Long-term Consequences of Childhood ADHD on Criminal Activities

Jason Fletcher*
Yale University
Barbara Wolfe
University of Wisconsin-Madison

This Draft: February 28, 2007

Abstract:

Even though ADHD is one of the most prevalent mental conditions in school-age children (affecting approximately 2 million in the United States), little is known about the long-term consequences of the illness for individuals and society. This paper uses retrospective ratings of Attention-Deficit/Hyperactivity Disorder symptoms in childhood to examine outcomes in early adulthood. In particular, the effects of ADHD on criminal activities are examined, controlling for a rich set of individual, family, and community level variables. Sibling fixed effects and a variety of robustness checks also are employed in an effort to identify the influence of ADHD. This paper separately examines the effects of the different dimensions of ADHD symptoms, including inattentive, hyperactive, and combined typologies. The results show that both inattentive and hyperactive symptoms during childhood increase the likelihood of engaging in many types of criminal activities, in numerous cases the increases are substantial; however there is little evidence that individuals with symptoms of the combined type of ADHD face a multiplicative risk. Overall, the findings of this paper indicate that ADHD is tied to significant long-term consequences on both individuals and society and is an important area for future academic and clinical research.

* This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth@unc.edu).
This research was supported by a grant from the National Institutes of Health under Ruth L. Kirschstein National Research Service Award T32 MH18029-20 from the National Institute of Mental Health.
We thank Daniel Eisenberg, Brett Haberstick, John Mullahy, Jody Sindelar, and participants of the 2006 Add Health User Conference for helpful comments.

Introduction

Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent and fastest growing mental health problems facing children. The prevalence is estimated to be between 2-10% of school-aged children, and the rate of treatment has increased from 0.9 per 100 children in 1987 to 3.4 per 100 children in 1997 (Olsfson et al. 2003).[1] [2] ADHD also has large financial impacts on school systems and families; one national estimate for the cost of care attributable to children with ADHD is 2.15 billion a year (Burd et al. 2003). While much research has documented the short term consequences of ADHD on school-children, such as increased likelihood of pursuing risky behaviors such as smoking (Kollins et al. 2005) and lower academic performance (Currie and Stabile 2004, Mannuzza and Klein 2000), less research has examined outcomes during the transition to adulthood using nationally representative data (Barkley 2002, Mannuzza and Klein 2000).[3] This is partly due to data limitations; in order to examine early adult outcomes, information about ADHD is required during childhood and follow up information is needed for adult outcomes of interest that occur much later. Since ADHD is a relatively new diagnosis[4], several important longitudinal datasets that span the relevant years do not contain information on the subject.[5]

This paper contributes to the literature by using nationally representative data that collected retrospective childhood ADHD symptoms as well as early adult outcomes to examine the consequences of ADHD on criminal activity. Crime is an important activity in the United States economy which leads to large private and social costs. Freeman (1996) reports that while the total loss of victims averages approximately $500 per crime (0.3% of GDP), including the costs of lost productivity, pain, and resources devoted to combat crime, the total social costs attributable to crime could be as high as 4% of GDP. As most previous research focuses on hyperactivity symptoms or global measures of

[1] The prevalence within the subpopulation of children receiving special education services in public schools has been reported to be as high as 50% (Bussing et al. 1998).
[2] The largest increases in treatment are from poor, near-poor, and low-income families and children ages 12-18 (Olfson et al. 2003).
[3] One exception to the current focus on childhood ADHD is Kessler et al. (2005b), where the authors estimate that adult ADHD leads to 120 million days of annual work lost in the US labor force.
[4] For example, the US Department of Education recognized that students with ADHD could be considered disabled and be eligible for special education services in 1991 (Olfson et al. 2003).
[5] The Panel Study of Income Dynamics (PSID) only added ADHD measures in 1997 and the National Longitudinal Study of Youth (NLYS) has only a partial measurement for children ages 4-14 by their parents. Several additional data bases that contain information on childhood ADHD are cross-sectional.

ADHD (Barkley 2002), this paper also contributes to the literature by separately examining the effects of the different dimensions of ADHD symptoms, including inattentive, hyperactive, and combined typologies. The results show that both inattentive and hyperactive symptoms during childhood increase the likelihood of engaging in numerous types of criminal activities—in many cases the increases in risks for bad behaviors associated with ADHD are substantial. However, there is little evidence that individuals with symptoms of the combined type of ADHD face a multiplicative risk. Overall, the findings of this paper indicate that ADHD imposes significant long-term consequences on both individuals and society and is an important area for future academic and clinical research.

Background

While much is known about the family and individual level predictors of childhood ADHD, there are still many open questions about its specific causes. Hypotheses about the causes of ADHD have evolved from simple one-cause theories to the view that it is a complex, multifactoral disorder that appears after a threshold of cumulative risk has been met (Biederman and Faraone 2005, Larson et al. 2004). Suggested environmental risks include maternal tobacco and alcohol use and lead exposure; ADHD is more likely to occur in males, individuals with low socioeconomic status, and younger children (Biederman and Faraone 2005). A genetic tie is also suspected as prevalence of ADHD is much higher among close relatives than in the general population. (Biederman et al 1990)

The consequences of ADHD for children occur along several dimensions. Children with ADHD have been found to have fewer close friends (Bagwell et al. 2001) and exhibit antisocial behavior (Biederman and Faraone 2005). Poorer educational outcomes may be the most important consequence of ADHD (Barkley 2002), including poor concentration and impulsiveness during preschool (Harpin 2005), lower grades and greater retention and suspension (Mannuzza and Klein 2000, Barkley 2002), poorer perceptions by teachers (Eisenberg and Schneider 2005), and lower eventual educational attainment (Currie and Stabile 2004). Researchers have also found an increase in risky behaviors, including earlier sexual intercourse and lower rates of contraceptive use (Barkley 2002)

ADHD has also been shown to be linked with several measures of criminal activity, although much of this research has used small convenience samples of individuals or assessed the relationship in a cross-sectional context. Individuals with ADHD have been shown to commit both minor offenses such as traffic violations and speeding (Barkley et al 1993) as well as crimes leading to incarceration (Harpin 2005). In particular, property theft, carrying a concealed weapon, illegal drug possession, and arrests rates have been shown to be positively related to ADHD status (Barkely et al. 2004, Mannuzza and Klein 2000, Biederman and Faraone 2005, Babinsky et al. 1999), but in most cases the reported associations were estimated using cross sectional data on fewer than 300 individuals.

While there are many consequences of ADHD for individuals, their families are also affected by the illness. Families with children with ADHD face increased likelihood of disturbances in family and marital functioning (Harpin 2005) and worse maternal mental health (Lesesne et al. 2003). Further, the relationship between parents and children with ADHD is often more conflicted and stressful (Barkley 2002, Harpin 2005) and siblings are more likely to feel victimized by brothers with ADHD (Kendall 1999). Family resources are also likely to be affected by having a child with ADHD. Matza et al. (2005) have documented that ADHD leads to between a $500 and $1,500 increase in medical expenditures per child per year (Chan et al. 2002).[6]

Finally, treatments for ADHD are still somewhat controversial. On one hand, approximately 70% of the patients with ADHD respond to treatment with stimulant medications in the short term and over periods of up to 18 months (Olfson et al. 2003). On the other hand, long-term effects of many treatments are unknown and controversial (Daley 2006). Additionally, pharmacotheraphy alone has not yet been shown to improve the long-term outcome for any domain of functioning (Goldman et al. 1998), and treatment has been found to be less effective in adults (Adler and Chua 2002). The explosion is pharmacological therapy occurred in 1991 and as yet there are no long term studies of the consequences of long term use. (Diller 2000).

While the previous literature outlined in this section has produced many important findings for the potential consequences of childhood ADHD, few studies contain both adequate diagnostic criteria for ADHD in children and large and representative samples

[6] This is similar in magnitude to the medical costs of having a child with asthma.

of children. The current study adds to the literature by examining the relationships between a broad set of criminal activities and child ADHD using a nationally representative sample and information on ADHD symptoms.[7]

Methodology

The data in this study come from the restricted version of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a school-based, longitudinal study of the health-related behaviors of adolescents and their outcomes in young adulthood. Beginning with an in-school questionnaire administered to a nationally representative sample of students in grades 7 through 12 in 1994-95, the study follows up with a series of in-home interviews of students approximately one year and then six years later. Other sources of data include questionnaires for parents, siblings, fellow students, and school administrators. By design, the Add Health survey included a sample stratified by region, urbanicity, school type, ethnic mix, and size. Preexisting databases (e.g. census data) provide information about neighborhoods and communities.[8]

For the present study, several exclusions of the 20,747 adolescents originally sampled are made. First, those who did not complete the three waves of in-home surveys are excluded. This leaves 15,197 eligible respondents. Next, individuals without longitudinal weights are excluded, leaving 14,322 individuals. Community-level measures are unavailable for sixty-four individuals. The Peabody Vocabulary Test scores of 650 individuals are unavailable. ADHD symptoms (explained below) are not available for fourteen individuals.. These exclusions leave 13,572 (almost 95% of eligible sample) individuals in the analysis sample. Finally, note that wave 1 family income and mother's education level are imputed for almost 3,200 and 1,300 individuals, respectively.

The primary indicator of childhood ADHD symptoms is taken from an eighteen question retrospective rating collected during Wave III of the Add Health study, when respondents were between the ages of 18 and 28 years old. The questions ask respondents to think back to when they were between 5 and 12 years of age and report how often they performed a set of behaviors (e.g. squirmed in their seat, had difficulty

[7] Unfortunately, due to data limitations, we are unable to contribute to knowledge regarding the consequences of treatment of ADHD.
[8] See Udry 2003 for full description of the Add Health data set.

sustaining attention in tasks).[9] [10] Since nearly all of these children will answer these questions for a period before 1991 when the use of pharmaceuticals to treat ADHD (e.g Ritalin) became common (Diller 2000), we make the assumption that all those who report symptoms were not being treated by pharmaceuticals by that date. To the extent they are subsequently treated, this may influence the outcomes we measure. (We expect that this will lead us to underestimate the effect of ADHD, to the extent the pharmaceuticals reduce the symptoms of ADHD.) Unfortunately, we have no information on treatment so our analysis focuses only on the tie between presence of ADHD symptoms during ages 5 to 12 and subsequent outcomes.

Summary statistics for the analysis sample are presented in Table 1. Following Kollins et al. (2005) as well as community based samples (Murphy and Barley 1996), a symptom was considered present if it was experienced "often" or "very often." Since there is evidence that the effects of ADHD may vary by the whether the symptoms are of the inattentive or hyperactive type (e.g. Babinski et al. 1999), we examine the effects of these different domains as well as usual measures of ADHD of any type. In order to examine the consequences of the different dimensions of ADHD, individuals were divided into 1 of 4 groups based on the number of their reported symptoms: (1) 6 or more inattentive (IN) symptoms and fewer than 6 hyperactive (HI) symptoms; (2) 6 or more HI symptoms and fewer than 6 IN symptoms; (3) both 6 or more IN symptoms and 6 or more HI symptoms; and (4) both fewer than 6 HI and fewer than 6 IN symptoms. This 6-symptom cutoff was chosen to be consistent with the DSM-IV ADHD criteria requiring the presence of 6 or more symptoms from either the IN or HI symptom domains (Kollins et al. 2005).[11]

In terms of outcome or dependent variables, many individuals in the sample report engaging in criminal activities in wave III of the data collection period, when the average age of the individuals is nearly twenty-two years old. Almost 3.5 percent of the

[9] One item asked in the retrospective ADHD section of wave III ("You were spiteful or vindictive") is not a DSM-IV ADHD symptom and was excluded from analyses; while 1 DSM-IV impulsivity symptom ("Often interrupts or intrudes on others") was not included in the retrospective ADHD section. Thus, our analyses included responses to 9 inattentive and 8 hyperactive/impulsive symptoms.

[10] Retrospective ratings of previous health should be used with caution when examining adult outcomes. Fortunately, several reviews have concluded that childhood experiences are recalled with sufficient accuracy to provide useful information in retrospective studies (e.g. Kessler et al. 2005a). Babinski et al. (1999) also suggest that since the criteria for ADHD has changed over time, current measures of the illness may be preferred.

[11] We also present results using a lower threshold of five or more symptoms in the appendix.

sample reports stealing something worth $50 or more in the previous year, more than 8 percent of the sample reports selling drugs in the last year, 2 percent reported committing burglary in the past 12 months,[12] 2 percent committed a robbery in the past twelve months.[13] Twelve percent of the sample report ever being arrested and two percent reported ever being convicted of a crime. Nearly 20 percent of the sample reported one of these outcomes, which we label as "any crime."

Persons raised in communities with high rates of poverty and who were themselves poor may be more likely to commit crimes than those raised in higher income areas; persons living in high unemployment areas may be more likely to commit crimes as the opportunity costs are lower than when jobs are plentiful. If these living conditions are correlated with the presence of ADHD we might attribute to ADHD the causal influence of poverty and unemployment. In order to take such factors into account, we control explicitly for those we can measure. For example, we include the percent in poverty, income characteristics, and education of the community members in our models to take these into account. In addition, since living in high crime areas might lead to greater cultural acceptance of criminal activities and greater ease of engaging in certain types of crime, we include juvenile and total arrests in the community to the estimated model. (These variables may also be tied to higher probability of an individual's arrest given any actual involvement in crime, which we also seek to control for in our model.) The full list of the individual, family-level and community variables are found in Table 1. Finally, in order to test for the influence of ADHD, we conduct fixed effects analysis where we limit our analysis to families with two or more siblings in the data, where at least one sibling reports ADHD symptoms and one other does not. Since this is a small sample, we also estimate random effects models in a further attempt to capture unobserved factors that might influence the propensity to commit a crime.

Empirical Results

[12]The question reads, "…how often did you go into a house or building to steal something?" *Burglary* is defined as "An unlawful entry of a structure to commit a felony or theft" by the FBI.

[13] The question reads, "…how often did you use or threaten to use a weapon to get something from someone?" *Robbery* is defined as, "The taking or attempting to take anything of value from the care, custody, or control of a person by force or threat of force or violence and/or by putting the victim in fear" by the FBI.

We present associations between childhood ADHD and criminal activities during early adulthood, including stealing, selling drugs, burglary, robbery, being arrested, being convicted, and "any crime" in a series of tables below; all results use robust standard errors clustered at the school-level, longitudinal weights, and report odds ratio from logistic regression analysis.

In Table 2, we present results for whether the individual reported to have perpetrated any crime in wave III.[14] Individuals with all types of ADHD show an increased odds of reporting any crime, including a 50% increase for the inattentive type, more than a 90% increase for the hyperactive type, and almost a 40% increase in odds of the combined type (not statistically significant). These results are qualitatively similar across several robustness checks, including the exclusion/inclusion of community control variables, education control variables, additional family background variables (public assistance receipt, paternal incarceration, and low birth weight status), stratification by age groups, and the use of lower thresholds for ADHD status (see the appendix). Finally, in order to examine the robustness of the results to unobserved family backgrounds we use random and fixed effects specifications. We use an "any ADHD" variable rather than separate the subtypes because of the relatively low prevalence of the subtypes. The baseline results for the full sample show a 60% increase in the odds of any criminal activity, the family random and fixed effects results predict a 114% and a 95% increase in the odds of reporting any criminal activity.

In our next set of Tables, we disaggregate the "any crime" variable into its components to examine the relationships between ADHD types and each individual criminal activity.

First, in Table 3 we present results for whether an individual reported stealing items worth over $50 in the last year (in wave III). Persons reporting any of the types of ADHD show an increased odds of stealing, including 140 percent for the inattentive type, over 180 percent for the hyperactive type, and 130 percent for the combined type. Results of our series of robust checks are qualitatively similar and presented in the appendix. Several community level variables increase the odds of reported stealing but

[14] Results are similar if we instead examine whether the individual reported any crime in any of the waves of the survey. Unfortunately, due to the sample design of the dataset, information was not collected from all individuals the same number of times across the three waves of the sample, so the "ever" variables are not comparable for all individuals in the survey

are not statistically significant, including higher unemployment rates (3 percent increase), juvenile crime (3 percent increase), and total serious crime (0.5 percent increase). Finally, we estimate the specification using sibling differences in ADHD status and reported stealing for the "any ADHD" variable. Results using the full sample indicate that "any ADHD" increases the odds of reported stealing by 150%, and using family random and fixed effects models shrinks the estimate to between a 45% and 65% increase in odds.

Next, in Table 4 we present results for whether an individual reported "often" selling drugs in the last year. While those with all types of ADHD symptoms show an increase in the odds of selling drugs, only the inattentive type is statistically significant, increasing the odds by almost 80 percent. Growing up with married parents decreases the odds of selling drugs at a young adult by 18 percent. School performance, as measured by grade point average, decreases the odds of selling drugs by 20 percent per GPA point. Community-level variables are also important in predicting drug selling behavior. The unemployment rate is associated with an increase in the odds of drug selling by 7 percent, and juvenile crime arrests per 100,000 appears to tied to an increase in the odds of 11 percent. Like the results for stealing, these results were not very sensitive to a series of robust checks described earlier. Also like previous results, we explore the "any ADHD" variable in the baseline specification using family random and fixed effects. The baseline results showed that ADHD increased the odds of selling drugs by 50%, the random effects specifications showed an increase in odds of 80%, and the fixed effects specification showed an increase in odds of nearly 50% with a sample size of approximately 400.

Third, in Table 5 we present results for whether an individual reported burglarizing a home or building during the last year. Although all three subtypes of ADHD are positively related to this outcome, the inattentive type of ADHD is the only statistically significant result—increasing the odds by nearly 150%. The results shrink somewhat but are qualitatively similar with our robustness checks, with results ranging from 120-160% (results in appendix). Using the "any ADHD" measure with and without family fixed effects, we estimate increases in odds of 90% and 26% (N=136), respectively. We find few individual, family, or community level results of note—male, black, and younger individuals are more likely to report committing burglaries.

Fourth, in Table 6 we present results for whether an individual committed a robbery in the past year. The hyperactive type of ADHD increases the odds of robbery by over 130% and the combined type by over 140%, and the results are quite robust to our sensitivity analyses. Using the "any ADHD" measure with and without family random effects increases the odds by over 100% and family fixed effects increases the odds by over 40% (N=140), with random effects results estimated at over 115%.

Fifth, in Table 7 we present results for whether an individual reported ever being arrested by police. Persons with all types of ADHD appear to face an increase in the odds of being arrested: the inattentive type by almost 30 percent (not significant), hyperactive type by over 80 percent, and the combined type by over 50 percent. The hyperactive results range between 80-100% and the combined-type results range between 35-95% in our robust results. Our "any ADHD" results showed an increase in the odds of arrest of nearly 60% in the baseline results, 130% in the random effect results, and nearly 140% in the fixed effect results (N=625). Growing up in a married household decreases the odds of being arrested as a young adult by over 23 percent. The only community-level variable that is statistically related to being arrested is the rate of juvenile crime, associated with an increase in the odds of over 9 percent.

Finally, in Table 8 we present results for whether the individual reports ever being convicted of a crime. We find the robust results that having the hyperactive type of ADHD increases reported convictions by almost 120%; the range in the sensitivity analyses was 50-150%. We found positive relationships between the inattentive (20%-160%) and combined types (50-180%) and convictions, but the results were less often statistically significant. Our specifications using "any ADHD" showed an increase in odds of conviction of nearly 90% in the baseline results, 170% in the random effects results, and 90% in the family fixed effects results. Male and black individuals were much more likely to report convictions, and individuals who grew up in married households had nearly 50% lower odds of reporting a conviction.

Conclusion

The evidence presented above leads to a clear conclusion: persons with symptoms of ADHD during the period 5-12 years of age, whether they be of the hyperactivity, inattentive or combined type, are far more likely to report criminal activities as young

adults than other individuals. This clear pattern prevails even while other factors that might be expected to influence risk taking are taken into account; these factors include individual characteristics such as gender, race/ethnicity, education of parents, family income, type of family in which raised, and community characteristics such as poverty and income, race/ethnicity, income inequality, the unemployment rate and crime rates.

Turning to results on type of ADHD, the evidence suggests that persons with the inattentive type symptoms are more likely to commit all of the studied crimes except robbery than individuals with no ADHD symptoms. Individuals with hyperactive-type ADHD many times had the highest odds ratios of all the ADHD-types. Interestingly, individuals with the combined-type of ADHD symptoms had the weakest associations with crime; we find very little evidence that these individuals are at a multiplicative risk of criminal activities in comparison with individuals who have only inattentive or only hyperactive symptoms.

Our results are robust across several specification checks, including lowering the ADHD threshold, controlling for additional variables, and using family fixed and random effects specifications (full results in appendix). The magnitudes of the random and fixed effects results are largely consistent with the results for the entire sample, but due to the smaller sample size, fewer are statistically significant, especially for the fixed effects estimates which are run over the smallest number of observations. We also report evidence that ADHD likely has an indirect effect on risky behaviors through a direct effect on educational outcomes. In results reported in the appendix, the association between ADHD symptoms and risky behavior outcomes is often 10-20% higher when we do not control for education in our specifications.

This evidence suggests that children showing ADHD symptoms should be viewed as a group at high risk of poor outcomes as young adults. Regardless of whether or not causality can be established (between ADHD and these outcomes), the high and differential odds ratios suggest that society and individuals could well benefit from targeting intervention programs on those exhibiting ADHD symptoms. Development of such intervention programs and evaluating them for efficiency could be dollars well spent in terms of crime and drug abuse averted.

The reader should recall however that a disadvantage of the dataset used here is that we do not know whether the individuals were ever treated for ADHD. As noted

above, most of the individuals in this dataset were children before special education services were mandated for individuals with ADHD, which occurred in 1991. If few of the individuals in the data were ever treated for ADHD, then the results above provide an upper bound of the effects of ADHD on longer term life outcomes; now that ADHD is treated at much higher rates than when the individuals in this dataset were children the negative consequences may be far less severe. If most of the individuals with ADHD symptoms in the dataset were treated during childhood, then ADHD would still represent a significant cost to individuals and society in terms of adult outcomes. Of course, the costs of medical care, pharmaceuticals and counseling in treatment of ADHD all must be included in any full account of the costs and consequences of ADHD.

References

Adler, Lenard and Hong Chua. (2002). "Management of ADHD in Adults." *Journal of Clinical Psychiatry,* Vol 63 supp I2, pp. 29-35

Babinski, L. M., C. S. Hartsough, et al. (1999). "Childhood conduct problems, hyperactivity-impulsivity, and inattention as predictors of adult criminal activity." Journal of Child Psychology and Psychiatry and Allied Disciplines **40**(3): 347-355.

Bagwell, Catherine, Brooke Molina, William Pelham, and Betsy Hoza. "Attention-Deficit Hyperactivity Disorder and Problems in Peer Relations: Predictions from Childhood to Adolescence." *Journal of the American Academy of Child and Adolescent Psychiatry*, Vol 40(11), November 2001

Barkley, Russell. (2002). "Major Life Activity and Health Outcomes Associated with Attention-Deficit/Hyperactivity Disorder." *Journal of Clinical Psychiatry*, Vol 63) sup I2

Barkley, R. A., M. Fischer, et al. (2004). "Young adult follow-up of hyperactive children: antisocial activities and drug use." Journal of Child Psychology and Psychiatry **45**(2): 195-211.

Barkley, Russell, David Guevremont, Arthur Anastopoulos, George DuPaul, and Tern Shelton. (1993). "Driving-Related Risks and Outcomes of Attention Deficit Hyperactivity Disorder in Adolescents and Young Adults: A 3- to 5- Year Follow-up Survey." *Pediatrics*, Vol 92: 212-218

Biederman J, Faraone SV, Keenan K, Knee D, Tsuang MF. Family-genetic and psychosocial risk factors in DSM-III attention deficit disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 1990; 29(4): 526-533.

Biederman J, and S.V. Faraone 2005. Attention-deficit hyperactivity disorder *Lancet*. Volume 366, Issue 9481, 16 July 2005-22 July 2005, Pages 237-248

Burd, Larry, Marilyn Klug, Matthew Coumbe, and Jackb Kerbeshian. "Children and Adolescents with Attention Deficit-Hyperactivity Disorder: 1. Prevalence and Cost of Care." *Journal of Child Neurology*, August 2003, Vol 18 (8)

Bussing, Regina and others. (1998). "Children in Special Education Programs: Attention Deficit Hyperactivity Disorder, Use of Services, and Unmet Needs." *American Journal of Public Health*, Vol 88 (6)

Chan, Eugenia, Chunliu Zhan, and Charles Homer. "Health Care Use and Costs for Children with Attention-Deficit/Hyperactivity Disorder: National Estimates from the Medical Expenditure Panel Survey." *Archives of Pediatrics and Adolescent Medicine*, 2002, Vol 156, pp.504-511

Conners, Keith C. Edward D. Levin, Elizabeth Sparrow, Sean C. Hinton, D. Erhardt, W. H. Meck, J.E. Rose, and J. March. (1996). "Nicotine and Attention in Adult Attention Deficit Hyperactivity Disorder (ADHD)." *Psychopharmacology Bulletin*, 32 (1), pp. 67-73

Currie, Janet and Mark Stabile. "Child Mental Health and Human Capital Accumulation: The Case of ADHD." NBER Working Paper, July 2004

Diller, Lawrence. 2000. Interview. http://www.pbs.org/wgbh/pages/frontline/shows/medicating/interviews/diller.html accessed 9/15/2006.

Ding, Weili, Steven Lehrer, Niels Rosenquist, Janet Audrain-McGovern. (2006). "The Impact of Poor Health on Education: New Evidence Using Genetic Markers." Queen's University Working Paper

Eisenberg, Daniel and Helen Schneider. "Perceptions of Academic Abilities of Children Diagnosed with Attention Deficit Hyperactivity Disorder." Working Paper 2005

Freeman, R. B. (1996). "Why do so many young American men commit crimes and what might we do about it?" Journal of Economic Perspectives **10**(1): 25-42.

Goldman, Larry and others. (1998). "Diagnosis and Treatment of Attention-Deficity/Hyperactivity Disorder in Children and Adolescents." *Journal of the American Medical Assocation*, Vol 279, pp. 1100-1107

Harpin, VA. (2005). "The Effect of ADHD on the Life of an Individual, Their Family, and Community from Preschool to Adult Life." *Archives of Disease in Childhood*, Vol 90 supp I, pp. i2-i7

Kadesjo, C., Kadesjo, B., Hagglof, B. & Gillberg, C. (2001) ADHD in Swedish 3- to 7-year-old children. *Journal of the American Academy of Child and Adolescent Psychiatry*, **40**, 1021–1028.

Kendall J, Siblings accounts of attention deficit hyperactivity disorder. *Family Proc* 1999;38:117–36. (Not Read)

Kessler, Ronald and others. (2005a). "Patterns and Predictors of Attention-Deficit/Hyperactivity Disorder Persistence into Adulthood: Results from the National Co-morbidity Survey Replication." *Biological Psychiatry*, Vol 57, pp. 1442-1451

Kessler, Ronald and others. (2005b). "The Prevalence and Effects of Adult Attention Deficit/Hyperactivity Disorder on Work Performance in a Nationally Representative Sample of Workers." *Journal of Occupational and Environmental Medicine*, Vol 47 (6)

Kollins, Scott H, F. Joseph McClernon, and Bernard Fuemmeler. "Association Between

Smoking and Attention-Deficit/Hyperactivity Disorder Symptoms in a Population-Based Sample of Young Adults." *Archives of General Psychiatry*, 2005, Vol 62, pp. 1142-1147

Larsson, J. O., Larsson, H. & Lichtenstein, P. (2004) Genetic and environmental contributions to stability and change of ADHD symptoms between 8 and 13 years of age: a longitudinal twin study. *Journal of the American Academy of Child and Adolescent Psychiatry*, **43**, 1267–1275.

Lesesne, Catherine, Susanna Visser, and Carla White. (2003). "Attention-Deficit/Hyperactivity Disorder in School-Aged Children: Association with Maternal Mental Health and Use of Health Care Resources." *Pediatrics*, Vol 111 (5)

Mannuzza, Salvatore, and Rachel Klein. (2000). "Long-Term Prognosis in Attention-Deficit/Hyperactivity Disorder." *Child and Adolescent Psychiatric Clinics of North America*, Vol 9 (3)

Matza, Louis, Clark Paramore, and Manishi Prasad. "A Review of the Economic Burden of ADHD." *Cost Effectiveness and Resource Allocation*, 2005, Vol 3 (5)

Murphy K, and R. Barkley (1996). "Prevalence of DSM-IV symptoms of ADHD in adult licensed drivers: implications for clinical diagnosis." *J Attention Disorders* Vol 1, pp.147-161.

Olfson, Mark and others. (2003). "National Trends in the Treatment of Attention Deficit Hyperactivity Disorder." *American Journal of Psychiatry*, Vol 160, pp.1071-1077

Swensen, Andrine and others. "Attention-Deficit/Hyperactivity Disorder: Increased Costs for Patients and Their Families." *Journal of the American Academy of Child and Adolescent Psychiatry*, Vol 42 (12)

Table 1
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Outcomes					
Any Crime	13566	0.19	0.40	0	1
Steal	13449	0.03	0.18	0	1
Sell Drugs	13409	0.08	0.27	0	1
Burglary	13461	0.02	0.13	0	1
Robbery	13456	0.02	0.14	0	1
Arrested	13478	0.12	0.33	0	1
Convicted	13559	0.02	0.15	0	1
Individual Characteristics					
Male	13572	0.51	0.50	0	1
White	13572	0.73	0.44	0	1
Black	13572	0.16	0.37	0	1
Hispanic	13572	0.12	0.32	0	1
Still in School	13564	0.36	0.48	0	1
Age	13572	21.79	1.85	18	28
Peabody Verbal Test Score	13572	101.37	14.72	14	146
Grade Point Average	13350	3.17	0.73	1	5
Education Attainment	13560	13.23	2.00	6	22
Any ADHD	13772	0.09	0.29	0	1
ADHD (Inattentive Type)	13572	0.04	0.19	0	1
ADHD (Hyperactive Type)	13572	0.03	0.16	0	1
ADHD (Combined Type)	13572	0.03	0.17	0	1
Family Characteristics					
Family Income ($1000s)^	13572	45.10	38.80	0	990
Mother's Education Level^	13572	13.19	2.27	8	18
Married Parents	13572	0.65	0.48	0	1
Community Characteristics					
% in Poverty	13572	13.98	7.06	3	40
% White	13572	80.92	15.43	25	100
% Black	13572	13.62	14.00	0	75
Median Income	13572	29.52	7.84	13	55
Standard Deviation of Income	13572	29.15	5.42	18	50
Unemployment Rate	13572	6.83	2.41	3	14
% Without HS Diploma	13572	25.04	9.26	5	61
Juvenile Arrests per 100,000	13112	3.46	1.68	0	23
Total Serious Crimes per 100,000	13242	56.49	26.48	0	169

^Imputed Variable

Table 2
Association between Retrospective Ratings of ADHD Symptoms
and Any Adult Criminal Activity

Outcome	Any Crime	Any Crime	Any Crime	Any Crime
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	3.406	3.445	3.830	3.122
	(2.964 - 3.913)**	(2.999 - 3.957)**	(3.082 - 4.760)**	(2.274 - 4.284)**
Black	1.258	1.241		
	(1.031 - 1.535)*	(1.017 - 1.515)*		
Hispanic	0.957	0.965		
	(0.767 - 1.194)	(0.775 - 1.201)		
Income	1.000	1.000		
	(0.999 - 1.001)	(0.998 - 1.001)		
In school	0.913	0.848		
	(0.776 - 1.075)	(0.723 - 0.996)*		
Age	0.921	0.898	0.878	0.921
	(0.884 - 0.960)**	(0.864 - 0.933)**	(0.829 - 0.929)**	(0.843 - 1.006)
Mom Education	1.073	1.063		
	(1.041 - 1.107)**	(1.031 - 1.096)**		
Intact Family	0.786	0.775		
	(0.675 - 0.915)**	(0.668 - 0.901)**		
Inattentive ADHD	1.520			
	(1.063 - 2.173)*			
Hyper ADHD	1.930			
	(1.332 - 2.796)**			
Combined ADHD	1.395			
	(0.983 - 1.981)			
ADHD ANY		1.622	2.142	1.957
		(1.309 - 2.011)**	(1.581 - 2.902)**	(1.218 - 3.143)**
Years of Schooling	0.927			
	(0.887 - 0.969)**			
PVT Test Score	1.009	1.008	0.998	0.997
	(1.004 - 1.015)**	(1.003 - 1.013)**	(0.991 - 1.005)	(0.983 - 1.012)
GPA	0.753	0.722		
	(0.668 - 0.850)**	(0.646 - 0.806)**		
% in Poverty	0.964	0.965		
	(0.931 - 0.999)*	(0.931 - 1.000)*		
% Black	0.995	0.995		
	(0.986 - 1.004)	(0.986 - 1.004)		
Median Household Income	0.993	0.992		
	(0.954 - 1.033)	(0.954 - 1.031)		
Std Dev Household Income	1.015	1.013		
	(0.970 - 1.062)	(0.969 - 1.059)		
Unemployment Rate	1.056	1.057		
	(0.997 - 1.118)	(0.998 - 1.120)		
% Without Diploma	1.007	1.005		
	(0.991 - 1.024)	(0.989 - 1.022)		
Juvenile Serious Crimes	1.095	1.092		
	(1.030 - 1.163)**	(1.028 - 1.161)**		

Total Serious Crimes	1.000	1.000		
	(0.995 - 1.004)	(0.995 - 1.004)		
Observations	12730	12737	3638	943
Families			1792	449

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Table 3
Association between Retrospective Ratings of ADHD Symptoms and Stealing

Outcome	Steal	Steal	Steal	Steal
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	2.647	2.654	2.338	1.562
	(1.983 - 3.533)**	(1.985 - 3.548)**	(1.543 - 3.543)**	(0.827 - 2.950)
Black	2.074	2.068		
	(1.475 - 2.916)**	(1.466 - 2.916)**		
Hispanic	1.534	1.534		
	(1.050 - 2.243)*	(1.048 - 2.246)*		
Income	1.002	1.001		
	(0.999 - 1.004)	(0.999 - 1.004)		
In school	0.885	0.881		
	(0.628 - 1.247)	(0.631 - 1.228)		
Age	0.818	0.815	0.795	0.789
	(0.753 - 0.889)**	(0.750 - 0.886)**	(0.710 - 0.890)**	(0.658 - 0.946)*
Mom Education	1.07	1.069		
	(0.998 - 1.147)	(0.997 - 1.145)		
Intact Family	0.869	0.869		
	(0.654 - 1.154)	(0.655 - 1.153)		
Inattentive ADHD	2.401			
	(1.141 - 5.050)*			
Hyper ADHD	2.846			
	(1.530 - 5.291)**			
Combined ADHD	2.307			
	(1.270 - 4.189)**			
ADHD ANY		2.498	1.440	1.657
		(1.629 - 3.831)**	(0.808 - 2.567)	(0.644 - 4.262)
Years of Schooling	0.992			
	(0.912 - 1.080)			
PVT Test Score	1.004	1.004	1.000	1.025
	(0.993 - 1.014)	(0.994 - 1.014)	(0.986 - 1.014)	(0.994 - 1.056)
GPA	0.919	0.916		
	(0.746 - 1.132)	(0.743 - 1.129)		
% in Poverty	0.978	0.977		
	(0.926 - 1.033)	(0.926 - 1.032)		
% Black	0.988	0.988		
	(0.974 - 1.003)	(0.974 - 1.003)		
Mediam Household Income	0.977	0.976		
	(0.913 - 1.045)	(0.913 - 1.044)		
Std Dev Household Income	1.023	1.023		
	(0.957 - 1.093)	(0.957 - 1.094)		
Unemployment Rate	1.031	1.032		
	(0.950 - 1.120)	(0.951 - 1.121)		
% Without Diploma	0.995	0.994		
	(0.973 - 1.017)	(0.972 - 1.017)		
Juvenile Serious Crimes	1.03	1.029		
	(0.930 - 1.140)	(0.929 - 1.140)		
Total Serious Crimes	1.005	1.005		

	(0.998 - 1.012)	(0.998 - 1.012)		
Observations	12623	12630	3578	214
			1762	100

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Table 4
Association between Retrospective Ratings of ADHD Symptoms and Selling Drugs

Outcome	Sell Drugs	Sell Drugs	Sell Drugs	Sell Drugs
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	3.053	3.072	3.849	3.747
	(2.509 - 3.715)**	(2.527 - 3.733)**	(2.811 - 5.271)**	(2.221 - 6.322)**
Black	1.154	1.148		
	(0.905 - 1.472)	(0.899 - 1.467)		
Hispanic	0.934	0.945		
	(0.667 - 1.309)	(0.673 - 1.327)		
Income	1.001	1.001		
	(0.999 - 1.003)	(0.999 - 1.003)		
In school	0.816	0.778		
	(0.631 - 1.055)	(0.608 - 0.995)*		
Age	0.818	0.804	0.878	0.936
	(0.770 - 0.869)**	(0.761 - 0.849)**	(0.811 - 0.950)**	(0.821 - 1.067)
Mom Education	1.073	1.068		
	(1.027 - 1.121)**	(1.023 - 1.115)**		
Intact Family	0.816	0.808		
	(0.679 - 0.980)*	(0.673 - 0.970)*		
Inattentive ADHD	1.755			
	(1.100 - 2.799)*			
Hyper ADHD	1.6			
	(0.929 - 2.756)			
Combined ADHD	1.17			
	(0.696 - 1.967)			
ADHD ANY		1.53	1.811	1.471
		(1.108 - 2.113)**	(1.214 - 2.702)**	(0.768 - 2.818)
Years of Schooling	0.951			
	(0.898 - 1.007)			
PVT Test Score	1.01	1.009	1.003	0.986
	(1.002 - 1.019)*	(1.001 - 1.018)*	(0.993 - 1.013)	(0.964 - 1.009)
GPA	0.783	0.761		
	(0.688 - 0.891)**	(0.672 - 0.862)**		
% in Poverty	0.957	0.958		
	(0.921 - 0.994)*	(0.922 - 0.997)*		
% Black	1.003	1.003		
	(0.993 - 1.013)	(0.993 - 1.013)		
Mediam Household Income	0.981	0.981		
	(0.948 - 1.016)	(0.948 - 1.016)		
Std Dev Household Income	1.023	1.021		
	(0.984 - 1.064)	(0.982 - 1.062)		
Unemployment Rate	1.07	1.069		
	(1.004 - 1.140)*	(1.003 - 1.139)*		
% Without Diploma	1.001	0.999		
	(0.984 - 1.018)	(0.982 - 1.017)		
Juvenile Serious Crimes	1.117	1.115		
	(1.054 - 1.184)**	(1.052 - 1.183)**		

Total Serious Crimes	0.993	0.993		
	(0.988 - 0.998)*	(0.988 - 0.999)*		
Observations	12588	12595	3560	416
			1753	197

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Table 5
Association between Retrospective Ratings of ADHD Symptoms and Burglary

Outcome	Burglary	Burglary	Burglary	Burglary
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	3.399	3.378	2.032	1.827
	(2.421 - 4.774)**	(2.400 - 4.755)**	(1.241 - 3.326)**	(0.858 - 3.891)
Black	3.134	3.236		
	(1.945 - 5.049)**	(1.981 - 5.287)**		
Hispanic	1.226	1.238		
	(0.640 - 2.347)	(0.645 - 2.377)		
Income	1.002	1.003		
	(1.000 - 1.005)	(1.000 - 1.005)*		
In school	0.837	0.892		
	(0.508 - 1.380)	(0.553 - 1.439)		
Age	0.742	0.758	0.85	0.921
	(0.663 - 0.830)**	(0.680 - 0.846)**	(0.743 - 0.971)*	(0.744 - 1.140)
Mom Education	1.087	1.094		
	(0.990 - 1.194)	(0.996 - 1.203)		
Intact Family	1.084	1.1		
	(0.737 - 1.595)	(0.750 - 1.614)		
Inattentive ADHD	2.467			
	(1.061 - 5.735)*			
Hyper ADHD	1.835			
	(0.742 - 4.537)			
Combined ADHD	1.341			
	(0.469 - 3.835)			
ADHD ANY		1.916	1.304	1.272
		(1.054 - 3.486)*	(0.634 - 2.679)	(0.406 - 3.987)
Years of Schooling	1.057			
	(0.938 - 1.191)			
PVT Test Score	0.995	0.996	0.991	1.001
	(0.976 - 1.015)	(0.978 - 1.016)	(0.975 - 1.008)	(0.959 - 1.045)
GPA	0.81	0.837		
	(0.617 - 1.064)	(0.640 - 1.094)		
% in Poverty	0.991	0.993		
	(0.906 - 1.084)	(0.909 - 1.086)		
% Black	0.98	0.979		
	(0.958 - 1.002)	(0.958 - 1.001)		
Mediam Household Income	0.978	0.979		
	(0.911 - 1.049)	(0.913 - 1.049)		
Std Dev Household Income	0.974	0.973		
	(0.901 - 1.052)	(0.900 - 1.052)		
Unemployment Rate	0.908	0.903		
	(0.788 - 1.047)	(0.781 - 1.044)		
% Without Diploma	1	1		
	(0.965 - 1.038)	(0.964 - 1.038)		
Juvenile Serious Crimes	1.052	1.053		
	(0.883 - 1.253)	(0.884 - 1.254)		
Total Serious Crimes	1.004	1.004		

	(0.991 - 1.017)	(0.991 - 1.018)		
Observations	12635	12642	3582	136
			1764	64

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Table 6
Association between Retrospective Ratings of ADHD Symptoms and Robbery

Outcome	Robbery	Robbery	Robbery	Robbery
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	2.9	2.949	2.752	3.042
	(2.002 - 4.200)**	(2.029 - 4.287)**	(1.618 - 4.681)**	(1.199 - 7.719)*
Black	2.899	2.781		
	(1.810 - 4.643)**	(1.715 - 4.509)**		
Hispanic	1.32	1.321		
	(0.757 - 2.303)	(0.751 - 2.324)		
Income	1.002	1.002		
	(0.999 - 1.005)	(0.999 - 1.005)		
In school	0.511	0.463		
	(0.300 - 0.870)*	(0.277 - 0.773)**		
Age	0.836	0.81	0.878	0.866
	(0.753 - 0.929)**	(0.735 - 0.894)**	(0.767 - 1.004)	(0.678 - 1.107)
Mom Education	1.127	1.112		
	(1.036 - 1.225)**	(1.022 - 1.210)*		
Intact Family	0.743	0.722		
	(0.531 - 1.038)	(0.516 - 1.009)		
Inattentive ADHD	1.439			
	(0.393 - 5.270)			
Hyper ADHD	2.312			
	(1.130 - 4.729)*			
Combined ADHD	2.424			
	(1.145 - 5.131)*			
ADHD ANY		2.026	2.162	1.423
		(1.132 - 3.624)*	(1.158 - 4.039)*	(0.563 - 3.599)
Years of Schooling	0.904			
	(0.805 - 1.014)			
PVT Test Score	0.99	0.989	0.97	0.987
	(0.978 - 1.003)	(0.977 - 1.000)	(0.955 - 0.986)**	(0.955 - 1.019)
GPA	0.964	0.913		
	(0.737 - 1.261)	(0.709 - 1.175)		
% in Poverty	0.964	0.961		
	(0.897 - 1.036)	(0.895 - 1.033)		
% Black	1.01	1.01		
	(0.990 - 1.030)	(0.991 - 1.030)		
Mediam Household Income	0.982	0.979		
	(0.906 - 1.064)	(0.902 - 1.063)		
Std Dev Household Income	1.011	1.009		
	(0.920 - 1.110)	(0.918 - 1.110)		
Unemployment Rate	1.039	1.045		
	(0.892 - 1.210)	(0.900 - 1.215)		
% Without Diploma	1	0.999		
	(0.965 - 1.035)	(0.965 - 1.034)		
Juvenile Serious Crimes	1.119	1.116		
	(0.955 - 1.312)	(0.949 - 1.313)		
Total Serious Crimes	0.993	0.993		

	(0.981 - 1.005)	(0.981 - 1.005)		
Observations	12632	12639	3583	140
			1765	66

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Table 7
Association between Retrospective Ratings of ADHD Symptoms and Arrests

Outcome	Arrest	Arrest	Arrest	Arrest
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	4.503	4.583	4.769	3.755
	(3.723 - 5.447)**	(3.787 - 5.546)**	(3.644 - 6.243)**	(2.524 - 5.588)**
Black	1.134	1.103		
	(0.879 - 1.464)	(0.857 - 1.418)		
Hispanic	0.865	0.87		
	(0.678 - 1.103)	(0.685 - 1.104)		
Income	1	0.999		
	(0.998 - 1.002)	(0.998 - 1.001)		
In school	0.929	0.82		
	(0.777 - 1.111)	(0.686 - 0.980)*		
Age	0.99	0.951	0.935	1.004
	(0.945 - 1.038)	(0.910 - 0.995)*	(0.875 - 0.999)*	(0.898 - 1.123)
Mom Education	1.065	1.048		
	(1.021 - 1.109)**	(1.005 - 1.092)*		
Intact Family	0.754	0.736		
	(0.637 - 0.893)**	(0.622 - 0.872)**		
Inattentive ADHD	1.284			
	(0.803 - 2.054)			
Hyper ADHD	1.847			
	(1.267 - 2.693)**			
Combined ADHD	1.547			
	(1.057 - 2.263)*			
ADHD ANY		1.571	2.328	2.382
		(1.215 - 2.032)**	(1.670 - 3.246)**	(1.330 - 4.267)**
Years of Schooling	0.882			
	(0.832 - 0.934)**			
PVT Test Score	1.009	1.007	0.999	0.997
	(1.003 - 1.015)**	(1.001 - 1.012)*	(0.990 - 1.007)	(0.978 - 1.016)
GPA	0.695	0.647		
	(0.603 - 0.801)**	(0.565 - 0.740)**		
% in Poverty	0.964	0.964		
	(0.917 - 1.013)	(0.917 - 1.013)		
% Black	0.994	0.994		
	(0.983 - 1.005)	(0.983 - 1.006)		
Mediam Household Income	0.983	0.982		
	(0.929 - 1.041)	(0.929 - 1.038)		
Std Dev Household Income	1.029	1.027		
	(0.964 - 1.099)	(0.965 - 1.093)		
Unemployment Rate	1.031	1.035		
	(0.956 - 1.111)	(0.961 - 1.115)		
% Without Diploma	1.015	1.012		
	(0.994 - 1.036)	(0.992 - 1.033)		
Juvenile Serious Crimes	1.095	1.092		
	(1.007 - 1.190)*	(1.006 - 1.185)*		
Total Serious Crimes	1	1		

	(0.993 - 1.006)	(0.994 - 1.006)		
Observations	12654	12661	3596	625
			1771	300

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Table 8
Association between Retrospective Ratings of ADHD Symptoms and Convictions

Outcome	Convicted	Convicted	Convicted	Convicted
Specification	Sub Types	Any ADHD	Any ADHD	Any ADHD
Specification	Baseline	Baseline	Random Effects	Fixed Effects
Male	7.086	7.353	7.833	5.782
	(4.165 - 12.058)**	(4.356 - 12.414)**	(3.998 - 15.346)**	(2.097 - 15.943)**
Black	1.649	1.447		
	(1.042 - 2.612)*	(0.940 - 2.226)		
Hispanic	1.272	1.265		
	(0.728 - 2.224)	(0.724 - 2.213)		
Income	0.996	0.994		
	(0.989 - 1.003)	(0.987 - 1.001)		
In school	0.962	0.697		
	(0.623 - 1.484)	(0.438 - 1.110)		
Age	0.85	0.787	0.887	0.833
	(0.761 - 0.949)**	(0.703 - 0.881)**	(0.781 - 1.007)	(0.654 - 1.060)
Mom Education	1.047	1.017		
	(0.952 - 1.151)	(0.928 - 1.115)		
Intact Family	0.539	0.504		
	(0.392 - 0.741)**	(0.361 - 0.705)**		
Inattentive ADHD	1.272			
	(0.535 - 3.025)			
Hyper ADHD	2.174			
	(1.022 - 4.622)*			
Combined ADHD	2.027			
	(0.857 - 4.793)			
ADHD ANY		1.864	2.778	1.919
		(1.085 - 3.203)*	(1.602 - 4.815)**	(0.585 - 6.296)
Years of Schooling	0.743			
	(0.649 - 0.852)**			
PVT Test Score	1.02	1.014	0.979	0.987
	(1.006 - 1.033)**	(1.001 - 1.028)*	(0.964 - 0.994)**	(0.949 - 1.027)
GPA	0.632	0.546		
	(0.471 - 0.848)**	(0.413 - 0.720)**		
% in Poverty	0.925	0.92		
	(0.810 - 1.058)	(0.808 - 1.048)		
% Black	0.993	0.993		
	(0.957 - 1.032)	(0.959 - 1.029)		
Mediam Household Income	0.91	0.903		
	(0.791 - 1.047)	(0.789 - 1.034)		
Std Dev Household Income	1.104	1.099		
	(0.950 - 1.283)	(0.953 - 1.269)		
Unemployment Rate	0.957	0.982		
	(0.801 - 1.144)	(0.824 - 1.171)		
% Without Diploma	0.976	0.968		
	(0.932 - 1.021)	(0.925 - 1.013)		
Juvenile Serious Crimes	1.171	1.148		
	(1.001 - 1.370)*	(0.987 - 1.336)		
Total Serious Crimes	0.997	0.999		

	(0.984 - 1.011)	(0.985 - 1.012)		
Observations	12723	12730	3631	146
			1789	69

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

APPENDIX: Robustness of Results across Specifications

Outcome	Any Crime	Any Crime	Any Crime	Any Crime
Specification	Baseline	No Census data	Just Exogenous	Drop PVT/GPA
Inattentive ADHD	1.520	1.633	1.896	1.754
	(1.063 - 2.173)*	(1.172 - 2.274)**	(1.434 - 2.506)**	(1.291 - 2.383)**
Hyper ADHD	1.930	1.943	1.990	1.985
	(1.332 - 2.796)**	(1.361 - 2.773)**	(1.400 - 2.830)**	(1.385 - 2.845)**
Combined ADHD	1.395	1.430	1.611	1.519
	(0.983 - 1.981)	(1.014 - 2.016)*	(1.164 - 2.231)**	(1.080 - 2.135)*
Observations	12730	13229	14302	13744
Outcome	Any Crime	Any Crime	Any Crime	Any Crime
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	1.573	1.807	1.279	1.411
	(1.058 - 2.340)*	(1.346 - 2.425)**	(0.913 - 1.793)	(0.965 - 2.061)
Hyper ADHD	1.863	1.956	1.618	1.912
	(1.228 - 2.826)**	(1.349 - 2.835)**	(1.251 - 2.094)**	(1.315 - 2.781)**
Combined ADHD	1.278	1.598	1.730	1.290
	(0.862 - 1.895)	(1.150 - 2.219)**	(1.314 - 2.277)**	(0.885 - 1.882)
Observations	9649	13753	12730	12046

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.
Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Outcome	Steal	Steal	Steal	Steal
Specification	Baseline	No Census data	just exogenous	Drop PVT/GPA
Inattentive ADHD	2.401	2.508	2.631	2.549
	(1.141 - 5.050)*	(1.220 - 5.156)*	(1.402 - 4.939)**	(1.318 - 4.931)**
Hyper ADHD	2.846	2.911	2.652	2.491
	(1.530 - 5.291)**	(1.570 - 5.396)**	(1.460 - 4.818)**	(1.355 - 4.579)**
Combined ADHD	2.307	2.193	2.057	2.12
	(1.270 - 4.189)**	(1.212 - 3.969)**	(1.178 - 3.593)*	(1.195 - 3.759)*
Observations	12623	13120	14180	13625
Outcome	Steal	Steal	Steal	Steal
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	2.419	2.596	1.337	2.242
	(1.031 - 5.674)*	(1.356 - 4.970)**	(0.708 - 2.523)	(1.071 - 4.695)*
Hyper ADHD	2.979	2.497	2.392	2.975
	(1.520 - 5.836)**	(1.375 - 4.537)**	(1.469 - 3.895)**	(1.602 - 5.523)**
Combined ADHD	2.034	2.158	2.683	2.069
	(1.028 - 4.023)*	(1.242 - 3.749)**	(1.664 - 4.327)**	(1.137 - 3.764)*
Observations	9603	13634	12623	11947

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.
Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Outcome	Sell Drugs	Sell Drugs	Sell Drugs	Sell Drugs
Specification	Baseline	No Census data	just exogenous	Drop PVT/GPA
Inattentive ADHD	1.755	1.966	2.113	1.872
	(1.100 - 2.799)*	(1.281 - 3.017)**	(1.441 - 3.098)**	(1.225 - 2.861)**
Hyper ADHD	1.6	1.708	1.58	1.476
	(0.929 - 2.756)	(1.050 - 2.778)*	(0.966 - 2.585)	(0.855 - 2.547)
Combined ADHD	1.17	1.216	1.353	1.257
	(0.696 - 1.967)	(0.726 - 2.036)	(0.827 - 2.213)	(0.759 - 2.082)
Observations	12588	13085	14136	13581
Outcome	Sell Drugs	Sell Drugs	Sell Drugs	Sell Drugs
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	1.814	1.955	1.35	1.726
	(1.054 - 3.122)*	(1.295 - 2.952)**	(0.871 - 2.094)	(1.047 - 2.847)*
Hyper ADHD	1.591	1.456	1.448	1.568
	(0.885 - 2.862)	(0.842 - 2.517)	(0.986 - 2.126)	(0.903 - 2.722)
Combined ADHD	1.098	1.333	1.819	1.144
	(0.637 - 1.893)	(0.814 - 2.184)	(1.255 - 2.638)**	(0.671 - 1.949)
Observations	9577	13590	12588	11913

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.
Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Outcome	Burglary	Burglary	Burglary	Burglary
Specification	Baseline	No Census data	just exo	Drop PVT/GPA
Inattentive ADHD	2.467	2.77	2.633	2.35
	(1.061 - 5.735)*	(1.204 - 6.374)*	(1.173 - 5.912)*	(1.030 - 5.363)*
Hyper ADHD	1.835	1.854	1.746	1.676
	(0.742 - 4.537)	(0.785 - 4.378)	(0.758 - 4.019)	(0.684 - 4.108)
Combined ADHD	1.341	1.248	1.264	1.368
	(0.469 - 3.835)	(0.432 - 3.608)	(0.453 - 3.529)	(0.489 - 3.828)
Observations	12635	13132	14191	13636
Outcome	Burglary	Burglary	Burglary	Burglary
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	2.239	2.4	1.947	2.283
	(0.718 - 6.978)	(1.054 - 5.463)*	(0.971 - 3.903)	(0.909 - 5.735)
Hyper ADHD	1.524	1.678	2.623	1.893
	(0.611 - 3.800)	(0.690 - 4.079)	(1.401 - 4.910)**	(0.763 - 4.698)
Combined ADHD	1.527	1.39	1.908	1.393
	(0.491 - 4.749)	(0.503 - 3.841)	(0.854 - 4.262)	(0.485 - 4.001)
Observations	9613	13645	12635	11959

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.
Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Outcome	Robbery	Robbery	Robbery	Robbery
Specification	Baseline	No Census data	just exo	Drop PVT/GPA
Inattentive ADHD	1.439	1.743	1.802	1.344
	(0.393 - 5.270)	(0.569 - 5.337)	(0.613 - 5.301)	(0.378 - 4.786)
Hyper ADHD	2.312	2.754	2.425	2.091
	(1.130 - 4.729)*	(1.407 - 5.389)**	(1.280 - 4.596)**	(1.063 - 4.115)*
Combined ADHD	2.424	2.235	2.607	2.442
	(1.145 - 5.131)*	(1.039 - 4.806)*	(1.242 - 5.471)*	(1.151 - 5.181)*
Observations	12632	13129	14187	13632
Outcome	Robbery	Robbery	Robbery	Robbery
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	1.417	1.454	0.934	1.452
	(0.328 - 6.127)	(0.415 - 5.093)	(0.332 - 2.628)	(0.394 - 5.343)
Hyper ADHD	2.767	1.991	2.095	2.505
	(1.363 - 5.620)**	(1.013 - 3.914)*	(1.203 - 3.649)**	(1.217 - 5.157)*
Combined ADHD	2.512	2.787	2.309	2.167
	(1.111 - 5.681)*	(1.344 - 5.779)**	(1.238 - 4.307)**	(0.972 - 4.832)
Observations	9613	13641	12632	11954

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.
Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Outcome	Arrest	Arrest	Arrest	Arrest
Specification	Baseline	No Census data	just exo	Drop PVT/GPA
Inattentive ADHD	1.284	1.244	1.607	1.61
	(0.803 - 2.054)	(0.796 - 1.944)	(1.103 - 2.342)*	(1.087 - 2.386)*
Hyper ADHD	1.847	1.923	2.058	2.049
	(1.267 - 2.693)**	(1.343 - 2.755)**	(1.424 - 2.973)**	(1.419 - 2.960)**
Combined ADHD	1.547	1.601	1.94	1.765
	(1.057 - 2.263)*	(1.113 - 2.304)*	(1.383 - 2.722)**	(1.228 - 2.537)**
Observations	12654	13149	14208	13655
Outcome	Arrest	Arrest	Arrest	Arrest
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	1.512	1.676	1.317	1.163
	(0.942 - 2.427)	(1.141 - 2.462)**	(0.902 - 1.925)	(0.708 - 1.909)
Hyper ADHD	1.804	1.981	1.594	1.871
	(1.158 - 2.812)**	(1.341 - 2.927)**	(1.199 - 2.118)**	(1.268 - 2.761)**
Combined ADHD	1.371	1.92	1.596	1.363
	(0.880 - 2.136)	(1.353 - 2.724)**	(1.169 - 2.180)**	(0.898 - 2.071)
Observations	9635	13664	12654	11974

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.

Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Outcome	Convicted	Convicted	Convicted	Convicted
Specification	Baseline	No Census data	just exog	Drop PVT/GPA
Inattentive ADHD	1.272	1.4	2.615	2.281
	(0.535 - 3.025)	(0.626 - 3.129)	(1.423 - 4.807)**	(1.208 - 4.309)*
Hyper ADHD	2.174	2.379	2.52	2.472
	(1.022 - 4.622)*	(1.219 - 4.642)*	(1.369 - 4.639)**	(1.239 - 4.931)*
Combined ADHD	2.027	1.832	2.541	2.294
	(0.857 - 4.793)	(0.807 - 4.158)	(1.195 - 5.402)*	(0.997 - 5.278)
Observations	12723	13222	14294	13736
Outcome	Convicted	Convicted	Convicted	Convicted
Specification	Include Other Xs	Drop Educ/Family Vars	Lower ADHD Bar	Drop Older Kids
Inattentive ADHD	1.535	2.521	1.539	1.29
	(0.639 - 3.686)	(1.354 - 4.694)**	(0.738 - 3.213)	(0.506 - 3.289)
Hyper ADHD	2.418	2.326	1.306	1.525
	(1.046 - 5.593)*	(1.159 - 4.667)*	(0.716 - 2.380)	(0.609 - 3.820)
Combined ADHD	1.487	2.827	1.549	2.165
	(0.426 - 5.191)	(1.292 - 6.185)**	(0.769 - 3.121)	(0.908 - 5.160)
Observations	9647	13745	12723	12039

Just Exogenous: We drop education attainment, indicator for currently in school, grade point average, PVT score, mother's education attainment, family income, and family structure
Include other Xs: Welfare receipt, whether father ever jailed, birthweight
Lower ADHD Threshold: Individuals must have 5 symptoms rather than 6.
Robust 95% confidence intervals in parentheses, +10%, *5%, **1%

Retrospective Add Health Variables for ADHD

Inattentive Variables

H3RA1—You failed to pay close attention to details or made careless mistakes in your work.
H3RA3—You had difficulty sustaining attention in tasks or fun activities.
H3RA5—You didn't listen when spoken to directly.
H3RA7—You didn't follow through on instructions and failed to finish work.
H3RA9—You had difficulty organizing tasks and activities.
H3RA11—You avoided, disliked, or were reluctant to engage in work requiring sustained mental effort.
H3RA13—You lost things that were necessary for tasks or activities.
H3RA15—You were easily distracted.
H3RA17—You were forgetful.

Hyperactive Variables

H3RA2—You fidgeted with your hands or feet or squirmed in your seat.
H3RA4—You left your seat in the classroom or in other situations when being seated was expected.
H3RA6—You felt restless.
H3RA8—You had difficulty doing fun things quietly.
H3RA10—You felt "on the go" or "driven by a motor."
H3RA12—You talked too much.
H3RA14—You blurted out answers before the questions had been completed.
H3RA16—You had difficulty awaiting your turn.