An Epidemiological Study of Attention-Deficit Hyperactivity Disorder and Major Depression in a Male Prison Population

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One hundred two inmates were interviewed and tested to determine epidemiological rates of attention-deficit hyperactivity disorder (ADHD) and depression in an adult male prison population. The Beck Depression Inventory, Hamilton Rating Scale, and four measures to assess childhood and adult ADHD were completed. The two disorders were diagnosed independently. Diagnosable ADHD was found to occur in 25.5 percent of the inmates, and major depression occurred in 25.5 percent of the inmates. A significant relationship between ADHD and depression was found to exist ($p < .001$). Having identified a major mental health problem in the prison population, implications include a need for further diagnosis and treatment of these disorders within a prison setting. The relationship between depression and ADHD also needs further examination.

In reviewing the literature it becomes apparent that attention-deficit hyperactivity disorder (ADHD) and depression represent two diagnostic categories of potential concern in prison populations as well as in the general population. A brief review of this literature follows.

Attention-Deficit Hyperactivity Disorder The primary symptoms of ADHD are inattention, hyperactivity, and impulsivity. It was previously believed that ADHD, a disorder beginning in childhood, remitted before adulthood, but it has been known that there are sequelae of this disorder. The majority of longitudinal studies conclude that some hyperactive children become delinquent and develop psychiatric disorders as adults significantly more often than do normal children.[1-4]

More specifically, the relationship of interest between ADHD and criminal behavior or incarceration has been studied widely with adolescents. Rates of hyperactive adolescents involved in antisocial behaviors and criminal activities vary widely, ranging from 10 percent to 45 percent.[5-9]

Studies with adults find similar results. The 5-, 10-, and 15-year controlled follow-up studies conducted at Montreal

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Children's Hospital found that 23 percent of the adults with ADHD met the criteria for antisocial personality disorder compared with only 2.4 percent of the controls. Interestingly, no other diagnosis distinguished the two groups.[10] Similarly, a study by Amado and Lustman[11] reported that in addition to ADHD symptoms, antisocial behavior develops in approximately one fourth of those adults manifesting ADHD as children. These rates concur with the rates of hyperactive adolescents engaging in antisocial patterns of behavior reported by Mendelson et al.[2] and Weiss et al.[7]

More direct evidence of the prevalence of ADHD in incarcerated individuals is given by Favarino.[12] She collected data on 100 males in jail and found 28 percent of them diagnosable with ADHD both as children and adults. The literature certainly suggests ADHD coincides with antisocial behavior and incarceration. Further evidence of the extent of ADHD in a prison population now needs to be documented.

Major Depression Major depression in adults has been widely studied, but its relationship to criminal activity is less frequently reported. Estimated prevalence rates for depression in the general population stand at three to five percent.[13] Prevalence has usually been computed on the basis of either the general population or those seeking help in clinics, hospitals, or community mental health care facilities.

Although the groups studied are diverse and the independent variables and classifications vary, several papers cite the co-occurrence of affective symptoms and sociopathic behaviors. Woodruff, Goodwin, and Guze[14] found a high degree of depression in persons diagnosed with antisocial personality disorder at a psychiatric outpatient treatment facility. Cytryn and McKnew[15] called antisocial behavior one of the common "masks" of "masked depression." Finally, Shaffer[16] found 75 percent of his sample of adolescents who committed suicide to have exhibited antisocial behaviors.

The presence of depression in incarcerated individuals has been acknowledged in studies by Lubin, Horned, and Knapp,[17] Chiles, Miller, and Cox,[18] and Good.[19] The Favarino study[12] found 21.3 percent of a jail sample to be diagnosable with major depression. Similarly, Cote and Hodgins[20] found 14.9 percent of a group of homicide offenders and 10.2 percent of other offenders for a total of 25 percent to meet a major depression diagnosis. The rate of major depression increased to 55 percent when subjects were permitted more than one diagnosis.

Good[19] reviewed the literature on mood disorders in criminal populations, concluding that such disorders are underdiagnosed. The prevalence studies that have been carried out directly with criminal populations used populations distinguished by specific crimes, populations of adolescents, disproportionate numbers of females, or subjects drawn only from minimum security facilities. Some reports used only descriptions without using diagnostic criteria for categorization. The literature lacks an overall epidemiologic study of depres-

sion using diagnostic criteria in the general male prison population.

Relationship Between ADHD and Depression Although ADHD and major depression have some similarities, they represent two distinct categories of diagnosis. The inclusion of both disorders in the same study is largely due to the extensiveness with which both potentially are found in the prison population. At the same time, symptom similarities suggest the desirability of their concurrent study for a determination of the relationship between the two disorders.

Lahey[21] presents evidence suggesting ADHD and depression may be highly correlated. Weiss and Hechtman[10] suggest that individuals with ADHD are more likely than matched controls to attempt suicide. Other studies have found ADHD predisposes individuals to manifesting depression in adulthood.[2,22-24] Finally, Biederman and various colleagues have produced three articles showing the comorbidity of ADHD and affective disorders including a possible familial association.[25-27]

One study specifically addressing the relationship between depression and ADHD in incarcerated individuals found 10.7 percent of all subjects in a jail population to exhibit both ADHD and major depression.[12] Aside from this study, the literature is devoid of research where independent diagnoses of each disorder within the same population have explored the relationships between the two diagnoses.

In summary, relationships between ADHD and criminality, between depression and criminality, and between ADHD and depression seem to exist but have not been fully explored. This study therefore seeks to fill a void in the literature by measuring the prevalence of ADHD and depression in a prison population and documenting the relationship between the two disorders for the same population.

Method

Subjects The subject pool consisted of 102 male offenders at the Utah State Prison, ages 16 to 64 years. Demographic distributions for the sample and prison at large can be found in Table 1. The Utah State Prison is the only prison in the state and houses inmates of all security classifications. Inmates bearing even prison identification numbers were approached for participation in the study. Use of even numbers represented no specific purpose but simply allowed some randomization, manageability, and a systematic approach. Every individual asked to be a subject agreed to participate.

Instruments Three different types of measures were administered in order to have a comprehensive data bank.

(1) *Pencil-paper tests of depression and ADHD.* Each inmate completed the Beck Depression Inventory (BDI)[28], which taps affective, cognitive, and physiological symptoms of depression.[29]

(2) *Questionnaires.* Subjects also completed three questionnaires developed by Wender, Reimherr, and Wood.[23] The Adult List of Problems was designed to tap ADHD symptoms in adulthood, whereas The Child List of Problems and

Table 1
Comparison of Sample Population to Prison Population at Large on Demographic Variables

	Sample		Prison	
	N	%	N	%
Age				
16–19	5	5.0%	36	2.0%
20–24	32	31.7%	385	21.7%
25–29	24	23.8%	462	26.1%
30–34	12	9.9%	333	18.8%
35–39	13	12.9%	229	12.9%
40–44	6	5.9%	153	8.6%
45–49	4	4.0%	94	5.3%
50–54	3	3.0%	36	2.0%
55–59	0	0.0%	24	1.4%
60+	2	2.0%	20	1.1%
Total	101		1772	
$(\chi_{(9)}^2 = 14.13, p > .05.)$				
Marital Status				
Married	25	24.8%	310	23.3%
Divorced	23	22.8%	297	22.3%
Separated	3	3.0%	67	5.0%
Widowed	2	2.0%	18	1.4%
Single	47	46.5%	624	46.8%
Other	1	1.0%	17	1.3%
Total	101		1333	
$(\chi_{(5)}^2 = 1.24, p > .05.)$				
Race				
White	81	81.0%	938	70.2%
Hispanic	9	9.0%	240	18.0%
Black	9	9.0%	121	9.1%
North American Indian	1	1.0%	27	2.0%
Asian	0	0.0%	10	.7%
Total	100		1336	
$(\chi_{(4)}^2 = 7.08, p > .05.)$				
Education				
7–9	18	18.6%	194	18.8%
10–12	70	72.2%	736	71.2%
13–15	8	8.2%	89	8.6%
16+	1	1.0%	15	1.5%
Total	97		1034	
$(\chi_{(3)}^2 = .13, p > .05.)$				
Occupation				
Laborer	46	45.1%	629	52.4%
Craftsman	12	11.8%	76	6.3%
Operative	10	9.8%	46	3.8%
Service/Sales	9	8.8%	92	7.7%
Professional	5	4.9%	18	1.5%
None	8	7.8%	137	11.4%
Unknown	7	6.9%	139	11.6%
Other*	5	4.9%	63	5.39%
Total	102		1200	

$(\chi_{(7)}^2 = 22.11, p < .05.)$

Table 1 — Continued

	Sample		Prison	
	N	%	N	%
Religion				
LDS (Mormon)	46	46.5%	496	37.5%
Catholic	16	16.2%	352	26.6%
Protestant	12	12.1%	187	14.1%
None	14	14.1%	195	14.7%
Other	11	11.1%	93	7.0%
Total	99		1323	
($\chi_{(4)}^2 = 8.22, p > .05$.)				
Type of crime				
Property	49	48.5%	460	36.6%
Against persons	16	15.8%	496	39.5%
Sexual	24	23.8%	226	18.0%
Drug related	11	10.9%	39	3.1%
Other	1	1.0%	35	2.8%
Total	101		1256	
($\chi_{(4)}^2 = 35.73, p < .05$.)				
Degree of crime				
Class A	4	3.9%	8	.6%
First degree	14	13.7%	400	30.7%
Second degree	39	38.2%	511	39.29%
Third degree	31	30.4%	333	25.6%
Capital	0	0.0%	4	0.0%
Unknown	14	13.7%	46	3.5%
Total	102		1302	
($\chi_{(4)}^2 = 23.60, p < .05$.)				
Weapons used in the crime				
Yes	13	13.3%	468	36.1%
No	85	6.73%	829	64.0%
Total	98		1297	
($\chi_{(1)}^2 = 21.00, p < .05$.)				
Mental health record				
Past institutionalization	17	17.9%	313	27.1%
No institutionalization	78	82.1%	843	72.9%
Total	95		1156	
($\chi_{(1)}^2 = 3.81, p > .05$.)				
Juvenile institutional record				
Yes	29	31.5%	578	51.1%
No	63	68.5%	554	48.9%
Total	92		1132	
($\chi_{(1)}^2 = 12.98, p < .05$.)				
Age at first arrest				
7–9	2	2.0%	67	5.0%
10–14	23	23.5%	486	36.6%
15–19	37	37.8%	514	38.7%
20–24	18	18.4%	130	9.8%
25–29	6	6.1%	60	4.5%
30–39	3	3.4%	45	3.4%
40+	9	9.2%	25	1.9%
Total	98		1327	
($\chi_{(6)}^2 = 33.48, p < .05$.)				

Adult Questionnaire—Childhood Characteristics focus on child ADHD symptoms.

(3) *Interviews.* Each subject was given a semistructured interview during which the Hamilton Psychiatric Rating Scale of Depression and the Attention Deficit Disorder-Residual Type Rating Scale[23] were completed.

Procedure Inmates were contacted, tested, and interviewed during the 14- to 90-day period of evaluation and placement upon initial entry to the prison. Completion of the paper-pencil tests and interview for each subject were always completed within one week once begun.

Paper-pencil tests were administered individually to subjects by a psychology technician on the prison staff who was taught about the measures so that he could answer questions. The tests were read to the subject when reading skills were not sufficient for adequate test completion.

All interviews of inmates were conducted by the first author (hereafter called the examiner). Each subject's paper-pencil tests were reviewed prior to the interview. The examiner checked for appropriate test completion, inquired as to subject's interpretations of possible ambiguous questions, and gauged the reading ability, honesty, and effort of the subject.

Diagnosis occurred after the collection of test and interview data from all subjects. The examiner served as the diagnostician. Realizing experimenter bias may have been a factor, two methods of interrater reliability were employed. First, a comparison was made between the examiner's diagnoses and another clinician's diagnoses on 100 protocols. These protocols were obtained using the same instruments and methods used in the current study. They came from individuals incarcerated in a jail. A second comparison was made between the examiner's diagnoses and those given by the second author on the data collected for the current study.

The criteria in DSM-III-R and the "Utah Criteria" served as guidelines for the diagnosis of child and adult ADHD. The Utah Criteria for ADHD in adults were developed by Wender and colleagues[23] during their study of attention-deficit hyperactivity disorder—residual type (ADHD-R). Diagnosis for major depression was based on the DSM-III-R criteria for major depression. All of these diagnostic guidelines have specific criteria, which were used along with clinical judgment in determining a diagnosis.

Independent consideration of child ADHD, adult ADHD, and major depression permitted classification in all three general categories. The following levels under each category provided finer distinctions: 1) no symptoms manifest (none), 2) some symptoms manifest (mild), and 3) significant diagnosable symptoms manifest, meets criteria for child ADHD, adult ADHD (ADHD-R), or major depression (significant).

Epidemiology rates were calculated by producing point prevalence rates for each general category (child ADHD, adult ADHD, and depression) and each level within all diagnostic categories. In addition, rates were computed for a sin-

gle combined child and adult ADHD diagnosis. The ADHD subcategories were combined as follows:

None: No ADHD symptoms at any point in time.

Childhood symptoms only: Either mild or significant symptoms manifest only in childhood.

Adult symptoms only: Either mild or significant symptoms manifest only in adulthood.

Varied symptoms, child and adult: Mild symptoms in childhood with significant symptoms in adulthood, significant symptoms in childhood with mild symptoms in adulthood, or mild symptoms throughout both childhood and adulthood.

Significant symptoms, childhood and adulthood: Significant symptoms in both childhood and adulthood.

Pearson chi-square tests were used to determine the statistical significance of the joint frequency distribution across diagnoses.

To assess representativeness of the prison sample, frequency counts obtained from data on the subjects' prison records were compared with data on the prison population at large[30] using a Pearson chi square. Individuals were excluded from the analysis on any variable for which information was missing. The total number of subjects in the sample and the prison population at large thus varies according to variable. It should be noted that in some of the entire prison categories, statistics have substantial missing information, usually caused by the lack of cooperation or reading difficulties on the part of the inmate, making interpretation of the comparison of groups difficult.

Results

Epidemiological rates for both depression and ADHD in the prison sample are reported in Table 2. For a review of just the ADHD diagnosis, see the row totals. For a summary of the distribution of depression in the sample see the column total. Other data are included for comparison of the interactions between diagnoses.

Of 102 inmates, 40 reported having no ADHD symptoms as either adults or children. Seven subjects exhibited symptoms only as children, and seven others manifested symptoms only as adults. Twenty-two individuals showed varying patterns of ADHD symptoms throughout childhood and adulthood but did not have sufficient symptoms to be diagnosed ADHD. Twenty-six subjects merited a positive diagnosis of ADHD having significant symptoms both as children and as adults.

Forty-four of the 102 subjects from the prison population received no diagnosis of depression. Thirty-two individuals exhibited symptoms of depression but did not merit classification as clinically depressed. Major depression was manifested in 26 subjects (25.5 %).

There exists a relationship between ADHD and depression. As seen in Table 2, the overall categories of ADHD and depression have a statistically significant relationship at the .001 level ($\chi_{(8)}^2 = 26.76$, $p < .001$). The relationship between ADHD and depression can be seen further when child and adult

Table 2
Epidemiology of Attention-Deficit Hyperactivity Disorder and Depression in an Adult Male Prison Population

ADHD	Depression			Row Total
	None	Mild	Significant	
None				
Count	29	8	3	40
Row %	72.5	20.0	7.5	39.2
Column %	65.9	25.0	11.5	
Total %	28.4	7.8	2.9	
Childhood symptoms only				
Count	2	2	3	7
Row %	28.6	28.6	42.9	6.9
Column %	4.5	6.3	11.5	
Total %	2.0	2.0	2.9	
Adult symptoms only				
Count	3	2	2	7
Row %	42.9	28.6	28.6	6.9
Column %	6.8	6.3	7.7	
Total %	2.9	2.0	2.0	
Varied symptoms childhood and adulthood				
Count	6	9	7	22
Row %	27.3	40.9	31.8	21.6
Column %	13.6	28.1	26.9	
Total %	5.9	8.8	6.9	
Significant symptoms childhood and adulthood				
Count	4	11	11	26
Row %	15.4	42.3	42.3	25.5
Column %	9.1	34.4	42.3	
Total %	3.9	10.8	10.8	
Column total	44	32	26	102
Total %	43.1	31.4	25.5	100.0

$\chi_{(8)}^2 = 26.76, p < .001$.

ADHD categories are used. Tables 3 and 4 list subject frequencies and percentages for childhood ADHD crossed with depression and adult ADHD crossed with depression, respectively. A statistical significance exists between the diagnostic categories of childhood ADHD and depression ($\chi_{(4)}^2 = 23.31, p < .001$) and between the diagnostic categories of adult ADHD and levels of depression ($\chi_{(4)}^2 = 23.82, p < .001$). As symptoms of one disorder increase, it appears that symptoms of the other likewise increase.

Using a .05 level of significance, the prison sample studied was not found to differ significantly from the prison population at large on: age ($\chi_{(9)}^2 = 14.13$), marital status ($\chi_{(5)}^2 = 1.24$), race ($\chi_{(4)}^2 = 7.08$), education ($\chi_{(3)}^2 = .13$), religion ($\chi_{(4)}^2 = 8.22$), or mental health record ($\chi_{(1)}^2 = 3.81$). Dimensions on which the prison sample did differ from the population at large include: occupation ($\chi_{(7)}^2 = 22.11$) with a higher percentage of professionals in the sample; type of crime ($\chi_{(4)}^2 = 35.73$) with sexual crimes disproportionately high in the sample; weapons used in the crime ($\chi_{(1)}^2 = 21.00$)

Table 3
Comparison of Childhood Attention-Deficit Hyperactivity Disorder With Depression: Prison Sample

Depression	Childhood ADHD			Row Total
	None	Mild	Significant	
None				
Count	32	6	6	44
Row %	72.7	13.6	13.6	43.1
Column %	68.1	26.1	18.8	
Total %	31.4	5.9	5.9	
Mild				
Count	10	9	13	32
Row %	31.3	28.1	40.6	31.4
Column %	21.3	39.1	40.6	
Total %	9.8	8.8	12.7	
Significant				
Count	5	8	13	26
Row %	19.2	30.8	50.0	25.5
Column %	10.6	34.8	40.6	
Total %	4.9	7.8	12.7	
Column total	47	23	32	102
Total %	46.1	22.5	31.4	100.0

Pearson	23.307	$df = 4$	$p < .0001$
Likelihood Ratio	24.458	$df = 4$	$p < .0001$
Mantel-Haenszel	19.347	$df = 1$	$p < .0001$

Table 4
Comparison of Adult Attention-Deficit Hyperactivity Disorder with Depression: Prison Sample

Depression	Adult ADHD Disorder			Row Total
	None	Mild	Significant	
None				
Count	31	7	6	44
Row %	70.5	15.9	13.6	43.1
Column %	66.0	33.3	17.6	
Total %	30.4	6.9	5.9	
Mild				
Count	10	9	13	32
Row %	31.3	28.1	40.6	31.4
Column %	21.3	42.9	38.2	
Total %	9.8	8.8	12.7	
Significant				
Count	6	5	15	26
Row %	23.1	19.2	57.7	25.5
Column %	12.8	23.8	44.1	
Total %	5.9	4.9	14.7	
Column total	47	21	34	102
Total %	46.1	20.6	33.3	100.0

Pearson	23.820	$df = 4$	$p < .0002$
Likelihood Ratio	22.460	$df = 4$	$p < .0002$
Mantel-Haenszel	19.150	$df = 1$	$p < .0001$

with fewer instances in the sample; degree of crime ($\chi_{(4)}^2 = 23.60$) with the sample tending toward having less serious crimes; juvenile institutional record ($\chi_{(1)}^2 = 12.98$) with more subjects in the sample having no institutionalization; and age at first arrest ($\chi_{(6)}^2 = 33.48$) with the sample subjects more frequently over 40 at first arrest.

Interrater reliability yielded 92 percent agreement between the experimenter and outside clinician on diagnoses for the set of 100 protocols collected on individuals in a jail. A 90 percent agreement was found between the examiner and the second author. For both interrater reliability checks, differences in diagnoses never exceeded one level, i.e. mild vs. significant depression or mild vs. no ADHD.

Discussion

The results indicate that rates of both ADHD and major depression in a prison population substantially exceed the prevalence of both disorders in the general population. A surprising 25 percent of the prison sample exhibited diagnosable ADHD, manifesting substantial symptoms both in childhood and adulthood. There are no widely accepted estimates of adult ADHD prevalence in the general population. However, ADHD in prison populations appears to far exceed rates in the general population, which are estimated at 3 to 5 percent for childhood.

As the literature suggests, there seems to exist a portion of the childhood ADHD population for whom symptoms remit with age. Not quite seven percent of our inmate sample exhibited a remission. In addition to a number of subjects in remission, there was a similar number of cases for whom ADHD emerged or worsened. Therefore no change in overall percentage is apparent.

For the vast majority of the sample, however, subjects with ADHD in childhood had symptoms that continued to be troublesome in adulthood, thus affirming the notion of a persisting course of ADHD at least in people who come to prison. At the same time, the fact that some children with ADHD escape ongoing symptoms suggests that ADHD in childhood does not necessarily cause criminal activity in adulthood.

There was also a small subgroup of individuals who reported having symptoms of ADHD as adults but not as children. No clear, consistent pattern emerged among these subjects, although it seemed possible that for some of them ADHD symptoms manifested as adults could be attributed to anxiety or depression. Not surprisingly, four of seven incarcerated men from this adult-only ADHD group showed signs of adult depression.

It may be argued that more people in prison than in the general population could be expected to be depressed given the circumstances. The fact that the collection of data took place upon prison entry might also lead one to believe the depression rates found are inflated. The current study does not really address the course of depression while in prison. Nonetheless, the rates found upon admission are substantial.

ADHD and major depression repre-

sent two distinct diagnostic categories. The current study, however, shows that the two overlap to a great extent in an incarcerated population with 47 (46.1 %) of all individuals who manifest any symptoms of one diagnosis also manifest some level of symptoms of the other diagnosis. Such findings support previous assertions by Lahey[21] and others[23] that there exists a relationship between ADHD and depression.

It is perhaps not surprising that depressive symptoms occur frequently in conjunction with ADHD. Given findings relating ADHD to school failure, poor peer relationships, and feelings of being out of control, low self-esteem, anhedonia, and feelings of hopelessness may be natural consequents. Interestingly, five of the seven individuals from the prison sample whose ADHD symptoms remitted reported having some or significant symptoms of clinical depression as adults. Cantwell's review[31] cites several studies that seem to support a connection between childhood ADHD and subsequent adult depressive symptoms.

It is possible that some subjects either overreported or underreported their symptoms hoping to gain something in the prison system, even though they were told their participation and results would not have any bearing on their treatment or placement in the prison. It is believed that the number of subjects used and extensive briefing before and after participation helped minimize this variable.

Implications This study finds 25 percent of the prison population to be diagnosable with ADHD, 25 percent with major depression, and 10 percent of the entire sample to exhibit significant levels of both. These results are comparable to Favarino's.[12] Such statistics suggest a major mental health need. Although we do not know if criminal activity would decrease with the remission of symptoms for either ADHD or depression, we do understand that treatment of illness is humane and required even for prison populations. Concern arises as funding for rehabilitation in prisons declines and psychological treatment becomes less available. ADHD and depression are sufficiently debilitating to require therapeutic intervention. Obviously budget allowances for such treatment will be needed.

ADHD and depression have been increasingly considered to have biological components for at least some of those affected. Biederman's studies[25,27] imply a genetic link. Physiologically, both disorders have been shown to respond favorably to medication. Each is often treated with different medications, however. The problem is determining which medication would be most effective when an individual exhibits both disorders. Further study is needed to refine diagnostic issues and explore treatment options.

There are a number of additional areas that require further investigation. For example, the inclusion of women in further study is needed. The women at the prison were not available for this study. Each disorder could be evaluated in terms of course, concomitant variables, and treatment. A study that in-

cludes ADHD and the other mood disorders (bipolar, dysthymia, and cyclothymia) is also needed. It would be desirable to obtain prevalence rates for all the mood disorders and to explore further the relationship between ADHD and mood disorders.

The apparent relationship of ADHD and major depression suggests a need to study this dual diagnosis further not only in incarcerated individuals but also in the general population. In addition, it seems that continued efforts are needed to identify and treat the subgroup of children with ADHD at risk for criminal activity in adulthood.

Care must be taken in generalizing the results of this study, as representativeness of the sample to inmates in other state prisons is unknown. It is hoped the current study will be replicated in other penal institutions.

In conclusion, more than half of subjects in the prison population showed either major depression, ADHD, or both. The prevalence of these disorders in incarcerated individuals far exceeds that suspected to be in the general population. Furthermore, a significant relationship exists between ADHD and major depression.

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