

Does Family Matter? Exploring the Relationship between ADHD and Substance Abuse

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Bios:

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Abstract:

In our study we examined the relationship of family structure to alcohol and drug use among people diagnosed with ADHD. We used data from the National Longitudinal Study of Adolescent Health (Add Health). The study followed a nationally representative sample of adolescents in grades 7-12 in the United States during the 1994-1995 school year. We analyzed the data using logit analysis. Our study indicates that alcohol dependence among individuals with ADHD is more likely to occur among Blacks compared to other ethnic groups, among males compared to females, and among people with incomes less than \$50,000 a year, but less likely to occur among individuals with ADHD who report that they are close to the grandmother who raised them. Binge drinking was more common among males than females, among those who are not married, and less likely among Asians and Blacks compared to other ethnic groups as well as among people with many close friends. Dependence on cannabis was less likely among those diagnosed with ADHD compared to those without the diagnosis. Blacks, male, and those with incomes below \$30,000 a year, are more likely to be dependent on cannabis than whites, females, and those with higher incomes. People who report being close their fathers are less likely to use cannabis than those who report that they are not close to their fathers. Blacks, married individuals, and people who are raised by their grandfathers are less likely to be dependent on other substances than other ethnic groups, single individuals, and those who live with people other than their grandfather.

Introduction

The last several decades have been spent trying to gain a better understanding of risk taking behavior among adolescents and young adults. More recently, social scientists have begun focusing on the role that social structure plays in substance abuse (Parkins and Angell 2011). Individuals diagnosed with Attention Deficit Hyperactivity Disorder, which affects cognitive skills functioning, are part of a larger community and their actions can have consequences not only to themselves, but also for their families and friends, and for the communities in which they live. Those diagnosed with ADHD are more likely to have impulse control issues that lead them to engage in risk taking behavior. The repercussions of risky behavior have an impact not only on federal, state, and local governments, but on the individual's family unit and social circle as well. Based on previous research, we will review the following questions: Does family structure influence substance abuse? Are there differences in substance abuse for ADHD individuals? How does ADHD affect substance abuse? Could family structure be a protective factor in decreasing substance abuse? Our contribution to this research focuses on whether or not family structure serves as a protective factor against substance abuse among individuals diagnosed with ADHD.

The costs of healthcare skyrocketed in the U.S. while, simultaneously; substance abuse treatment programs have been cut from many insurance policies making access to help more difficult to those individuals who are least likely to seek treatment. The National Center on Addiction and Substance Abuse estimates substance abuse and addiction cost federal, state, and local government \$467.7 billion dollars in 2005 (CASA 2009). Substance abuse not only takes a toll on the health care system, but also the criminal justice system which includes incarceration, probation, parole, and family court costs. The more immediate costs to society are felt at the family level when repeated substance abuse affects an individual's ability to complete work;

hold a job; take care of immediate family needs; interpersonal conflicts with family, co-workers, and friends; and legal costs. Considering the high costs to not only the individual, but to the family and community as well, it is important to understand if family structure affects substance abuse.

We start by detailing how ADHD is diagnosed and possible issues surrounding it. Next we will explore the relationship between ADHD and substance abuse, including some recent controversy. In addition, we will highlight some recent studies on family structure and the role it plays in risky behavior including substance abuse. Current research on family structure and ADHD is explored. Finally, we present the most current research that includes ADHD and its links to family structure and substance abuse. We hope to answer the question: Could family structure be a protective factor in decreasing substance abuse among individuals diagnosed with ADHD?

The data for this project will come from the National Longitudinal Study of Adolescent Health. This long-term study, begun in 1994-95, surveyed 7-12 graders across schools in the United States and consisted of in-school as well as at home surveys and interviews. The data used for this study comes from Wave IV, which is the first wave to ask the question “Has a doctor, nurse, or health care provider ever told you have or had: attention problems, or ADHD, or ADD?” Analyzing this question, as well as those relating to family structure and substance abuse, we will attempt to find the patterns associated with ADHD/ADD, substance abuse, and the role that family structure plays.

As the previous research suggests, many people diagnosed with ADHD struggle with inattentiveness which leads to problems with both accomplishing daily tasks and impulse control. This inattention has been suggested to be a significant factor in predicting substance abuse (Molina and Pelham 2003) which may be an attempt to self-medicate. By analyzing the

responses reported in the Health Data from Wave IV of the study, we will explore whether or not there is a correlation between the diagnosis of ADHD and substance abuse.

Family structure has consistently been shown to have an impact on life outcomes including education, mental health, and risky behavior (Bramlett and Blumberg 2007). We will identify the family structure by concentrating on questions related to the family, including number of siblings, who the individual was raised by, and how close they felt to that parent. Our research will analyze the current relationship status of those diagnosed with ADHD and whether or not there are consistent patterns among the respondents. Does a diagnosis of ADHD affect an individual's relationship status? By analyzing the individuals' relationships, we hope to identify distinctive patterns of social support and dependence among those diagnosed with ADHD compared to those who are not.

Finally, we hope to identify whether or not there is a correlation between family structure, ADHD, and substance abuse. We will begin by studying the relationship structure of those diagnosed with ADHD. We will then analyze patterns of alcohol, marijuana and other substance abuse within this population and determine whether or not there is a correlation. We will attempt to identify the patterns of family structure among individuals with substance abuse and those individuals who always answer no to substance abuse questions. Our research will explore whether or not identifying patterns of family structure affect an individual diagnosed with ADHD and his tendency toward substance abuse. We will consult previous literature and observe the themes of ADHD and its effect on substance abuse, family structure and its effect on substance abuse and whether or not family structure influences substance abuse among those diagnosed with ADHD.

Literature Review

Theoretical Review

The current literature highlights several key themes concerning ADHD, substance abuse, and family structure. First we begin by addressing how ADHD is diagnosed and possible issues with the techniques used. Next we look at current studies that explore the relationship with ADHD and substance abuse. Additionally we highlight the most recent studies on family structure and its relationship to risky behavior. Current research on family structure and ADHD is explored. Finally, we summarize the most current research that includes ADHD and its links to family structure and risky behavior.

ADHD Diagnosis

An understanding of what ADHD is and how it is diagnosed is important to understanding the relationship between ADHD and substance abuse. Most often, ADHD is diagnosed in childhood and, until recently, it was assumed that most children simply grew out of it as they reached adulthood. The increased awareness of how inattentiveness, restlessness, and impulsivity affect an individual's executive functioning skills has shown that many do not necessarily "outgrow" these deficits, but that they may have learned to adapt, compensate, or self-medicate in order to cope (Kalbag and Levin 2005).

There is no simple test to determine if an individual has ADHD and repeated changes to the *Diagnostic and Statistical Manual of Mental Disorder* (DSM) manual for both children and adults have only added to the confusion. Several tests are used to measure various symptoms using rating scales and, while systematic and quantitative, they may not necessarily be objective (Gualtieri and Johnson 2005). For children, this includes combining surveys from both parent and teacher assessments as well as academic process, screening for vision or hearing, and measuring cognitive function (Von Polier, Vloet, and Herpertz-Dahlmann 2012). Adults generally rely on self-reporting alone, and Sibley et al. (2012) suggest that young adults with ADHD tend to underreport current symptoms while young adults without ADHD tend to over

report symptoms. The symptoms of ADHD are non-specific and may fall under other conditions including anxiety disorders, conduct disorder, bipolar disorder, developmental disabilities, and substance abuse issues (Gualtieri and Johnson 2005). To further complicate things, the DSM-IV, which is considered the gold standard for diagnosing, emphasizes that ADHD cannot be diagnosed if the symptoms fall under another diagnosis (Faraone and Antshel 2008). This has led to some questioning to what extent over/under diagnosing of ADHD is occurring (Kalbag and Levin 2005).

With estimates of an ADHD diagnosis found to be anywhere from 3 percent to 9 percent of the population and clinical experts suggesting that many of those individuals may not continue to experience symptoms into adulthood then we could expect a lower percentage of the adult population to suffer from ADHD. What makes the link between a diagnosis of ADHD and substance abuse important is that as symptoms of ADHD and substance abuse increase, the severity of both diseases is found to increase (Kalbag and Levin 2005).

ADHD Diagnosis and Substance Abuse

Recent research suggests a correlation between ADHD diagnosis and substance abuse. Much of the literature finds that early identification of both ADHD and substance abuse is important in order to successfully treat both diseases. The research is controversial. Some posit that stimulants used to treat ADHD will increase future substance abuse, while other research concludes it has made future substance abuse less likely. The treatment for ADHD individuals becomes more complicated because deficits in executive functioning may make standard treatment options less reliable. Studies suggest both ADHD and substance abuse may need to be considered as a combined treatment in order to be more effective. Given that ADHD is prevalent in only 1 to 5 percent of the adult general population but it is estimated to affect 11 to 35 percent

of substance abusers, understanding the relationship is important for both prevention and treatment of the disease in order to prevent future abuse (Kalbag and Levin 2005).

It is important to understand the patterns of ADHD and substance abuse. This study by Yewers, Hay, and Barton (2005) compared adults currently using illicit drugs or alcohol compared to the general population. They found that adult participants with more severe symptoms of ADHD present in childhood were more likely have severe symptoms of drug abuse. On the other hand, there were no significant differences between drug users with ADHD and those without when comparing alcohol abuse. This would suggest that future studies would want to identify the type of substance abuse (alcohol, cannabis, other drugs, and smoking) instead of grouping all types of substance abuse under one category. The severity of ADHD in childhood and the relationship to drug abuse in adulthood is important to understanding the long term affects that ADHD can have.

Gordon, Tulak, and Troncale's (2004) study indicates that 34 percent of adolescents who reported a diagnosis of ADHD at some point in their lifetime admitted to substance abuse or dependency problems. This finding is consistent with other literature that suggests the range is from 30 to 50 percent (Gordon, Tulak, and Troncale 2004). Additionally, half of the individuals with ADHD had been prescribed Schedule II psycho stimulant medication. Twenty percent admitted abusing the medication. This would suggest that initially the legal use of stimulant medication to treat the disorder could be used as a gateway drug leading to substance abuse. Recognizing the effect that ADHD can have on substance abuse is important when considering the impact of various medications in treating and preventing both issues.

Controversy surrounds the relationship between ADHD and the link to self-medication that may lead to future substance abuse. Recent research has highlighted evidence suggesting that the two are positively related (Wilens et al. 2007). To understand the relationship, Wilens

and colleagues (2007) conducted a study that measured the type of substance abuse; drug of preference, and reasons for continuance among a group of participants. The findings concluded that substance abuse differed between ADHD and non-ADHD participants (Wilens et al. 2007). This contributes to our understanding of what substances are chosen for abuse and why, as well as the differences between ADHD and non-ADHD individuals. These articles suggested that there is a link between ADHD individuals who self-medicate and substance abuse patterns.

Substance Abuse and Family Structure

An important aspect of substance abuse is the correlation it has with family structure. Barnes et al. (2000) studied the correlation and discussed the effects that different types and levels of parenting have on adolescent substance abuse. The authors hypothesized that parental support and monitoring would influence the adolescent's alcohol use and misuse. The researchers found that effective parenting decreased the likelihood of alcohol abuse among adolescents (Barnes et al. 2000). The authors used the family socialization theory which suggests that a child's environment and parental involvement affects life outcomes and participation in risky behaviors. The two areas of parental involvement the authors focus on are parental support and monitoring. The parental support factor includes the parent's encouragement and praise of the child's growth and development so that the child feels emotionally connected to and accepted by a supportive parent (Barnes et al. 2000). In general, the more supportive a parent is, the less the child is involved in poor and destructive behavior. The control factor suggests that the parents monitor the child's behavior and when, where, and what activities the child participates in. Control can be viewed as negative or positive. Depending on the parenting style, the child's behavior may positively or negatively change. According to the study, parental support and control were related to decreased delinquency and substance abuse among adolescents (Barnes et al. 2000).

ADHD Diagnosis and Family Structure

The next theme that developed in our research was in the relationship between family structure and ADHD. Schroeder and Kelley (2009) assessed family factors that are associated with ADHD and other emotional disorders. The authors compared parents of children with ADHD and parents of children without based on “(1) stress, support and quality of life; (2) current family functioning; (3) parenting style and satisfaction in the family of origin and current family; and (4) higher levels of stress and lower levels of both social supports and quality of life than did normal controls” (Lange et al. 2005, p. 76). Contradictory to the hypothesis, the ADHD and emotional disorder respondents did not show profiles that were distinctly different than those in the normal control group. The parents did report different styles of parenting; for example, the parents of children with ADHD reported higher levels of authoritarian parenting styles. The authors did find that parents of children with ADHD reported higher levels of stress in parenting than did the normal control group (Lange et al. 2005). They also reported less parental satisfaction than did the parents of the normal control group (Lange et al. 2005). This suggests that family environment for families of children with ADHD may be more stressful than that for families without ADHD children.

Schroeder and Kelley (2009) analyze and compare the associations between family environment, parenting practices and functioning of children who are diagnosed with ADHD and those who are not. Previous research suggests that children diagnosed with ADHD struggle with executive functioning skills which have been defined as “...a set of regulatory processes necessary for selecting, initiating, implementing and overseeing thought, emotion, behavior, and certain facets of motor and sensory functions” (pp. 27-28). The research suggests that family involvement is related to the positive or negative behavior of the child. They compared this information among children who were and were not diagnosed with ADHD. They wanted to

know if a diagnosis of ADHD would affect the relationship between family involvement and child behavior. The families of children who were diagnosed with ADHD did report less organization in the family. Although the researchers had hypothesized that family environment and parenting practices would be related to executive function among children with ADHD, they did not find support for this hypothesis in their study.

Using data from the Add Health Survey, Fletcher and Wolfe (2008) found an association between ADHD, repeating a grade, and/or participation in special education. What makes this particular study useful is that it is a longitudinal study that included siblings. The ability to analyze long term outcomes can give a better understanding of the impact that ADHD has on education, not only for the individual diagnosed with ADHD, but also for siblings. As a result, ADHD was shown to have a statistically significant impact on GPA, suspension, being expelled, dropping out, the years of education attained, and whether or not the students attended college. Another unique characteristic of this study was its ability to compare the ADHD individual with another sibling also diagnosed with ADHD. The hypothesis was that having a sibling with ADHD reduces the human capital for other children, taking away time, resources, and money that would also have a negative effect on the sibling with ADHD. These results compared an ADHD individual to siblings who were both diagnosed with ADHD. While the results did show a negative effect on the extended family, the siblings were not necessarily worse off than the single ADHD case. As we explore the relationship of family structure to ADHD, this study is useful as a framework to understand the role that families play and that ADHD does not affect just the individual, but also the extended family unit. In addition, for those with ADHD and a sibling with ADHD, the results show that while educational outcomes were affected in the short term, it did not necessarily lead to long-term negative outcomes to education. ADHD siblings were statistically better off than the ADHD individual in terms of education. As we explore the

role that family structure plays, it may be important to take into consideration how additional family members diagnosed with ADHD affect substance.

ADHD Diagnosis, Family Structure, Substance Abuse

Finally, previous research briefly addresses a relationship among ADHD, family structure and substance abuse. Groenman et al. (2013) examined the relationship between childhood ADHD and substance abuse. The findings of this study are useful because it not only identified families of individuals who were diagnosed with ADHD and compared them with non-ADHD siblings, it also followed up four years later and measured changes that occurred over time. The conclusion of this study confirmed that individuals diagnosed with ADHD were at an increased risk for substance abuse compared to the general population and those with a co-morbid diagnosis were found to be at a higher risk for problems compared to the general population. Non-ADHD siblings were not found to have an increased risk for substance abuse. The increased risk for substance abuse as well as well as early participation is important for our understanding of the role ADHD plays in substance abuse behaviors. As we explore the role family structure plays, this study is applicable as there was no increased risk for substance abuse in the non-ADHD siblings.

The research by Fulkerson et al. (2006) suggests that the more a child feels cared for, the less he or she will engage in risky behaviors. This research also suggested that the more family involvement that occurs, the less high-risk behavior a child will engage in. They hypothesized that the frequency of family meals correlates with the risky behavior of the adolescents in the family. The authors concluded that “family connectedness is associated with decreased engagement in high-risk behaviors such as substance abuse and violence...”. Consistent inverse relationships were found between the frequency of family dinners and all high-risk behaviors measured. The more involved the family members are with one another, the less the adolescents

will participate in destructive behaviors. This suggests that family support and involvement could be a prevention measure for adolescent destructive behavior.

Wilens et al. (2007) examined the relationship between ADHD and the link to self-medication, which may lead to substance abuse. Type of substance abuse as well as drug of choice preference and reasons for continued use was all assessed among all participants. The findings concluded that the substances abuses were different between ADHD and non-ADHD participants. Over time, no noticeable differences for continued substance abuse, which included “unknown, self-medication, or get high,” were seen for either the ADHD or the control group. This contributes to our understanding of what substances are chosen for abuse and why, as well as the differences between ADHD and non-ADHD individuals.

Summary

The theoretical review has helped us to focus on how ADHD affects substance abuse as the findings conclude a large percentage of substance abusers have co-morbid ADHD when compared to the general population. Much of the research on family structure has focused on education showing a positive correlation between parental involvement and educational success. The studies on family structure have shown a positive correlation between strong family structure and reduced risky behavior including substance abuse. Based on the literature review, we have developed the hypothesis that family structure could be a protective factor decreasing substance abuse in individuals with ADHD.

Methods Review

Attention Deficit Disorder (ADHD) is best understood as an executive functioning deficit. In order to understand the relationship between ADHD, increased substance abuse, and family structure, our research has broken it down to five methods of research in order to analyze the findings. The articles focus on diagnosing ADHD in adolescents and adults, as well as the

controversies surrounding both groups, research involving the relationship between ADHD and substance abuse. Finally, we reviewed studies that involved both positive life outcomes for the effects of family structure on individuals diagnosed with ADHD and those who admit to struggling with substance abuse.

The first article uses a meta-analysis where the researchers compared and combined results from various studies. Next, we reviewed articles that contained quantitative empirical research which observed and gathered data which was analyzed using SPSS. The researchers administered assessments such as surveys and questionnaires to acquire the data concerning the topics at hand, and then recorded the findings. The next method involved reviewing articles that used quantitative statistical analysis and some of these articles used results from other studies and recorded the findings based on secondary data analysis. The final method used in the articles reviewed is the longitudinal study. This type of study observes the same variables over an extended period of time and researchers study the correlations within the observations.

Meta-Analysis

Kalbag and Levin's (2005) meta-analysis is a review of research on individuals with ADHD. The criteria for diagnosing ADHD using various tests, the time and skill involved in administering tests, and, finally, the changes to criteria over the past 20 years are addressed. An overview of the controversial treatment options including stimulant, non-stimulant, and behavioral therapy and their connections to substance abuse were discussed. Recent findings for the prevalence of substance abuse among those with ADHD compared to the general population, as well as explanations for the relationship between ADHD and substance abuse, were also included. Finally, how symptoms of ADHD could affect traditional treatments for substance abuse and alternatives for treating the combined diseases was discussed. The meta-analysis contributes to our understanding of what ADHD is and controversies that surround it.

Quantitative Empirical Analysis: New Data Collection

Cross-sectional survey. Yewers, Hay, and Barton (2005) used quantitative statistical analysis gathered through self-administered surveys of adult males aged 18-65 that were currently using drugs or alcohol as measured using the standard U.S. criteria for diagnosis that is included in the *DSM-IV*. The data from current substance abusers was then statistically compared to the results of the Australian Twin ADHD project (Yewers, Hay, and Barton 2005). Their method of measuring prevalence of ADHD among substance abusers, as well as the quantity and frequency of substance abuse contributes to our understanding of the relationship between ADHD and substance abuse.

Fletcher and Wolfe (2008) used quantitative statistical data gathered from the ADD Health to study the role that ADHD may play on family structures . The data collection in this study is most similar to ours in using secondary data from ADD health. While this study used symptoms associated with ADHD from Waves I and II, we will only use data from Wave IV in which individuals have been diagnosed with ADHD.

Fulkerson and associates (2006) used quantitative statistical survey to conduct a study of family structure and risky behavior amongst 6-12 graders amongst a large national sample. The relationship between family involvement and risky behavior was measured using a Likert scale. Various risk patterns were assessed to measure students' involvement in these behaviors. The use of secondary data similar to our study contributes to our understanding of the relationship between family structure and risky behavior.

We continued our research using the structured quantitative survey conducted by Schroeder (2009), who gathered data from multiple types of families including step-parents and legal guardians of children aged 6-12 who had ADHD as well as those that did not. Measures included executive functioning skills, as well as the parent-child relationship. The inclusion of

unique family structures used in the methods of this particular study contribute to our knowledge of the role family structure plays in both ADHD and non-ADHD individuals.

Lange and colleagues (2005) studied the role family played in ADHD using a structured quantitative questionnaire with 22 mothers, 13 fathers, and 22 boys diagnosed with ADHD including assessments that measured the quality of life, parental styles, family environment, and general health. The researchers analyzed the data using SPSS. There were a large number of dependent variables (26). The statistical measurements as well as SPSS are similar to the way we will conduct our statistical analysis.

Gordon, Tulak, and Troncale (2004) used quantitative empirical research to statistically analyze data gathered through interviews and self-report surveys. Like the previous research, participants were participating in substance abuse behaviors. Variables for age, gender, type of substance abused, ADHD diagnosis, age of onset, and use of psycho stimulant drugs in treating the symptoms of ADHD were all measured. This study contributes to our understanding of the relationship between ADHD and substance abuse by examining whether treatment of symptoms for ADHD can lead to future substance abuse as well as the relationship between ADHD and non-ADHD individuals and substance abuse.

Groenman et al. (2013) also used quantitative empirical research to study adolescents and substance abuse. The data was then statistically analyzed using the same SPSS program that will be employed in our data analysis. Adolescents aged 15-17 were identified through outpatient treatment centers for substance abuse while control participants were gathered from the same geographic areas for comparison which included a 4-year follow-up with a total of 1017 participants. At least one sibling either with or without a diagnosis of ADHD was included in the total number of participants. Measures included the long version of Conners' Parent and Teacher Diagnostic Interview for Children (DISC-IV-P) and the Alcohol Use Disorders Identification

Test (AUDIT [23]) as well as the Drug Abuse Screening Test-20 (DAST: [24]) to measure drug abuse.

Longitudinal Study. To study family influence on alcohol abuse, Barnes et al. (2000) conducted a longitudinal study of adolescents and families who were randomly selected using a random-digital dial computer-assisted interviewing network. The study used structured interviews to question adolescents and their parents and the authors used measures that included the alcohol misuse index and parental involvement measures. The study concluded that family structure could act as a protective factor in substance abuse.

Finally, the longitudinal study by Wilens et al. (2007) conducted a two part longitudinal study using quantitative statistical analysis to measure for relationships among ADHD, non-ADHD individuals, family structure, and potential substance abuse, as well as frequency, preference, motivation, and problems associated with its substance abuse. Both nominal, ordinal, and interval-ratio scales were used for the statistical analysis. This study is very similar to our proposed research in terms of questions. Like our proposed study, it examined the differences in substance abuse by ADHD and non-ADHD individuals' as well as what substances are chosen for abuse and why.

The methods portion of our research articles consisted of quantitative statistical analysis using intake evaluations, interviews, and self-administered surveys and meta-analysis. Adolescents, adults, and families were the focus of the studies. Statistical data provided unbiased outcomes compared to interpretive interviews. Because our project will focus on the use of secondary data from the Add Health Longitudinal study, we chose these as our focus in order to gain a better understanding of the variables they used.

Methods

Data Source

The data for this study came from the National Longitudinal Study of Adolescent Health (Add Health), which is longitudinal study conducted using a nationally representative group of adolescents systematically chosen from a sample of 80 high schools and 52 middle schools (132 schools in total) in grades 7-12 (Harris and Udry 2009). The study was designed to investigate all aspects of adolescent life in order to better understand their health, relationships, education, and behavior. Approximately 90,000 youth participated in the initial Wave I in-school survey with approximately 20,745 youth and 17,700 caregivers participating in the follow-up interview (Harris and Udry 2009). The first wave was conducted in 1994-1995 and subsequent waves followed in 1996, 2001-2002, and wave IV in 2007-2008 when the respondents were between the ages of 24-32 (Harris and Udry 2009). For our research purposes, we have used the most recent data from the Wave IV in-home questionnaire survey conducted in 2008.

Participants

From the nationally representative sample, our smaller subset has a total population of 3473 (N=3473) which was identified through both the “alcohol dependence symptoms scale” and “other substance dependence symptoms scale” from responses obtained during Wave IV at-home survey. The difference between these two groups is that we are only concerned with the individuals who have indicated substance dependency and we are not concerned with the general population. Informed consent was received through the National Longitudinal Study of Adolescent Health (Add Health Survey) and we respected the rights of the participants at all times. We completed an IRB application which was approved. The data from Wave IV is a secondary data source with no way to link participants to his or her responses.

Measures

Dependent variables. Our measure of substance abuse comes from two different scales using questions from the Add Health Survey. The Alcohol Dependency Index was created by

measuring the number of DSM4 alcohol dependence symptoms which included eight variables such as increasing drinking, withdrawal from alcohol, continuing despite realizing it was causing emotional or health problems, and if the individual had given up, or cut back on activities that would interfere with drinking? The Alcohol Index measured (no=0 and yes=1) and the eight responses were then summed and scaled .00-7.0 with a mean of .8244. The Other Drug Dependency Index was also created using the DSM4 with eight variables that included the following:

- Having to use more {favorite drug} to get the effect you wanted? Has there ever been a period of time when you wanted to quit or cut down on your use of {favorite drug}?
- During the first few hours of not using do you experience withdrawal symptoms?
- Have you continued to use {favorite drug} after you realized it was causing emotional or health problems?"

The results were then measured similar to Alcohol dependence (no=0 and yes=1) and the eight responses were then summed and scaled .00-7.0 with a mean of .3812.

Independent variables. Two independent variables were included in our study. The first, was a diagnosis of ADHD, which for the first time, Wave IV asked the question “Has a doctor, nurse or other health care provider ever told you that you have or had: attention problems or ADD or ADHD?” (no = 0 and yes = 1). Based on previous studies, it is assumed that individuals with ADD/ADHD are more likely to have substance abuse issues. Using this variable allows us to analyze and compare the relationship between substance abuse and ADHD and non-ADHD.

To understand family structure, we used four questions from Wave IV, two questions related to “the mother figure who raised you,” and two questions that related to “the father figure who raised you.” The first question “Who was the mother figure who raised you?” was recoded

into four categories, each with a value of '1' if true, '0' if otherwise. Continuing with family structure, we wanted to understand the strength of the relationship with both the mother figure and father figure. In order to understand this, we chose "How close do you feel to your mother/father figure?" that was then ranked on a Likert scale with ranges falling between 1, not at all close to 5, very close.

Control Variables. We included the standard key demographic variables in our survey to include gender (male = 1, female = 0). Race was broken down into five nominal categories to include Hispanic, Black, Asian, Other, and White. Age was included with all of the respondents from Wave IV falling between the ages of 25-33 years. Education was recoded from the question "What is the highest level of education that you have achieved to date?" in order to find the percentage that had never attended high school. Marriage was recoded using the question "How many people have you ever married?" and individuals who had been married at least once, including those who were currently married, were recoded (married at least once=1 and never married=0). Finally, household income was recoded to an ordinal scale with four categories; <=\$29,000; \$30,000 to \$49,000; \$50,000 to \$74,999; and >=\$75,000 to account for the typical low, middle, middle-high, and upper household incomes.

Analysis strategy. The data was analyzed with SPSS statistical software. Two scales were designed which included one for alcohol abuse and the second for "other" substance abuse. Internal consistency of the scales can be achieved using Crombach's Alpha with a test result of .7 or higher indicating the results are reliable. Running Crombach's Alpha on our scales resulted in Crombach's Alpha of .82 for alcohol and .919 for other substance abuse. Because both measure well above the minimum .7, we conclude that our scales were reliable for our research.

The dependent variables were not normally distributed. Looking at Table 2 and 3, it is obvious that most of the responses were at zero which violates the normal distribution

assumption. To compensate for this, we used Zero-Inflated Poisson, (ZIP) models. Typically several groups are underrepresented in the U.S. so the original design oversampled for these groups which included well educated (i.e., parents had a college degree), black middle class families. Chinese, Cubans, and Puerto Rican populations were oversampled as well. To account for Add Health's complex sampling design and appropriate sampling weights, ZIP models were run in STATA. This allowed us to account for the clustering of data collected by school.

Descriptive statistics. Descriptive data is shown in Table 1. Mean, standard deviation, and range is shown for the variables. The sample's average age is 28.34 years old. Males make up 44.80% of the sample size. In terms of education, only 4.58% of the individuals for this sample have no high school education. Nearly half of the individuals included for this study had been married at least once, 49.73%. The majority of the sample was White, 62.63%; Blacks accounted for 21.57% of the sample; and nearly 10% was Hispanic (9.88%). Asian and "Other" accounted for less than 6% of the remaining sample. Approximately 5% of the sample had been diagnosed with ADD/ADHD which is consistent with the estimated 3-9% of the overall population.

Results

Limitations

While previous studies have used data from the first three waves of the Add Health Survey in order to make an assumption about those individuals could be diagnosed with ADHD, our study is limited to those individuals who had been formally diagnosed by a professional. Limiting ourselves strictly to Wave IV data meant we were unable to identify patterns and relationships using time series. Additionally, the Alcohol and Other Substance scales were also created from the Wave IV data limiting any insights into patterns or relationships using time series as well. Individuals self-reported whether a nurse or doctor had ever told them they had

ADHD and as research suggests, it may be difficult to diagnose an individual with ADHD once they have been diagnosed with substance abuse disorders. As was noted in our theoretical review, the DSM-IV can be interpreted to mean that overlapping symptoms of ADHD and alcohol or substance abuse prevent the diagnosis of ADHD (Kalbag and Levin 2005).

Results

When considering our proposed question, “Does family structure serve as a protective factor against substance abuse among individuals diagnosed with ADHD,” we designed four scales that offered information regarding family structure, ADHD and substance use. We were not able to compare the results for those diagnosed with ADHD to the results for those who were not. We controlled for race, gender, income, education and marital status on all four tables. We also included an independent variable to consider those who had previously been diagnosed with ADHD. The four tables measure the weighted estimates of individuals who reported levels of alcohol dependence, binge drinking, cannabis dependence, and other drug dependence. In the following paragraphs, we will divide our findings according to each individual scale beginning with Table 2 and concluding with Table 5. We have chosen to divide our results by these four independent variables in order to avoid spurious results.

To begin our analysis we reviewed the scale created to measure the population’s dependence on alcohol. Table 2 illustrates these findings. As Table 2 illustrates, black individuals show a significant level of decreased dependence on alcohol [-2.59(.090) $p < .001$]. As mentioned in the methods section, we must remember that the Add Health Survey oversampled for Black middle class males and this could affect the results of these findings. The table also shows that the rate of males’ alcohol dependence significantly increases as opposed to females [.171(.048) $p < .001$]. When considering household income, the model shows that those that earn an income below \$50,000 increase their level of alcohol dependence [\leq \$29,000:

.279(.084) $p < .001$]; [\$30,000-\$49,000: .207(.061) $p < .001$].

When considering the *Always Zero Group*, we are looking at those respondents who answered that they have never been alcohol dependent. The table shows that black individuals in comparison to white individuals show a strong significant increase in the log odds of never being alcohol dependent [1.304(.154) $p < .001$]. Table 2 also illustrates that males display a significant decrease in the log odds for never being dependent on alcohol [-.414(.106) $p < .001$]. This suggests that males have more of a tendency than females to at least sometimes become dependent on alcohol.

Table 3 measures the rates at which individuals participated in binge drinking. The *Always Zero Group* represents those who have never participated in binge drinking. According to the table, males in comparison with females have an increased rate of binge drinking [307(.054) $p < .001$]. When considering those individuals who are married, the rate of binge drinking decreases by [-.257(.040) $p < .001$]. This shows a strong significant correlation between being married and binge drinking. When considering race, Asians show a slightly significant decrease in comparison to white individuals [-.383(.151) $p < .01$].

When considering those who never participate in binge drinking, those diagnosed with ADHD increase the log odds by .605 [.605(.219) $p < .01$]. This suggests that individuals diagnosed with ADHD have a higher tendency not to participate in binge drinking. This same is true for Blacks who, in comparison to Whites significantly increase the log odds of never binge drinking by 1.245 [1.245(.144) $p < .001$]. Another observation is that Table 2 shows a significant increase in the probability that individuals who have a greater number of close friends will never participate in binge drinking. The log odds decrease by -.309 [-.309(.068) $p < .001$].

Table 4 demonstrates those individuals who expressed dependence on cannabis. The

Always Zero Group represents the individuals who responded by answering that they had never been dependent on cannabis. As opposed to what we hypothesized, Table 4 suggests that young adults who have been diagnosed with ADHD have a slightly significant decreased dependence on cannabis. According to the chart the rate for young adults with ADHD decreased by .339 [- .339(.144)] $p < .05$ points when compared to those without.

The *Always Zero Group* suggests interesting results for those diagnosed with ADHD. The log-odds of young adults with ADHD decreased by .661 [-.661(.235) $p < .001$] when compared to those without ADHD. This suggests that young adults diagnosed with ADHD are less likely to never use cannabis than those who are not diagnosed with ADHD. Table 4 also suggests that Black individuals show an increase in the log-odds of never being dependent on cannabis when compared to white individuals [.576(.224) $p < .01$]. We also see that males show a [-.691(.134) $p < .001$] decrease in the log odds that they will never use when compared to females who never use. Marriage increases the log-odds by [.627(.147) $p < .001$] points. Table 4 also suggests that an income of less than \$30,000 decreases the odds of never using cannabis by [-.423(.157) $p < .01$]. Finally, when considering those who never become dependent on cannabis, table 4 shows that the log odds increase by [.108(.043) $p < .01$] when the individual feels close to his or her father.

Table 5 demonstrates those individuals who have been dependent on other drugs. The *Always Zero Group* measures the log-odds of those who have never been dependent on other drugs. In contrast with our hypothesis, an ADHD diagnosis did not have a significant correlation with dependence on other drugs. There are many factors that could affect this portion of the research such as: incorrect responses, sample size, etc. Although there were not any strong

significant findings concerning other drug dependence, the *Always Zero Group* showed otherwise.

According to Table 5, Black individuals showed an increase of [2.606(.310) $p < .001$] in the log odds of never being dependent on other drugs when compared to white individuals. Similar to cannabis dependence, marriage significantly increases the log odds of never being dependent on other drugs by [.536(.170) $p < .01$]. Lastly, we see that there is a slight significant increase in those who never depend on other drugs when they are raised by their grandfather [.542(.207) $p < .05$].

Conclusion

It is important for us to acknowledge our findings in relation to race and substance abuse. According to the tables measuring substance dependence, black individuals are less likely to become dependent on substances such as alcohol and drugs than white individuals are according to the Add Health data. Although we did not hypothesize that race would predict substance abuse, it is important to acknowledge this information. We did hypothesize that individuals diagnosed with ADHD would have a stronger tendency to become dependent on drugs and alcohol. There were not strong significant findings of this relationship within the data. Further research would benefit from administering in depth interviews to individuals diagnosed with ADHD in order to better understand their use of alcohol, cannabis and other drugs. We were able to see differences between those who were single and those who were married. Our findings suggest that there is a significant correlation between marriage and decreased levels of substance dependence. This suggests that this support or accountability may affect an individual's dependence on potentially harmful substances. We also see that feeling close to a father or mother figure who raised them increased the probability that they never become dependent on drugs and alcohol. We hope to continue our research by creating scales to measure the

relationship between types of family structure to understand whether or not certain family types prevent or diminish substance abuse among individuals diagnosed with ADHD.

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Table 1. Descriptive Statistics (N=3473)

Variable	Mean	Standard Deviation	Minimum	Maximum
Alcohol Index	0.8244	1.40961	0	7
Other Drug Index	0.3182	1.1789	0	7
ADHD	0.0504	0.21878	0	1
Race/Ethnicity				
Hispanic	0.0988	0.29838	0	1
Black	0.2157	0.41134	0	1
Asian	0.0394	0.19468	0	1
Other	0.0199	0.13957	0	1
White	0.6263	0.48387	0	1
Gender, Education, Marriage Status				
Male	0.448	0.49736	0	1
Never attended high school	0.0458	0.20904	0	1
Married	0.4973	0.50006	0	1
Age (in years)	28.34	1.821	25	33
Respondents household income				
<=\$29,000	0.2128	0.40934	0	1
\$30,000 to \$49,000	0.2283	0.41982	0	1
\$50,000 to \$74,999	0.2407	0.42758	0	1
>=\$75,000	0.3182	0.46583	0	1
Respondent Was Raised by				
Biological Mother	0.9369	0.2431	0	1
Grandmother	0.0291	0.16806	0	1
Female Biological Relative	0.0095	0.09703	0	1
Non-Biological Female Parent	0.0245	0.15454	0	1
Biological Father	0.8206	0.38373	0	1
Grandfather	0.0334	0.17971	0	1
Male Biological Relative	0.0202	0.14055	0	1
Non-Biological Male Parent	0.1258	0.3317	0	1
Satisfied with your mother	4.2701	1.14056	1	5
Close to mother	4.3539	1.08058	1	5
Satisfied with father	3.8149	1.40111	1	5
Close to father	3.8362	1.37096	1	5
Number of close friends	3.1952	0.96655	1	5
Number of siblings	2.7354	2.22469	0	20

Table 2. Individuals with ADHD that are dependent on alcohol and the *Always Zero Group*, those who always answered never to all alcohol dependency questions.

Alcohol Dependence	Weighted Estimates	Weighted Estimates
	Overall Coefficients	Always Zero Group
ADHD	.122(.119)	.080(.192)
<i>Who raised the respondent compared to biological mother and/or father</i>		
Grandmother	.37(.189)*	-.309(.346)
Female Biological Relative	-.17(.258)	-.428(.460)
Non-Biological Female Parent	-.161(.232)	.062(.336)
Grandfather	-.136(.228)	.232(.386)
Male Biological Relative	-.072(.176)	-.810(.297)
Non-Biological Male Parent	-.039(.083)	-.330(.164)*
Feels close to mother	-.021(.024)	.038(.050)
Feels close to father	-.002(.018)	.017(.039)
Number of close friends	-.012(.024)	-.181(.056)**
Number of siblings	.011(.016)	.011(.025)
<i>Race/Ethnicity compared to Whites</i>		
Hispanic	.050(.087)	.526(.182)*
Black	-.259(.090)***	1.304(.154)***
Asian	.242(.101)	.794(.210)*
Other	-.116(.133)	-.089(.366)
<i>Gender, Education, Marriage Status</i>		
Male	.171(.048)***	-.414(.106)***
Never attended high school	-.079(.122)	.259(.274)
Married at least once	.009(.046)	.556(.104)
Age (in years)-	-.008(.014)	.051(0.033)
<i>Respondents household income compared to upper class</i>		
Lower class <=\$29,000	.279(.084)***	.429(.145)*
Middle class-\$30,000 to \$49,000	.207(.061)***	.263(.166)
Upper middle-class \$50,000 to \$74,999	.058(.069)	-.017(.133)
Intercept	.890(.413)	-1.171(.978)

Note. Correlations are significant at * $p < .05$; ** $p < .01$; *** $p < .001$; and +.10 Standard errors are shown in parentheses. *Note.* Due to the large number of respondents who always answered never (never=0; therefore Always Zero Group) those results have been included as well.

Table 3. Individuals with ADHD that binge drink and the *Always Zero Group* those who answered never to all binge drinking questions.

Binge Drinking	Weighted Estimates	Weighted Estimates
	Overall coefficients	Always Zero Group
ADHD	.072(.121)	.605(.219)**
<i>Who raised the respondent compared to biological mother and/or father</i>		
Grandmother	-.107(.156)	-.378(.286)
Female Biological Relative	.207(.237)	-.375(.496)
Non-Biological Female Parent	-.217(.355)	-.419(.622)
Grandfather	.004(.057)	.009(.139)
Male Biological Relative	.009(.170)	.356(.380)
Non-Biological Male Parent	.065(.142)	.102(.394)
Feels close to mother	-.022(.038)	-.071(.075)
Feels close to father	-.005(.026)	-.020(.064)
Number of close friends	.025(.024)	-.309(.068)***
Number of siblings	.010(.011)	.006(.024)
<i>Race/Ethnicity compared to Whites</i>		
Hispanic	-.046(.080)	.425(.189)
Black	-.102(.064)	1.245(.144)***
Asian	-.383(.151)**	.200(.426)
Other	.045(.120)	-.289(.378)
<i>Gender, Education, Marriage Status</i>		
Male	.307(.054)***	-.506(.127)***
Never attended high school	.175(.131)	.488(.217)*
Married at least once	-.257(.040)***	.675(.130)***
Age (in years)-	-.006(.011)	.085(.030)**
<i>Respondents household income compared to upper class</i>		
Lower class <=\$29,000	-.033(.061)	.379(.181)*
Middle class-\$30,000 to \$49,000	-.024(.069)	.013(.180)
Upper middle-class \$50,000 to \$74,999	-.032(.063)	.061(.170)
Intercept	.923(.391)*	-2.16(1.021)*

Note. Correlations are significant at * $p < .05$; ** $p < .01$; *** $p < .001$; and +.10 Standard errors are shown in parentheses. *Note.* Due to the large number of respondents who always answered never (never=0; therefore Always Zero Group) those results have been included as well.

Table 4. Individuals with ADHD that are dependent on cannabis and the *Always Zero Group*, those who always answered never to all cannabis dependency questions.

Cannabis Dependence	Weighted Estimates	Weighted Estimates
	Overall Coefficients	Always Zero Group
ADHD	-.339(.144)*	-.661(.235)**
<i>Who raised the respondent compared to biological mother and/or father</i>		
Grandmother	.366(.194)+	-.126(.437)
Female Biological Relative	-.361(.152)*	.609(.627)
Non-Biological Female Parent	.157(.220)	.033(.346)
Grandfather	-.450(.285)	-.170(.499)
Male Biological Relative	.051(.274)	-.502(.353)
Non-Biological Male Parent	.075(.108)	-.323(.170)+
Feels close to mother	.011(.031)	.027(.055)
Feels close to father	.009(.029)	.108(.043)**
Number of close friends	-.042(.032)	.042(.054)
Number of siblings	.023(.015)	.041(.023)
<i>Race/Ethnicity compared to Whites</i>		
Hispanic	.150(.118)	.181(.180)
Black	-.061(.110)	.576(.224)**
Asian	.125(.146)	.407(.298)
Other	.194(.235)	.011(.395)
<i>Gender, Education, Marriage Status</i>		
Male	-.037(.073)	-.691(.134)***
Never attended high school	-.005(.165)	-.082(.210)
Married at least once	.038(.082)	.627(.147)***
Age (in years)-	-.002(.019)	.053(.041)
<i>Respondents household income compared to upper class</i>		
Lower class <=\$29,000	.100(.111)	-.423(.157)**
Middle class-\$30,000 to \$49,000	.002(.121)	-.065(.175)
Upper middle-class \$50,000 to \$74,999	-.019(.108)	-.178(.136)
Intercept	.880(.612)	-.759(1.182)

Note. Correlations are significant at * $p < .05$; ** $p < .01$; *** $p < .001$; and +.10 Standard errors are shown in parentheses. *Note.* Due to the large number of respondents who always answered never (never=0; therefore Always Zero Group) those results have been included as well.

Table 5. Individuals with ADHD that are dependent on other drugs and the *Always Zero Group*, those who always answered never to all other drug dependency questions.

Other Drug Dependence	Weighted Estimates	Weighted Estimates
	Overall Coefficients	Always Zero Group
ADHD	-.105(.130)	-.441(.261)
Who raised the respondent compared to biological mother and/or father		
Grandmother	.170(.225)	.279(.389)
Female Biological Relative	.079(.283)	-.246(.555)
Non-Biological Female Parent	-.085(.300)	.249(.790)
Grandfather	-.058(.097)	.542(.207)*
Male Biological Relative	.075(.158)	.863(.581)
Non-Biological Male Parent	-.346(.338)	.746(.715)
Feels close to mother	.020(.035)	.129(.107)
Feels close to father	-.050(.034)	-.038(.088)
Number of close friends	-.026(.036)	.102(.088)
Number of siblings	.000(.015)	-.039(.033)
Race/Ethnicity compared to Whites		
Hispanic	.107(.104)	.152(.219)
Black	.022(.091)	2.606(.310)***
Asian	-.081(.111)	.014(.388)
Other	.124(.134)	.277(.416)
<i>Gender, Education, Marriage Status</i>		
Male	-.044(.065)	-.252(.165)
Never attended high school	.056(.093)	-.468(.260)+
Married at least once	-.027(.069)	.536(.170)**
Age (in years)-	.022(.019)	.031(.037)
Respondents household income compared to upper class		
Lower class <=\$29,000	-.064(.109)	-.438(.219)
Middle class-\$30,000 to \$49,000	-.031(.108)	-.208(.193)
Upper middle-class \$50,000 to \$74,999	-.042(.117)	-.116(.206)
Intercept	.830(.572)	

Note. Correlations are significant at * $p < .05$; ** $p < .01$; *** $p < .001$; and +.10 Standard errors are shown in parentheses. *Note.* Due to the large number of respondents who always answered never (never=0; therefore Always Zero Group) those results have been included as well.

