentially through moral disengagement (Walters, 2019). The literature on psychopathy often discusses animal cruelty as a proxy for CU traits, and recently, researchers have been using psychopathic tendencies to examine predictive validity of antisocial behavior in adolescents through adulthood (Dadds

et al., 2006; Frick & White, 2008; McMahon, Witkiewitz, Kotler, & Conduct Problems Prevention Research, 2010). Youth with conduct problems who also have CU traits specifically, tend to follow a more severe and stable pattern of antisocial behavior (Frick & White, 2008). Therefore, non-cruelty towards animals being related to an individual having UDICCD, rather than qualifying for a specified DBD, is consistent with the literature. Familial support is important for prevention of antisocial behavior and delinquency (Gove & Crutchfield, 1982) and neglect has been associated with higher recidivism rates (Ryan et al., 2013), thus youth who do not have familial support may be more likely to qualify for a specified DBD, rather than UDICCD. The other variables were not helpful in successfully classifying youth as having a UDICCD diagnosis.

Of special interest was the high endorsement probability of drinking or taking drugs in the past 6 months, in addition to the elevated scores on the alcohol/drug index of the MAYSI across both classes. The current substance use variable had the highest peak in the graph of probabilities, which suggests many of the youth may struggle with SUD. Previous research has found direct links between DBD’s, delinquency, and SUD (Loeber et al., 1999; Neighbors et al., 1992). In addition, those studies also reported relationships between internalizing disorders such as depression and anxiety with SUD and DBD’s, which helps explain the finding from the current paper that both classes had elevated reports of substance. While there are special units at HCJPD for individuals with drug abuse problems, it may be necessary for more youth in the system to receive the necessary support. Future exploration of the type of substances most often abused as well as the motivation behind the substance use (for example, coping mechanism versus peer pressure) is necessary because the reason of substance use can influence the type of intervention that will be most effective (Glavak Tkalić et al., 2013).

Limitations

The sample used in this research was from an administrative dataset provided by the HCJPD, which includes unique and valuable information about the youth involved in the JJS, specifically in the MHU. However, administrative datasets have certain limitations. The study was not designed; thus, analyses could only be conducted on available variables which may have impacted the limited findings of the third aim. The diagnostic process within JJS does not include a structured diagnostic interview, which may clarify specific diagnoses and, therefore, enhance the validity of the diagnoses of the youth (Wasserman et al., 2004). More research on the correspondence between administrative diagnoses and diagnoses that are based on clinical interviews is needed.

Conclusions

The current study provides information on two clusters of risk factors for JJS involvement. The endorsement of more risk factors and less protective factors or low IQ and achievement demonstrate common problems juveniles face which can inform future treatment plans. Identifying youth who endorse multiple diagnoses, common risk factors, trauma, or low family support can be informative for providing the best care possible – whether it is providing individual therapy to the youth or multisystemic therapy to those families. Working with administrative samples can provide much needed insight to real-world problems, which will then lead to relevant solutions and treatments.

The current dataset contained an overwhelming number of youth with the UDICCD diagnosis. The unspecified residual category of diagnoses does not typically provide much information about the youth, which can impact the types of services the youth may receive. Structured diagnostic tools would be beneficial in forensic settings due to their reliability and validity (Meyer et al., 2001; Segal et al., 2006), given that youth are provided services and treatment based on their diagnosis. Future research will need to investigate whether similar patterns of diagnosis are identified using structured interviews. Specific guidance needs to be provided to JJS clinicians with regard to the usefulness or lack of such for the utilization of the unspecified residual category of diagnoses in forensic settings.

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Availability of Data and Material Data can be made available upon request.

Code Availability Code can be made available upon request.

Authors' Contributions All authors whose names appear on the submission.

1) made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data;

2) drafted the work or revised it critically for important intellectual content.;

3) approved the version to be published;

4) agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Declarations

Ethics The research was approved by the University of Houston IRB.

Informed Consent Statement Data were administrative in nature, with no identifying information included in the manuscript. Written consent for all HCJPD procedures was obtained from the parents by HCJPD employees when the juveniles were being processed after arrest and/or detention.

Conflicts of Interest/Competing Interests One of the authors, Matthew Shelton, is employed by the organization where the data were collected, Harris County Juvenile Probation Department. No other conflicts of interest to report.

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