YOUTH DEPRESSION AND FUTURE CRIMINAL BEHAVIOR

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Abstract

While the contemporaneous association between mental health problems and criminal behavior has been explored in the literature, the long-term consequences of such problems, depression in particular, have received much less attention. Using data from the National Longitudinal Study of Adolescent Health (Add Health), we examine the effect of depression during adolescence on the probability of engaging in a number of criminal behaviors later in life. In our analysis, we control for a rich set of individual-, family-, and neighborhood-level factors to account for conditions that may be correlated with both childhood depression and adult criminality. One novelty in our approach is the estimation of school and sibling fixed effects models to account for unobserved heterogeneity at the neighborhood and family levels. Furthermore, we exploit the longitudinal nature of our data set to account for baseline differences in criminal behavior. The empirical estimates show that adolescents who suffer from depression face a substantially increased probability of engaging in property crime. We find little evidence that adolescent depression predicts the likelihood of engaging in violent crime or the selling of illicit drugs. Our estimates imply that the lower-bound economic cost of property crime associated with adolescent depression is approximately 227 million dollars per year.

Keywords: Crime; Depression; Add Health; Youth; Adolescent
JEL Classification: I10, K42

I. Introduction

Major depression is a serious public health problem in the United States and around the world. According to the World Health Organization (WHO), depression is the leading cause of disability and the fourth leading contributor to the global burden of disease.[1] The incidence of mental health problems also runs high among children and adolescents. For example, 8.1 percent of 2 million adolescents aged 12-17 experienced at least one major depressive episode in 2009 (Substance Abuse and Mental Health Services Administration, 2010). Furthermore, about 15 million children meet the criteria to be diagnosed with a mental health disorder (American Psychological Association, 2008).

These problems constitute a major source of concern because the consequences of depression are wide-ranging and long-lasting. The literature covers a broad spectrum of outcomes influenced by depression including educational attainment (Fletcher, 2008; Fletcher, 2010; Wilcox-Gök et al., 2004), labor market productivity (Chatterji et al., 2011; Fletcher, 2013; Marcotte and Wilcox-Gök, 2003; Ruhm, 1992), substance use (Greenfield et al., 1998; Rao et al., 2000; Swendsen and Merikangas, 2000), and risky sexual behavior (Ramrakha et al., 2000; Shrier et al., 2001; Stiffman et al., 1992). Moreover, the economic burden of mental health disorders is substantial. It has been estimated that annual treatment and disability payments are roughly $83.1 billion, while the indirect costs associated with productivity loss are roughly $51.5 billion per year (Greenberg et al., 2003; Ettner et al., 1997). Because of the substantial economic and social costs that depression and other mental illnesses impose on society, the U.S. Department of Health and Human Services has identified improving mental health as a vital

[1] By 2020, the WHO predicts that depression will be the second leading contributor to the global burden of disease (WHO, 2001).

objective. Accordingly, the goal set by the government is to achieve a 10 percent reduction in the proportion of adolescents who experience a major depressive episode by the year 2020.[2]

Not surprisingly, the association between mental health and criminal activity has received considerable attention in the literature. Research has shown that individuals with mental health disorders face higher arrest rates, have records of past violence, and are more likely to be victims of crime themselves (e.g., Choe et al., 2008; Donnellan et al., 2005; Elbogen and Johnson, 2009; Teplin et al., 2005; Trzesniewski et al., 2006; White et al., 2006). It has also been documented that adult prisoners and incarcerated adolescents suffer from mental illnesses at much higher rates than the general population (e.g., Marcotte and Markowitz, 2011).[3] More specifically, studies have identified depression as a motiving factor for criminal behavior (e.g., Broidy and Agnew, 1997; Piquero and Selock, 2004; Swartz and Lurigio, 2007; Woddis, 1957-1958). Depression has frequently been linked to acts of violence such as homicide (Benezech, 1991; Benezech and Bourgeois, 1992; Malmquist, 1995). On the other hand, several studies have argued that depression may decrease delinquent behavior because it reduces an individual's energy and desire to act (Agnew, 1992, Broidy, 2001; Mazerolle and Piquero, 1997).

While associations between mental health and crime and, more specifically, depression and crime have been considered in the literature, the existing studies contain limitations. First, much of the previous work has been descriptive in nature.[4] These studies are usually motivated by the observation that mental health problems are more common among incarcerated groups

[2] The U.S. Department of Health and Human Services outlines their objectives in *Healthy People 2020.* Available at: http://www.healthypeople.gov/2020/default.aspx.

[3] In particular, more than 20 percent of all prisoners have a history of serious mental health problems (Marcotte and Markowitz, 2011) and between 50 to 75 percent of incarcerated adolescents have diagnosable mental illnesses (Coalition for Juvenile Justice, 2012).

[4] See Marcotte and Markowitz (2011) for a detailed summary of the literature on the relationship between depression and crime.

(e.g., Teplin, 1990; Silver et al., 2008; Wallace et al., 1998) or that criminal behavior is higher among individuals with mental health disorders (e.g., Hodgins, 1992; Swanson et al., 2002).

Second, most previous studies use cross-sectional data to study the relationship between mental health and crime. Exceptions include several cohort studies that follow individuals over time to illustrate that those suffering from mental health disorders are more likely to exhibit criminality or become incarcerated (e.g., Arsenault et al., 2000; Brennan et al., 2000). However, these studies generally use data from outside the United States and rely on a limited set of controls to account for differences across individuals that could be correlated with both mental health and criminal behavior. Therefore, it is not clear-cut to move from a correlation between depression and crime to a statement about causality due to a multitude of omitted factors, such as financial stress or poor parenting. While these factors are likely to have an independent effect on criminal behavior, they may also influence crime through affecting mental health. In addition, the direction of causality may go from crime to mental health. For example, poor mental health may be a result of incarceration (Marcotte and Markowitz, 2011; Vermeiren et al., 2000). Cross-sectional or observational studies cannot account for this problem. Additionally, the crime and mental health variables often used in these studies are based on arrest or incarceration records and official reports of clinical diagnoses. Consequently, many individuals engaging in crime and/or suffering from mental illnesses go unnoticed and are left untreated.

Finally, much of the previous research has used data drawn from non-representative populations (e.g. prison populations). While these studies suggest that a link between mental health and future criminality exists, the generalizability of their results is questionable.

This paper makes two valuable contributions to the literature on mental health and crime. First, we use data from a longitudinal survey, which allows us to study the long-term relationship

between adolescent depression and adult criminality. Specifically, the National Longitudinal Survey of Adolescent Health (Add Health) spans a period that covers both adolescence and adulthood. Previous studies that have relied on cross-sectional data are only able to examine the contemporaneous relationship between depression and crime (either at adolescence or adulthood). However, studying the long-term consequences of depression is important because it has been shown that childhood depression has substantial continuity into adulthood (Greden, 2001; Weissman et al., 1999). Similarly, early onset of criminal behavior greatly increases criminal tendencies later in life, and it becomes harder for individuals with a criminal background to invest in legal human capital that could allow them to make a transition from the illegal to the legal labor market. The use of longitudinal data also allows us to account for the effect of criminal behavior in adolescence on the propensity to engage in subsequent crime. Moreover, focusing on the long-term consequences of depression on crime minimizes concerns associated with reverse causality.

Second, we improve upon the existing literature by using multiple estimators including fixed effects at the neighborhood and family levels and propensity score matching. For example, by including school fixed effects, we account for the possibility that adolescents who grow up in disadvantaged neighborhoods may be simultaneously more likely to have poor mental health and engage in criminal behaviors. In addition, by including family fixed effects, we control for important household characteristics (e.g., socioeconomic status and parenting style) that are typically shared by siblings. To complement our fixed effects estimators, we also consider a propensity score matching approach that does not rely on within-school or within-family variation in depression for identification. While our estimates are likely to be purged of sources of unobserved heterogeneity that have plagued previous studies, it is important to keep in mind

that producing causal effects of adolescent depression on adult criminality is a challenging task. Controlled experiments are not feasible given the nature of the research question.

The findings in this paper have important implications for understanding the potential for policies to improve outcomes for children and their families. The social cost of crime is substantial. According to the U.S. Department of Justice, law enforcement agencies recently made a total of 13.7 million arrests.[5] Furthermore, the U.S. prison population exceeds 1.5 million inmates (Bureau of Justice Statistics, 2013). Designing sensible policies to reduce these numbers requires a full assessment of the factors that cause these behaviors with an understanding of both the short-term and long-term dynamics. Our findings indicate that adolescents who suffer from depression face a significantly increased probability of engaging in property crime. We find little robust evidence that adolescent depression influences the likelihood of engaging in violent crime or the selling of illicit drugs. Our estimates imply that the lower-bound direct economic cost of property crime associated with adolescent depression is about 227 million dollars per year.

The remainder of this paper proceeds as follows. In Section II, we describe our data. In Section III, we present the conceptual framework and describe the estimation strategies. The results are summarized in Section IV, while conclusions and suggestions for future research are discussed in Section V.

II. Data

The data used in this paper come from the restricted version of the National Longitudinal Study of Adolescent Health (Add Health). The Add Health is a nationally representative sample

[5] See http://bjs.ojp.usdoj.gov/content/pub/pdf/aus8009.pdf.

of United States youths, who were in grades 7 through 12 during the 1994-1995 academic year.[6] Adolescents were surveyed from 132 schools that were selected to ensure representation with respect to region of country, urbanicity, school size and type, and ethnicity. High schools that participated in the study were asked to identify feeder schools that included a 7th grade and sent at least five graduates to that high school. The feeder schools were chosen with probability proportional to the number of students sent to the high school.

In Wave I, data were collected from adolescents, their parents, siblings, friends, relationship partners, fellow students, and school administrators. The Add Health cohort has been followed with three subsequent in-home surveys in 1996, 2000-2001, and 2007-2008. The data contain information on respondents' social, economic, psychological, and health status. In addition to individual-level information, the Add Health data include information on family, neighborhood, school, and peer network characteristics. The Add Health data also contain information on a genetic oversample of siblings. We take advantage of the sibling sample to better control for unobserved heterogeneity in the relationship between depression and crime. The primary analyses in this paper use data from the Wave I and Wave IV in-home surveys of the Add Health. These data are useful for investigating the relationship between adolescent depressive symptoms and adult criminality because they span a period of roughly 13 years. The original Add Health respondents were between ages 25 and 32 in Wave IV.

Add Health is ideal for the purposes of this study for a number of reasons. First, it was specifically designed to provide rich information on adolescents' health and risk behaviors and is considered to be the largest and most comprehensive survey of adolescents ever undertaken (Mocan and Tekin, 2006). Aside from containing a diagnostic instrument for depression, a

[6] See Udry (2003) for a full description of the Add Health data.

detailed set of questions on delinquent behaviors were asked to respondents in each wave. Second, the longitudinal nature of the Add Health allows us to examine the long-term relationship between depression and criminal behavior. Third, since we have information on criminal behavior in all waves, we can account for baseline differences in these behaviors. Finally, the neighborhood and family identifiers allow us to account for many of the confounding factors that may bias the estimated relationship between depression and crime.[7]

Measures of Depression

Our empirical analyses consider a measure of depression that is based on the Center for Epidemiologic Studies Depression (CES-D) Scale. The CES-D Scale, originally developed by Radoff (1977), is a widely used and reliable depressive symptomatology metric (e.g., Cornwell, 2003; Fletcher, 2010; Rees and Sabia, 2011; Tekin and Markowitz, 2008; Tekin et al., 2009). The Add Health survey includes 18 of the 20 questions that constitute the CES-D Scale.[8] Respondents were asked such questions as how often they felt "lonely", "depressed", or "too tired to do things."[9] The possible responses were "never or rarely" (=0); "sometimes" (=1); "a lot of the time" (=2); and "most of the time or all of the time" (=3). Following previous research, we

[7] Despite these advantages, the Add Health comes with the limitations inherent to survey data, where one can only condition on observable factors. In the absence of a randomized controlled design and plausible instruments, we still need to rely on strong assumptions associated with quasi-reduced form methods even with a rich dataset like the Add Health.

[8] There is a 19th question that asked respondents if they felt whether "life was not worth living." While we do not use information from this question because it is not asked in the standard CES-D scale, it has been used by other researchers in constructing measures of depression (see, e.g., Fletcher, 2010). However, it must be noted that our results are similar when we redefined our depression measure by utilizing information from this question.

[9] It should be noted that the measures of depression used in our study do not come without limitations. Most importantly, these variables indicate depressive symptoms and do not represent medical diagnoses. In addition, as with any other survey, respondents may have answered questions dishonestly or with error. However, survey administrators took a number of steps to ensure data security and to minimize the potential for interviewer or parental influence. For example, respondents were not provided with printed questionnaires. Instead, all responses were recorded on laptop computers. Furthermore, for sensitive topics such as criminal behavior, respondents listened to pre-recorded questions through earphones and entered their own responses.

sum the coded responses to generate a score between 0 and 54.[10] Then, we rescale the score to be out of 60 so that it corresponds to the original 20-item CES-D Scale (see, e.g., Duncan and Rees, 2005; Rees et al., 2009; Sabia and Rees, 2008). Finally, a binary indicator of depression is created based on the cut-off points of 22 for males and 24 for females in the CES-D distribution (Roberts et al., 1991). Dichotomous measures constructed in this fashion are frequently used by social scientists, psychologists, and medical researchers (see, e.g., Fletcher, 2010; Goodman and Capitman, 2000; Hallfors et al., 2005; Sabia and Rees, 2008) and focus attention on the right-hand tail of the distribution; the portion of the distribution where clinical diagnoses of major depression are made (Sabia and Rees, 2008; Cesur et al., 2013).

Measures of Criminal Behavior

The Add Health contains a large number of questions related to delinquent and criminal activities. These questions are similar to those available in most other surveys and to the official definitions of "crime" used by government sources such as the Bureau of Justice Statistics.[11] We focus on self-reports of property crime, violent crime, the selling of illicit drugs, and a measure that encompasses any type of non-drug related criminal behavior.[12] Specifically, we construct a binary indicator, *Property*, to indicate involvement in property crime using answers to the following three questionnaire items: *In the past 12 months,*(i) *how often did you deliberately damage property that didn't belong you?*; (ii) *how often did you steal something*

[10] Four items assessed positive symptoms and, therefore, are reversed before calculating the scores. These positive symptoms include how often the respondents (i) felt "happy", (ii) felt "that you were just as good as other people", (iii) felt "hopeful about the future", and (iv) "enjoyed life."

[11] Mocan and Tekin (2005, 2006) show that the rates of criminal activities reported in the Add Health, e.g. crime and illicit drug use, are comparable to those in other national data sources.

[12] Evaluating specific types of crimes is of interest because previous research suggests mental health problems are more strongly associated with certain offenses. For example, Ritakallio et al. (2006) find that vandalism was the most typical offense committed among depressed delinquent girls, while Silver et al. (2008) illustrate that a history of mental health treatment is more strongly associated with assaultive violence and sexual offenses than with other types of crimes.

worth less than $50?; (iii) *how often did you steal something worth more than $50?*; and (iv) *how often did you go into a house or building to steal something?* The possible answers are "never", "1 or 2 times", "3 or 4 times", and "5 or more times." We coded the indicator *Property* as equal to one if the respondent committed one of these four acts at least once in the past 12 months, and equal to zero otherwise. Similarly, a binary indicator, *Violent*, is constructed using answers to the following two questionnaire items: *In the past 12 months,* (i) *how often did you use or threaten to use a weapon to get something from someone?*; (ii) *how often did you hurt someone badly enough in a physical fight that he or she needed care from a doctor or nurse?* (iii) *did you pull a gun or knife on someone?*; and (iv) *did you stab or shoot someone?* Again, we coded the variable *Violent* as equal to one if the respondent committed one of these four acts at least once in the past 12 months, and equal to zero otherwise. The binary variable, *Selling Drugs*, is constructed in a similar fashion using answers to the questionnaire item: *In the past 12 months, how often did you sell marijuana or other drugs?* Finally, we coded the variable *Non-drug* as equal to one if the respondent committed either a property or a violent crime in the past 12 months, and equal to zero otherwise. These criminal acts comprise the vast majority of the illegal activities committed by the Add Health respondents.

Table 1 shows the prevalence of criminal behaviors by depression status across Waves I and IV of the Add Health. Note that our main depression variable is measured at the time of Wave I. The descriptive statistics are displayed separately for the full sample and the sibling subsample. Consistent with declining criminal tendencies between adolescence and adulthood, the proportion of respondents who report committing illegal acts falls substantially between Waves I and IV. As shown in column (1), 29.4 percent and 21 percent of respondents reported committing property and violent crimes in Wave I, respectively, but these propensities decrease

to 7.5 percent and 13.3 percent in Wave IV. Similarly, the act of selling illicit drugs decreases from 7.5 percent to 4.2 percent during the same period. The reductions in criminal propensities between Waves I and IV are substantial for both depressed and non-depressed individuals.

Columns (2) and (3) in Table 1 present the fraction of Add Health respondents reporting various forms of criminal acts by depression status. The prevalence of criminal behaviors is much higher among the depressed group compared to the non-depressed group in Wave I. But, somewhat surprisingly, the difference in crime between the two groups becomes slightly narrower in Wave IV. Column (4) shows that the fraction of siblings who report criminal behaviors is similar to that reported by the full sample. Moreover, as shown in columns (5) and (6), the differences in criminal behaviors between the depressed and non-depressed sibling subsample are larger in Wave I than in Wave IV, again a pattern similar to that exhibited by the full sample. In fact, the differences are statistically significant only for property and non-drug crimes between depressed and non-depressed siblings in Wave IV.[13]

Explanatory Variables

The relationship between adolescent depression and adult crime may be influenced by a host of factors, and failing to control for these factors will bias the estimated effect of depression on crime. One particular advantage of the Add Health data set is that it allows us to account for a rich set of individual and family background characteristics that may be correlated with both depression and criminal behavior. In addition to the standard demographic characteristics, such as binary indicators for age, gender, race, and ethnicity, we consider individual-level controls for

[13] However, we may need a larger sample size to detect significant differences between the depressed and non-depressed individuals in Wave IV since crime drops sharply for both groups.

religiosity, birth weight, whether the respondent was born in the United States, and whether the respondent was an only child.[14]

At the household level, we control for parental marital status and presence of the biological father. These two variables are important because parental divorce and father involvement have been linked to adolescent mental health, youth behavior, and long-term young adult outcomes (Carlson, 2006; Cherlin et al., 1998; Cobb-Clark and Tekin, 2011; Finley and Schwartz, 2007). We also control for mother's education and household income because socioeconomic status is a well-known determinant of child development, with effects persisting into adulthood (e.g., Bradley and Corwyn, 2002; Goodman et al., 2003). Lastly, we include in our models an indicator for whether the respondent's biological father has ever spent time in jail. Children with fathers who have been incarcerated are not only more likely to suffer from depressive symptoms but are themselves more likely to commit crime when older (e.g., Hjalmarsson and Lindquist, 2011; Wilbur et al., 2007). The household-level characteristics that we consider are drawn from Wave I, the same period adolescent depression was measured. To retain sample size, we construct binary indicators to represent information on missing data. The list of explanatory variables is shown in Appendix Table 1 for the full sample as well as separately by Wave I depression status. The descriptive statistics presented in Appendix Table 1 clearly indicate the importance of controlling for differences between children and their parents. For example, we see that children who fall into the depressed category in Wave I are more likely to have a father who had spent time in jail and are more likely to have divorced parents. Overall, children with poorer parents in Wave I have a higher prevalence of depression than those from higher income households.

[14] In the models that include sibling fixed effects, we also control for birth order. Argys et al. (2006) illustrate that children with older siblings are more likely to engage in risky behavior than their firstborn counterparts.

In the bottom panel of Appendix Table 1, we consider factors that might differ between siblings in an attempt to explore the reasons for variation in sibling depression within families. It is not uncommon for some siblings within a family to exhibit depressive symptoms, while others do not (e.g., Hoffman, 1991; Rende et al., 1993). The question is whether this has anything to do with the factors that are also correlated with later criminal behavior and not controlled for in our models. As shown in the bottom panel of Appendix Table 1, individuals with depression are more likely to have bad temperament and a learning disability in Wave I as reported by their parents compared to those with no depression. They are also more likely to have ADHD based on a question in Wave IV about whether a doctor, nurse, or other health care provider ever told the respondent that he/she had attention problems, ADD, or ADHD. On the other hand, individuals with depression are less likely to have been breastfed, based on a question answered by their mothers. This pattern is true for both the general sample and the sibling sample. While there appear to be some differences in pre-existing conditions among siblings in certain characteristics that might possibly be correlated with both depression and future crime, controlling for them does not change our results in any appreciable way.[15]

III. Empirical Strategy

A relationship between depression during adolescence and adult criminal behavior can be analyzed within the framework developed by Becker (1968) and Ehrlich (1973), which posits

[15] We also regressed our depression indicator on a series of characteristics that may differ between siblings. Each cell in Appendix Table 2 presents a separate correlation between depression and these variables. Column (1) presents estimates from an OLS model based on the sibling sample, while column (2) presents estimates from a family fixed effects model based on the sibling sample. Column (1) indicates statistically significant associations between depression and whether the respondent had a learning disability, had bad temperament, was breastfed, and was male. However, none of these associations are statistically significant when we account for permanent differences between siblings using family fixed effects. It is also important to note that the estimated coefficients reported in column (2) are quite small in magnitude.

that individuals engage in crime based on a comparison of the expected utility from criminal activity to the expected utility from legal labor market opportunities. Depression during adolescence may influence this relationship in a number of ways. For example, depressed individuals may face a productivity penalty in the labor market, which may increase the relative rewards from engaging in illegal activities. Depression may also affect an individual's evaluation of arrest and conviction probabilities or depressed individuals may believe they face softer penalties due to their mental health status (Fletcher and Wolfe, 2009).

While a path from depression to crime is easy to elaborate, establishing an empirical link presents a number of difficult challenges. The primary difficulty in estimating the effects of adolescent depression on adult criminal behavior is due to the potential for unobserved heterogeneity that could confound the relationship. One can imagine a host of personal, family, school, and community factors that are potentially associated with both depression and crime. To address this empirical challenge, we employ several estimation strategies. First, we begin by considering the following equation:

$$Crime_{i4} = \alpha + \beta_1 Depression_{i1} + \boldsymbol{X_{i4}\beta_2} + \boldsymbol{X_{i1}\beta_3} + \varepsilon_{i4}, \quad (1)$$

where i indexes the individual respondent and the numeric subscript indicates the wave during which the variables were measured. Specifically, $Crime_{i4}$ represents a criminal behavior measured during Wave IV. The variable $Depression_{i1}$ is a binary indicator that is equal to one if the respondent scored above the CES-D scale threshold in Wave I, and equal to zero otherwise. The vectors $\boldsymbol{X_{i4}}$ and $\boldsymbol{X_{i1}}$ contain the personal and family characteristics described above that may influence an individual's propensity to engage in criminal behavior and are measured at Wave IV

and Wave I, respectively. Finally, ε_{i4} is a random error term and α, β_1, $\boldsymbol{\beta_2}$, and $\boldsymbol{\beta_3}$ are the parameters to be estimated. Equation (1) is estimated with OLS for ease of interpretation.[16] Because the Add Health is a school-based survey, the standard errors are corrected for clustering at the school level.[17]

We consider several channels through which adolescent depression may impact adult criminal behavior and assess the extent to which the relationship between depression and crime is influenced by these channels. First, in accordance with previous research, we recognize that mental illness can impede human capital accumulation and have a negative effect on earnings and employment (e.g., Ettner et al., 1997; Fletcher, 2008, 2009; Fletcher, 2010; Marcotte and Wilcox-Gök, 2003; Wilcox-Gök et al., 2004). If individuals suffering from depression face a wage penalty in the labor market, then we also expect them to face a decreased opportunity cost of crime. Second, we consider that adolescent depression may impact adult crime through adult depression. More specifically, if those who suffer from depression as children are more likely to be depressed as adults, then it may not be adolescent depression per se that is influencing criminal behavior. For example, Pine et al. (1999) illustrate that symptoms of major depression in adolescence strongly predict adult episodes of major depression. Third, there is evidence to suggest that depressive symptoms are related to a child's level of future expectations and impulsive behavior (e.g., d'Acremont and Van der Linden, 2007; Wyman et al., 1993). To the extent these characteristics persist over time, one concern is that they not only predict youth depression but also adult criminality.

[16] Probit and logit models yielded similar results.

[17] We present results from unweighted regressions. Results are similar when we use the sample weights provided by the Add Health. This is not surprising given the large number of variables that we control for in our regressions. The results from the weighted regressions are available from the authors upon request.

Another possible channel through which depression may lead to criminal behavior is by affecting a person's ability to evaluate the true costs and benefits associated with risk taking. An individual's decision to engage in crime is assumed to be a function of the anticipated costs and benefits of their actions (Becker, 1968). However, these expected costs and benefits may be influenced by depression experienced during adolescence. For example, depressed individuals may view the future as uncertain or unpredictable and this may affect assessment of their own life expectancy. Therefore, these individuals may discount the future consequences of their behavior and see little reason to delay activities that may generate immediate rewards. Such present orientation has been shown to be associated with increased propensities to engage in risky behaviors, including crime (e.g., Brezina et al., 2010; Hill et al., 1997; Wilson and Daly, 1997). To address the role of these potential pathways, we estimate equation (1) while controlling for education, employment status, a detailed set of occupational indicators, and two variables that proxy for an individual's expectations of the future:[18]

$$Crime_{i4} = \alpha + \beta_1 Depression_{i1} + \boldsymbol{X_{i4}\beta_2} + \boldsymbol{X_{i1}\beta_3} + \boldsymbol{M_i\beta_4} + \varepsilon_{i4}, \quad (2)$$

where $\boldsymbol{M_i}$ is the vector of mechanisms described above.

[18] The questions pertaining to anticipation of future survival include: (i) *when making decisions, do you usually go with your "gut feeling" without thinking too much about the future consequences of each alternative?*; and (ii) *what do you think are the chances that you will live to age 35?* The set of occupational indicators includes the following: management, business, and financial operation occupations; computer and mathematical occupations; architecture and engineering, life, physical, and social science occupations; community and social service occupations; legal occupations; education, training, and library occupations; arts, design, entertainment, sports, and media occupations; healthcare practitioners; support and technical occupations; protective service occupations; food preparation and serving related occupations; building and grounds cleaning and maintenance occupations; personal care and service occupations; sales, office, and administrative occupations; farming, fishing, and forestry occupations; construction, maintenance, and repair occupations; production occupations; and transportation and moving occupations.

If adolescent depression was exogenous after accounting for observable individual and family characteristics, then OLS estimations of equations (1) and (2) would yield consistent estimates of the impact of depression on adult crime. However, exogeneity is likely an unrealistic assumption due to the reasons mentioned above, even after controlling for a large number of covariates. One particular concern is neighborhood-level unobservables. For instance, adolescents in economically poor neighborhoods may experience higher rates of emotional and mental health problems (e.g., Leventhal and Brooks-Gunn, 2000; Caspi et al., 2000). These individuals are also likely to face poor labor market prospects, which may raise their propensities to commit crime. Similarly, young people attending schools in these neighborhoods may acquire poorer human capital, which may, again, lead to future criminal activities by reducing the opportunity costs of such acts. Finally, persistent differences in income and resources across school districts and neighborhoods may be associated with differences in rates of depression and crime in these localities and failing to account for these differences may generate biased estimates. Because of these concerns, we augment equation (1) with school fixed effects:

$$Crime_{i4} = \alpha + \beta_1 Depression_{i1} + \boldsymbol{X_{i4}\beta_2} + \boldsymbol{X_{i1}\beta_3} + \boldsymbol{M_i\beta_4} + \boldsymbol{\lambda_s} + \varepsilon_{i4}, \quad (3)$$

where $\boldsymbol{\lambda_s}$ is a vector of school fixed effects. Identification in equation (3) comes from differences in depression status between individuals who attended the same school.

While school fixed effects capture many unobserved factors across neighborhoods that may be correlated with both depression and crime, the richness of our data set provides a further opportunity to account for unobserved heterogeneity. We exploit the longitudinal nature of the Add Health and control for the respondent's criminal propensity measured at Wave I:

$$Crime_{i4} = \alpha + \beta_1 Depression_{i1} + \mathbf{X_{i4}\beta_2} + \mathbf{X_{i1}\beta_3} + \mathbf{M_i\beta_4} + Crime_{i1} + \boldsymbol{\lambda}_{\mathbf{s}} + \varepsilon_{i4}, \quad (4)$$

where $Crime_{i1}$ is the dependent variable measured during Wave I. The inclusion of a lagged dependent variable is a useful way to account for remaining unobserved heterogeneity that may be simultaneously correlated with adolescent depression and subsequent criminal behavior (e.g., Cesur et al., 2013; Cobb-Clark and Tekin, 2011; Herbst and Tekin, 2012; Rees and Sabia, 2011).

While equation (4) is likely to control for important sources of bias, it is possible that unobserved factors at the family level that are correlated with depression and subsequent criminal behavior exist. A poor home environment may simultaneously increase the likelihood a child is depressed and commits crime later in life. To control for unobserved characteristics at the family level, we estimate family fixed effects models of the following form:

$$Crime_{i4} = \alpha + \beta_1 Depression_{i1} + \mathbf{K_{i4}\beta_2} + \mathbf{K_{i1}\beta_3} + \mathbf{v_f} + \varepsilon_{i4}, \quad (5)$$

where i indexes the individual in family f. In this specification, $\mathbf{v_f}$ represents a vector of unique identifiers for each family and $\mathbf{K_{i4}}$ and $\mathbf{K_{i1}}$ represent a parsimonious set of controls that vary between siblings (i.e. age at Wave IV, gender, birthweight, height, weight, birth order, and two measures of parental favoritism). Consequently, equation (5) accounts for unobserved characteristics that are shared by siblings. Note that identification in equation (5) comes from discordant reports in depression status among siblings within a family.[19] We also estimate

[19] One concern with the sibling fixed effects strategy is that the estimates may reflect differences in parental investment rather than depression per se. To address this issue, we used information from the following Add Health question, "Think of all the things your parents do for you and your sibling. Do you think that you or your sibling

alternative versions of equation (5) that include a vector of potential mechanisms and a lagged dependent variable. A comparison of the results from Equations (1) through (5) provide insights to the degree to which our estimates may be biased due to omitted factors at the neighborhood and family levels (e.g., Currie and Stabile, 2006; Fletcher, 2010; Fletcher and Wolfe, 2008).[20]

Finally, we consider a propensity score matching (PSM) analysis. This approach consists of matching treated adolescents (i.e. depressed adolescents) with untreated adolescents based on their observable characteristics, and then comparing their criminal behaviors during adulthood. An average treatment effect on the treated (ATT) is obtained by averaging individual-level differences in behavior between the treated and untreated groups.

There are several advantages to using PSM methods. First, matching estimators do not impose functional form restrictions, nor do they assume the treatment effect is homogeneous across populations (Zhao, 2005). Second, with a sufficient vector of observables, PSM has been shown to yield estimates that compare favorably with experimental studies (Michalopoulos et al., 2004; Smith and Todd, 2001). Lastly, within the context of our study, PSM does not rely on differences in depression status within schools or families for identification.

In practice, a treatment propensity p($\boldsymbol{X}$) for each observation in the sample is estimated. This step requires regressing adolescent depression status on a vector of observable characteristics with a binary choice apparatus (e.g., a probit or logit regression). The sample is

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receives more attention and love from your parents? Would you say that your sibling receives [a lot more, a little more, the same amount, a little less, a lot less]?" Specifically, we estimated the sibling fixed effects models for only the sample of siblings who both reported equal parental treatment. Under this alternative specification, our estimates were qualitatively similar to those reported below. These results are available from the authors upon request.

[20] It should be noted that if depressive symptoms are measured with error, then sibling fixed effects may aggravate the bias associated with the measurement error. Also, those in the sibling sample who were not surveyed during Wave IV are slightly less likely to be depressed at Wave I but share similar Wave I criminal propensities with those individuals who remained in the sample.

then split into *k* equally spaced intervals of the propensity score. Within each interval, it is tested whether the average propensity score of the treated units differs from that of the untreated units. If this test fails in an interval, the interval is split in half and retested. This process is repeated until the average propensity score of treated and untreated units is the same in all intervals. Within each interval, it is also required that the means of each characteristic do not differ between treated and untreated observations.[21] Treated and untreated adolescents are matched based on their propensity scores using an algorithm and the differences in their behavioral outcomes are calculated. The ATT is obtained by averaging these differences across all matches.

Because it is not necessarily clear *a priori* which matching algorithm should be implemented, it is standard practice to present results from multiple techniques (see, e.g., Anderson, 2013; Mocan and Tekin, 2006; Morris, 2007). We consider the nearest neighbor, *k*-nearest neighbor, and within caliper matching algorithms. In general, the choice of one matching algorithm over another involves a tradeoff between variance and bias.[22]

IV. Results

Table 2 presents estimates of β_1 from equations (1) – (4) for each of the four crime outcomes.[23] Panel A shows baseline correlations from an OLS model with no control variables. These estimates clearly point to a strong positive correlation between depression during adolescence and subsequent criminality. The results in Panel B are from models that include the

[21] This condition is a necessary requirement of the Balancing Hypothesis.

[22] For more detailed discussions on matching algorithms, see Anderson (2013), Caliendo and Kopeinig (2005), or Dehejia and Wahba (2002).

[23] For the sake of brevity, we do not present the coefficient estimates for the other variables in our models. The results for these controls are consistent with previous studies on the determinants of crime (e.g., Currie and Tekin, 2012; Mocan and Tekin, 2006, 2010) and are presented in Appendix Table 3 for the most comprehensive specifications.

basic controls described above. Interestingly, the estimate on property crime increases by 27 percent and the estimate on violent crime decreases by 20 percent, suggesting that the factors captured by our basic controls have opposing effects on criminality. Both the estimates on the selling of illicit drugs and nondrug crimes increase by 0.3 percentage points. While the magnitudes change, all four estimates remain positive and statistically significant at conventional levels. These estimates indicate that those who suffer from depression during adolescence face a 4.7 percentage-point higher probability of committing a property crime, a 2.0 percentage-point higher probability of committing a violent crime, a 1.3 percentage-point higher probability of selling illicit drugs, and a 4.5 percentage-point higher probability of committing a non-drug crime during the past 12 months. In addition to being statistically significant, these estimates are large in magnitude, corresponding to effect sizes of approximately 63 percent for property crime, 15 percent for violent crime, 31 percent for the selling of illicit drugs, and 22 percent for non-drug crime.

Panel C shows estimates from models that control for educational attainment, employment status, log earnings, a vector of occupational indicators, and proxies for risk perceptions as specified in equation (2). These variables are included because they represent potential channels through which adolescent depression may influence subsequent criminality. Upon including these measures, we see that the coefficient estimates in the violent crime and the selling of drugs models decrease in magnitude such that they are no longer statistically significant at conventional levels. It is interesting, however, that the inclusion of these additional controls has little effect on the estimated depression coefficient in the models for property and non-drug crime. In other words, depression during adolescence continues to have long-lasting

effects on these crimes that cannot be accounted for by lower educational attainment, poor labor market performance, or changes in risk perceptions.

Panel D presents the estimates for models that include school fixed effects. The estimates with school fixed effects are nearly identical to those in Panel B, implying that neighborhood- and community-level characteristics are orthogonal to the relationship between depression and subsequent criminality upon controlling for family- and individual-level attributes.[24]

Finally, we present estimates from the specifications that also control for criminal behavior during Wave I. Not surprisingly, adolescents who are engaged in criminal behavior in Wave I are much more likely to do so again in Wave IV. This strong persistence in criminality is reflected by the highly significant and large estimates reported in Panel E of Table 2. In particular, the degree of persistence in crime over time is 5.5 percentage points for property crime, 2.8 percentage points for violent crime, 8.2 percentage points for the selling of illicit drugs, and 5.2 percentage points for any non-drug crime. Remarkably, even after controlling for criminal behavior in Wave I, the impacts of adolescent depression on subsequent property and non-drug crimes remain sizeable and statistically significant. In particular, adolescent depression is associated with a 3.5 percentage-point increase in the propensity to commit a property crime and a 2.9 percentage-point increase in the propensity to commit a non-drug crime.[25] One interpretation of the robustness of our estimates to controlling for past crime is that the control variables and fixed effects in earlier panels do a good job of accounting for unobservable factors that might be correlated with both youth depression and later criminal behavior.

[24] However, these neighborhood- and community-level characteristics may have independent and direct impacts on criminal behavior.

[25] Full results from the specification in Panel E are presented in Appendix Table 3.

While the results presented in Table 2, especially those in panel E, are indicative of a causal relationship between adolescent depression and future criminal behavior, they may still suffer from bias due to potential unobserved heterogeneity. To further address this issue, we consider models that employ the sibling subsample available in the Add Health. In Table 3, we show results from the sibling analyses in steps similar to those presented in Table 2.

Correlations from the OLS models with no controls are displayed in Panel A of Table 3. The OLS estimates using the sibling sample with the basic control variables are shown in Panel B. Despite the substantial reduction in sample size, the relationship between adolescent depression and future crime remains statistically significant for the property and non-drug crimes. It is useful to compare these estimates to those in Table 2 in order to assess how the sample change impacts the estimates. Panel A of Table 3 indicates that the OLS estimates are uniformly larger in the sibling subsample than in the full sample. One possible explanation for the larger estimates in the sibling subsample may be due to a non-linear relationship between depression and future crime among siblings. If, for example, siblings are more vulnerable to the effects of depression, then depression could have a larger effect on crime. As shown in Panel C, the estimates for the relationship between adolescent depression and future criminality change little when we add the potential mediators. In Panel D, we attempt to account for the possibility that depression experienced by a sibling may have spillover effects that influence the respondent's criminal behavior later in life. To do this, we include a binary indicator for whether any of the siblings in the family reported having depression in Wave I. We find that depression of any sibling had a (statistically insignificant) positive association with the criminal behavior of the respondent during adulthood. The inclusion of this indicator has little effect on our estimates of interest.

The models that control for family fixed effects are shown in Panels E and F of Table 3. In Panel E, we present fixed effects estimates from specifications with potential mediators and basic controls that differ between siblings. In panel F, we include the right-hand-side variables from Panel E and add a lagged dependent variable. These estimates show that adolescent depression is still a statistically significant predictor of adult property crime. The estimate in Panel F represents a 5.8 percentage-point increase in the propensity to commit a property crime and is statistically significant at the 10 percent level.[26, 27] The estimate on the non-drug crime coefficient is less precisely estimated and loses statistical significance upon controlling for family fixed effects. Also note that adding the lagged dependent variable in Panel F of Table 3 has little impact on the estimated effect of adolescent depression on future crime.[28] The fact that the estimate on property crime remains robust after using the sibling sample and controlling for education, employment, risk perceptions, and lagged criminality is a strong indication that a causal relationship exists between adolescent depression and the decision to engage in property crime later in life.

Next, we conduct analyses controlling for co-morbid conditions and substance use. To do so, we include binary variables to indicate the following individual-level characteristics: prior diagnosis of attention deficit hyperactivity disorder (measured at Wave IV), prior diagnosis of

[26] Waldinger et al. (2007) show that sibling rivalries predict occurrences of major depression, while Nelson and Martin (1985) report increased child abuse in families with twins.

[27] Note that the mean incidence of property crime is 0.062 in the not-depressed and 0.125 in the depressed sibling samples, respectively. The effect sizes in this paper are in line with effect sizes from other studies on the determinants of crime that use the Add Health data. For example, Currie and Tekin (2012) find that child maltreatment roughly doubles the probability an individual engages in several types of crimes. Mocan and Tekin (2006) show that having access to a gun at home increases the probability an individual engages in a variety of crimes by roughly 30 percent. Fletcher and Wolff (2009) document that childhood ADHD increases the probability an individual engages in crime as an adult by roughly 40 to 70 percent.

[28] Full results from the specification in Panel F are presented in Appendix Table 4.

anxiety (measured at Wave IV), prior marijuana use (measured at Wave I), prior alcohol use (measured at Wave I), and prior use of any drug (measured at Wave IV).[29] Research has shown a link between attention deficit hyperactivity disorder and criminal behavior (e.g., Fletcher and Wolfe, 2009; Manuzza et al., 2004, 2008; Sourander et al., 2007) and between substance use and criminal behavior (Carpenter, 2007; Markowitz, 2005). We present the results from these models in Table 4. In Panel A of Table 4, we show results from the most comprehensive specification for the full sample OLS models, which, in addition to comorbid conditions, include school fixed effects, a full set of family and individual characteristics, and a lagged dependent variable. These estimates are very similar to those in Panel E of Table 2. In particular, depression in adolescence is associated with a 3.8 percentage point increase in property crime and a 3.1 percentage point increase in non-drug crimes. We repeat this analysis for the sibling sample in Panel B of Table 4. Similar to Panel F of Table 3, the estimate on property crime remains large in magnitude and statistically significant when we control for comorbid conditions. These findings suggest that the association between adolescent depression and adult criminal behavior is unlikely to operate through these other conditions.[30]

Previous studies have shown that there are gender differences in both offending (Daly and Chesney-Lind, 1988; Steffensmeier and Allan, 1995) and the experience of depression (Compas and Hammen, 1994; Culbertson, 1997; Gjerde, et al., 1988). For example, studies examining personality characteristics of adolescents with depressive symptoms have found that depression is manifested in internalizing patterns of behavior among females (e.g, passivity), but

[29] Descriptive statistics for these variables are illustrated in Appendix Table 1.

[30] A potential caveat to these results is that the substance use indicators may be endogenously determined. We also experimented with controlling for adult depression. While our results were qualitatively similar when controlling for a Wave IV measure of depression, we were unable to rule out endogeneity due to a reverse causal relationship between adult depression and adult criminality. These results are available from the authors upon request.

is more likely to be manifested in externalizing patterns of behavior among males (e.g. aggression and conduct disorder). In Table 5, we present estimates from our most comprehensive specification (see Panel E in Table 2) for each gender separately. Despite reductions in sample size, we still find large positive effects of youth depression on adult property crime for both males and females. Our estimates also indicate that youth depression is associated with increases in nondrug crimes and the selling of illicit drugs for females during adulthood.[31]

Lastly, Table 6 presents results from a propensity score matching analysis.[32] A benefit of this approach is that our identifying variation does not rely solely on within-school or within-family differences in depression status. The results largely confirm our findings above. Regardless of the matching algorithm used, youth depression is associated with an increase in the propensity to commit property and nondrug crimes as an adult, and these estimates are statistically significant at conventional levels.[33] While youth depression shares a positive

[31] Another interesting consideration is whether a nonlinear relationship exists between youth depression and adult criminality. From a policy perspective, this may help to identify whether more targeted interventions among depressed youths would be beneficial. Appendix Table 5 shows results where our measures of crime are regressed on two separate depression indicators. The first indicator, Mildly Depressed, is equal to one if the CES-D score is between 23 and 26 for males or 25 and 30 for females, and is equal to zero otherwise. The second indicator, Severely Depressed, is equal to one if the CES-D score is greater than 26 for males or 30 for females, and is equal to zero otherwise. These cutoffs were chosen so as to create two roughly equal depression categories for each gender. Our results for the full sample with school fixed effects and the full set of controls suggest important nonlinearities exist for violent and nondrug crimes. "Severe depression" experienced as a youth is associated with a 2.6 percentage point increase in the likelihood of committing a violent crime as an adult and a 4.4 percentage point increase in the likelihood of committing a nondrug crime as an adult. Our results for the sibling sample with family fixed effects and the full set of controls tell a slightly different story. "Mild depression" experienced as a youth is associated with an 8.4 percentage point increase in the likelihood of committing a property crime as an adult.

[32] Appendix Table 6 presents results from the probit model used in the propensity score matching analysis. These estimates illustrate that gender, race, cognitive ability, religion, socioeconomic status, and family environment (e.g., whether the biological father was present in the household and whether the biological father spent time in jail) are all important correlates of youth depression.

[33] We chose $k = 3$ for the k-nearest neighbor matching method. The results for the within caliper matching method are based on a maximum propensity score distance (i.e., the caliper) of 0.001. The estimates changed little when we specified distances of 0.0001 and 0.00005. We also experimented with radius and kernel matching. These results were similar to those shown above, were omitted for the sake of brevity, and are available from the authors upon request.

relationship with violent crime and the selling of illicit drugs during adulthood, these estimates are statistically indistinguishable from zero.

V. Conclusion

Understanding the type of mental health problems that precede future criminal behavior is critical to developing effective intervention programs targeted at young people who suffer from these disorders. The results in this paper provide strong support for a positive and causal relationship between depression during adolescence and the probability of committing property crime during adulthood. Our results are robust across multiple specifications that control for a rich set of individual, family, and neighborhood characteristics. It is also remarkable that this relationship persists even after accounting for the several channels through which the relationship is expected to manifest itself. This suggests that there is an independent effect of childhood depression on future property crime that cannot be accounted for by these mechanisms. Moreover, our findings persist even when we compare individuals who attend the same schools or individuals who are siblings. Thus, we find no evidence to suggest that confounders at the school, neighborhood, or family level account for the relationship between depression and crime.

Crime is a problem that imposes substantial costs on society. These findings imply that policies designed to reduce depression at young ages may have real downstream benefits on criminal behavior. To put the magnitudes of our estimates into perspective, we consider the following back-of-the-envelope calculations. According to statistics from the National Crime Victimization Survey, the total economic loss to victims of property crime is 16.1 billion dollars for a total of 17.5 million crimes. These numbers translate into a per victim cost of

approximately 917 dollars per property crime.[34] An estimate for the annual per victim cost of depression associated with property crime can be obtained by multiplying this dollar amount by the estimate of 0.058 from our preferred specification (Panel F of Table 3) and then multiplying the resulting figure by the incidence of adolescent depression in our sample of 0.104 (= 917*0.058*0.104 = 5.53 dollars). Given that there were 41 million people in the United States aged 25 through 34 in 2010, this implies a total cost of roughly 227 million dollars per year. Note, however, that the cost of 5.53 dollars per victim is likely an underestimate since there are also costs associated with property crime burdened by non-victims. As a result, we view the approximation of 227 million dollars as a lower bound for the economic cost of property crime due to adolescent depression.

While our study points to a previously undocumented benefit of reducing the prevalence of adolescent depression, this paper does not come without limitations. In particular, the empirical methods we use are quasi-experimental and, thus, are only as good as our set of control variables. If our controls and fixed effects do not absorb the important sources of unobserved heterogeneity for the relationship between youth depression and adult criminality, then threats of bias remain. Beyond this, future research should aim to establish the exact mechanisms through which adolescent depression influences the propensity to engage in property crime as an adult. We have controlled for a host of potential channels, but none completely mediate the relationship between depression and property crime. To better direct intervention programs for youths, these mechanisms should be established.

[34] See Table 82 in http://bjs.ojp.usdoj.gov/content/pub/pdf/cvus07.pdf.

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Table 1: Descriptive Statistics

Variable	(1) Full Sample	(2) Full Sample Not-Depressed	(3) Full Sample Depressed	(4) Sibling Sample	(5) Sibling Sample Not-Depressed	(6) Sibling Sample Depressed
Wave I						
Property	0.294	0.280	0.412***	0.287	0.276	0.378***
	(0.456)	(0.449)	(0.492)	(0.452)	(0.447)	(0.486)
Violent	0.210	0.197	0.327***	0.199	0.188	0.294***
	(0.408)	(0.398)	(0.469)	(0.399)	(0.391)	(0.456)
Selling Drugs	0.075	0.067	0.142***	0.067	0.062	0.116***
	(0.263)	(0.250)	(0.349)	(0.251)	(0.240)	(0.320)
Nondrug	0.394	0.376	0.550***	0.378	0.362	0.518***
	(0.489)	(0.484)	(0.498)	(0.485)	(0.481)	(0.500)
Wave IV						
Property	0.075	0.071	0.109***	0.068	0.062	0.125***
	(0.264)	(0.257)	(0.311)	(0.253)	(0.241)	(0.331)
Violent	0.133	0.131	0.156***	0.141	0.137	0.168
	(0.340)	(0.337)	(0.363)	(0.348)	(0.344)	(0.374)
Selling Drugs	0.042	0.041	0.051*	0.037	0.035	0.052
	(0.200)	(0.198)	(0.220)	(0.188)	(0.183)	(0.222)
Nondrug	0.205	0.200	0.242***	0.202	0.195	0.259***
	(0.404)	(0.400)	(0.428)	(0.401)	(0.396)	(0.439)
Depressed	0.104	-	1	0.106	-	1
	(0.305)	-	(0)	(0.307)	-	(0)
CES-D Scale	12.389	10.456	29.129	12.572	10.685	28.558
	(8.136)	(5.824)	(5.759)	(8.055)	(5.907)	(5.768)
N	15,584	13,971	1,613	3,116	2,787	329

Notes: Standard deviations are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively, for the difference between the means in columns (2) and (3) and columns (5) and (6).

Table 2: Estimates of the Relationship between Adolescent Depression and Adult Crime

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: OLS with No Controls			
Depressed	0.037***	0.025**	0.010*	0.042***
	(0.009)	(0.010)	(0.006)	(0.011)
Mean	0.075	0.133	0.042	0.205
N	15,570	15,571	15,582	15,560
	Panel B: OLS with Basic Controls			
Depressed	0.047***	0.020**	0.013**	0.045***
	(0.009)	(0.010)	(0.005)	(0.011)
Mean	0.075	0.133	0.042	0.205
N	15,570	15,571	15,582	15,560
	Panel C: OLS with Basic Controls + Potential Channels			
Depressed	0.043***	0.015	0.007	0.037***
	(0.009)	(0.010)	(0.005)	(0.011)
Mean	0.075	0.133	0.042	0.205
N	15,570	15,571	15,582	15,560
	Panel D: School Fixed Effects + Basic Controls + Potential Channels			
Depressed	0.042***	0.015	0.008	0.036***
	(0.009)	(0.010)	(0.005)	(0.011)
Mean	0.075	0.133	0.042	0.205
N	15,570	15,571	15,582	15,560
	Panel E: School Fixed Effects + Basic Controls + Potential Channels + Lagged Dependent Variable			
Depressed	0.035***	0.013	0.004	0.029**
	(0.009)	(0.010)	(0.005)	(0.011)
Crime in Wave I	0.055***	0.028***	0.082***	0.052***
	(0.005)	(0.008)	(0.013)	(0.006)
Mean	0.075	0.133	0.042	0.204
N	15,467	15,464	15,494	15,504

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Control variables are listed in Appendix Table 1.

Table 3: Estimates of the Relationship between Adolescent Depression and Adult Crime – Sibling Sample

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: OLS with No Controls			
Depressed	0.063***	0.030	0.017	0.064**
	(0.019)	(0.024)	(0.013)	(0.028)
Mean	0.068	0.140	0.036	0.201
N	3,114	3,111	3,116	3,110
	Panel B: OLS with Basic Controls			
Depressed	0.074***	0.026	0.018	0.068**
	(0.018)	(0.024)	(0.012)	(0.028)
Mean	0.068	0.140	0.036	0.201
N	3,114	3,111	3,116	3,110
	Panel C: OLS with Basic Controls + Potential Channels			
Depressed	0.070***	0.020	0.011	0.060**
	(0.017)	(0.024)	(0.012)	(0.027)
Mean	0.068	0.140	0.036	0.201
N	3,112	3,109	3,114	3,108
	Panel D: OLS with Basic Controls + Potential Channels +Any Sibling Depressed			
Depressed	0.074***	0.028	0.018	0.070***
	(0.019)	(0.024)	(0.012)	(0.028)
Any Sibling Depressed	0.012	0.010	0.019	0.012
	(0.014)	(0.020)	(0.013)	(0.021)
Mean	0.068	0.140	0.036	0.201
N	3,100	3,097	3,102	3,096
	Panel E: Family Fixed Effects + Basic Controls + Potential Channels			
Depressed	0.059*	0.029	0.000	0.063
	(0.035)	(0.047)	(0.031)	(0.053)
Mean	0.068	0.140	0.036	0.201
N	3,114	3,111	3,116	3,110
	Panel F: Family Fixed Effects + Basic Controls + Potential Channels + Lagged Dependent Variable			
Depressed	0.058*	0.025	-0.001	0.059
	(0.034)	(0.047)	(0.031)	(0.054)
Crime in Wave I	0.043	0.063	0.070*	0.043
	(0.031)	(0.040)	(0.036)	(0.034)
Mean	0.068	0.140	0.036	0.201
N	3,114	3,111	3,116	3,110

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Estimates of the Relationship between Adolescent Depression and Adult Crime – Controlling for Comorbid Conditions

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: School Fixed Effects with Full Controls and Comorbidities			
Depressed	0.038***	0.013	0.005	0.031***
	(0.009)	(0.010)	(0.005)	(0.011)
Mean	0.075	0.133	0.042	0.205
N	15,569	15,570	15,581	15,559
	Panel B: Family Fixed Effects with Full Controls and Comorbidities			
Depressed	0.057*	0.024	-0.006	0.058
	(0.034)	(0.046)	(0.031)	(0.054)
Mean	0.068	0.140	0.036	0.201
N	3,114	3,111	3,116	3,110

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Control variables are listed in Appendix Table 1.

Table 5: Estimates of the Relationship between Adolescent Depression and Adult Crime by Gender

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: School Fixed Effects with Full Controls (*Male Sample*)			
Depressed	0.041***	0.006	-0.013	0.023
	(0.015)	(0.018)	(0.011)	(0.020)
Mean	0.103	0.142	0.066	0.240
N	7,212	7,207	7,227	7,237
	Panel B: School Fixed Effects with Full Controls (*Female Sample*)			
Depressed	0.030***	0.019	0.014**	0.031***
	(0.009)	(0.012)	(0.006)	(0.012)
Mean	0.051	0.125	0.021	0.173
N	8,255	8,257	8,267	8,267

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Control variables are listed in Appendix Table 1.

Table 6: Estimates of the Relationship between Adolescent Depression and Adult Crime – Propensity Score Matching Analysis

Variable	(1) Property			(2) Violent			(3) Selling Drugs			(4) Nondrug		
	Nearest Neighbor	*k*-Nearest Neighbor	Within Caliper	Nearest Neighbor	*k*-Nearest Neighbor	Within Caliper	Nearest Neighbor	*k*-Nearest Neighbor	Within Caliper	Nearest Neighbor	*k*-Nearest Neighbor	Within Caliper
Depressed	0.031***	0.040***	0.031***	0.021	0.021	0.021	0.011	0.008	0.011	0.033**	0.039**	0.034**
	(0.011)	(0.011)	(0.012)	(0.015)	(0.013)	(0.013)	(0.008)	(0.007)	(0.009)	(0.016)	(0.016)	(0.017)
Mean	0.075	0.075	0.075	0.133	0.133	0.133	0.041	0.041	0.041	0.205	0.205	0.205
N	15,557	15,557	15,547	15,557	15,557	15,547	15,557	15,557	15,547	15,557	15,557	15,547

Notes: Bootstrapped standard errors, based on 200 replications, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table 1: Descriptive Statistics by Depression Status

Variable	(1) Full Sample	(2) Full Sample Not-Depressed	(3) Full Sample Depressed	(4) Sibling Sample	(5) Sibling Sample Not-Depressed	(6) Sibling Sample Depressed
26 yrs. old or younger at wave IV[a]	0.157	0.165	0.086	0.147	0.155	0.079
	(0.363)	(0.371)	(0.280)	(0.355)	(0.362)	(0.270)
27 yrs. old at Wave IV	0.145	0.148	0.118	0.155	0.158	0.134
	(0.352)	(0.355)	(0.323)	(0.362)	(0.364)	(0.341)
28 yrs. old at Wave IV	0.180	0.179	0.183	0.196	0.190	0.246
	(0.384)	(0.384)	(0.387)	(0.397)	(0.392)	(0.432)
29 yrs. old at Wave IV	0.188	0.186	0.203	0.194	0.198	0.164
	(0.391)	(0.389)	(0.403)	(0.396)	(0.398)	(0.371)
30 yrs. old at Wave IV	0.185	0.181	0.224	0.171	0.169	0.188
	(0.388)	(0.385)	(0.417)	(0.377)	(0.375)	(0.392)
31 yrs. old at Wave IV	0.120	0.117	0.146	0.112	0.107	0.152
	(0.325)	(0.321)	(0.354)	(0.315)	(0.309)	(0.360)
32 yrs. or older at Wave IV	0.026	0.025	0.040	0.025	0.023	0.037
	(0.160)	(0.155)	(0.195)	(0.155)	(0.151)	(0.188)
Male	0.468	0.478	0.378	0.484	0.495	0.389
	(0.499)	(0.500)	(0.485)	(0.500)	(0.500)	(0.488)
White[a]	0.636	0.643	0.574	0.660	0.668	0.590
	(0.481)	(0.479)	(0.495)	(0.474)	(0.471)	(0.493)
Black	0.228	0.227	0.244	0.201	0.200	0.207
	(0.420)	(0.419)	(0.429)	(0.401)	(0.400)	(0.406)
Race/Ethnicity Other	0.145	0.140	0.193	0.150	0.143	0.213
	(0.353)	(0.347)	(0.395)	(0.357)	(0.350)	(0.410)
Hispanic	0.159	0.153	0.211	0.144	0.138	0.192
	(0.366)	(0.360)	(0.408)	(0.351)	(0.345)	(0.394)
Born in the U.S.	0.925	0.927	0.913	0.929	0.933	0.891
	(0.263)	(0.261)	(0.282)	(0.257)	(0.250)	(0.313)
Only Child	0.198	0.196	0.221	0.011	0.010	0.018
	(0.399)	(0.397)	(0.415)	(0.102)	(0.098)	(0.134)
Birth-weight in 250 grams	10.207	10.298	9.422	9.697	9.739	9.336
	(5.932)	(5.883)	(6.288)	(5.631)	(5.602)	(5.875)
Height in inches	65.565	65.598	65.280	65.472	65.515	65.113
	(7.453)	(7.407)	(7.834)	(7.862)	(7.805)	(8.330)
Weight in pounds	141.654	141.395	143.898	140.207	139.822	143.472
	(34.830)	(34.873)	(34.382)	(34.485)	(34.430)	(34.828)
Education: Less than High School[a]	0.079	0.072	0.146	0.078	0.070	0.140
	(0.270)	(0.258)	(0.353)	(0.268)	(0.256)	(0.347)
Education: High School	0.162	0.156	0.221	0.170	0.162	0.243
	(0.369)	(0.363)	(0.415)	(0.376)	(0.368)	(0.430)
Education: Some College or Vocational Training	0.442	0.440	0.456	0.414	0.411	0.438
	(0.497)	(0.497)	(0.498)	(0.493)	(0.492)	(0.497)
Education: College Degree	0.238	0.250	0.137	0.258	0.271	0.146
	(0.426)	(0.433)	(0.344)	(0.438)	(0.445)	(0.354)
Education: Graduate or Professional Degree	0.078	0.082	0.040	0.080	0.085	0.033
	(0.268)	(0.275)	(0.195)	(0.271)	(0.280)	(0.180)
Employed	0.651	0.656	0.607	0.642	0.646	0.605
	(0.477)	(0.475)	(0.489)	(0.480)	(0.478)	(0.490)
Personal Earnings	35242.9	36086.4	27720.6	34915.6	35756.8	27583.2

	(44875.2)	(46303.5)	(28108.9)	(40729.9)	(41304.8)	(34525.6)
Gut Feeling in Decision Making Wave I	0.089	0.080	0.171	0.090	0.079	0.179
	(0.285)	(0.271)	(0.376)	(0.286)	(0.270)	(0.384)
Low Chance to Live to Age 35	0.143	0.122	0.319	0.142	0.125	0.292
	(0.350)	(0.327)	(0.466)	(0.349)	(0.330)	(0.455)
Never Married[a]	0.502	0.503	0.487	0.490	0.495	0.453
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)
Currently Married	0.434	0.434	0.435	0.448	0.445	0.471
	(0.496)	(0.496)	(0.496)	(0.497)	(0.497)	(0.500)
Divorced	0.064	0.062	0.078	0.062	0.060	0.076
	(0.244)	(0.241)	(0.268)	(0.241)	(0.237)	(0.265)
Add Health Picture Vocabulary Test Score	95.940	96.505	91.042	95.566	96.185	90.322
	(25.601)	(25.620)	(24.909)	(24.423)	(24.361)	(24.353)
Religion: None, Atheist, or Agnostic[a]	0.181	0.180	0.187	0.176	0.174	0.185
	(0.385)	(0.384)	(0.390)	(0.381)	(0.380)	(0.389)
Religion: Protestant	0.291	0.296	0.252	0.305	0.312	0.246
	(0.454)	(0.456)	(0.434)	(0.461)	(0.464)	(0.432)
Religion: Catholic	0.218	0.218	0.225	0.223	0.219	0.252
	(0.413)	(0.413)	(0.418)	(0.416)	(0.414)	(0.435)
Religion: Other Christian	0.224	0.223	0.229	0.219	0.220	0.210
	(0.417)	(0.416)	(0.420)	(0.413)	(0.414)	(0.408)
Religion: Other	0.083	0.081	0.103	0.076	0.073	0.100
	(0.276)	(0.273)	(0.304)	(0.265)	(0.261)	(0.301)
Parents are Married at Wave I	0.615	0.624	0.532	0.647	0.657	0.565
	(0.487)	(0.484)	(0.499)	(0.478)	(0.475)	(0.497)
Mother's Education: Less than High School[a]	0.150	0.143	0.213	0.148	0.137	0.240
	(0.357)	(0.350)	(0.409)	(0.355)	(0.344)	(0.428)
Mother's Education: High School or Equivalent	0.312	0.314	0.292	0.325	0.330	0.286
	(0.463)	(0.464)	(0.455)	(0.469)	(0.470)	(0.452)
Mother's Education: More than High School	0.439	0.450	0.339	0.436	0.449	0.328
	(0.496)	(0.498)	(0.474)	(0.496)	(0.498)	(0.470)
Biological Father is Present at Wave I	0.496	0.507	0.403	0.579	0.590	0.492
	(0.500)	(0.500)	(0.491)	(0.494)	(0.492)	(0.501)
Total HH income in Wave I is < 40k[a]	0.379	0.371	0.446	0.388	0.380	0.450
	(0.485)	(0.483)	(0.497)	(0.487)	(0.486)	(0.498)
Total HH income in Wave I is between 40k and 80k	0.290	0.298	0.213	0.303	0.310	0.243
	(0.454)	(0.458)	(0.410)	(0.460)	(0.463)	(0.430)
Total HH income in Wave I is greater than 80k	0.091	0.095	0.063	0.094	0.097	0.067
	(0.288)	(0.293)	(0.242)	(0.292)	(0.296)	(0.250)
Biological Father Spent Time in Jail	0.146	0.141	0.185	0.142	0.136	0.192
	(0.353)	(0.348)	(0.388)	(0.349)	(0.343)	(0.394)
Ever Been Diagnosed with Anxiety	0.117	0.108	0.193	0.109	0.103	0.161
	(0.321)	(0.310)	(0.395)	(0.312)	(0.305)	(0.368)
Ever Been Diagnosed with ADD/ADHD	0.049	0.047	0.068	0.045	0.044	0.058
	(0.216)	(0.212)	(0.251)	(0.208)	(0.205)	(0.234)
Wave IV Ever Drug	0.553	0.552	0.561	0.519	0.515	0.550
	(0.497)	(0.497)	(0.496)	(0.500)	(0.500)	(0.498)
Wave I Alcohol in the Past Year	0.474	0.458	0.621	0.449	0.432	0.590
	(0.499)	(0.498)	(0.485)	(0.498)	(0.496)	(0.493)
Wave I Ever Marijuana	0.283	0.264	0.446	0.260	0.244	0.395
	(0.450)	(0.441)	(0.497)	(0.439)	(0.430)	(0.490)
Have an Older Sibling	--	--	--	0.705	0.706	0.698
	--	--	--	(0.456)	(0.456)	(0.459)
Parent Favors Myself	--	--	--	0.215	0.199	0.349
	--	--	--	(0.411)	(0.399)	(0.478)

Parent Treats Children Equally[a]	--	--	--	0.737	0.755	0.571
	--	--	--	(0.441)	(0.430)	(0.496)
Parent Favors My Sibling	--	--	--	0.058	0.055	0.086
	--	--	--	(0.235)	(0.229)	(0.282)
Means of adolescent characteristics that may differ between siblings						
Bad Tempered	0.307	0.294	0.431	0.320	0.310	0.412
	(0.462)	(0.456)	(0.496)	(0.467)	(0.463)	(0.493)
ADHD	0.049	0.047	0.068	0.045	0.044	0.058
	(0.216)	(0.212)	(0.251)	(0.208)	(0.205)	(0.234)
Learning Disability	0.119	0.112	0.185	0.123	0.117	0.176
	(0.324)	(0.316)	(0.388)	(0.329)	(0.322)	(0.381)
Breastfed	0.441	0.449	0.370	0.447	0.454	0.381
	(0.497)	(0.497)	(0.483)	(0.497)	(0.498)	(0.486)
Low Birth Weight	0.090	0.088	0.105	0.198	0.196	0.211
	(0.286)	(0.283)	(0.307)	(0.399)	(0.397)	(0.409)
N	15,584	13,971	1,613	3,116	2,787	329

Notes: Standard deviations are in parentheses. [a] refers to the omitted category in the regression models.

Appendix Table 2: Estimates of Depression on Various Child Characteristics

Variable	(1) OLS Sibling Sample	(2) Fixed Effects Sibling Sample
Child has Learning Disability	0.049***	0.009
	(0.018)	(0.052)
Child is Bad Tempered	0.042***	0.025
	(0.011)	(0.026)
Breastfed	-0.026*	0.027
	(0.014)	(0.051)
ADHD	0.031	0.024
	(0.032)	(0.069)
Low Birth Weight	0.008	0.033
	(0.016)	(0.041)
Male	-0.040***	-0.047
	(0.013)	(0.032)
N	3,116	3,116

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table 3: Estimates of the Relationship between Adolescent Depression and Adult Crime – Full Results from Panel E of Table 2

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
Depressed	0.035***	0.013	0.004	0.029**
	(0.009)	(0.010)	(0.005)	(0.011)
Wave I Crime	0.055***	0.028***	0.082***	0.052***
	(0.005)	(0.008)	(0.013)	(0.006)
26 yrs. old or younger at wave IV	0.041***	-0.017	0.026**	0.015
	(0.013)	(0.021)	(0.013)	(0.022)
27 yrs. old at wave IV	0.025**	-0.026	0.024**	-0.008
	(0.012)	(0.019)	(0.011)	(0.021)
28 yrs. old at wave IV	0.019	-0.009	0.024**	0.002
	(0.011)	(0.018)	(0.011)	(0.018)
29 yrs. old at wave IV	0.014	0.003	0.014	0.006
	(0.011)	(0.017)	(0.010)	(0.018)
30 yrs. old at wave IV	0.005	-0.012	0.008	-0.015
	(0.010)	(0.016)	(0.010)	(0.017)
31 yrs. old at wave IV	0.011	-0.007	0.007	-0.011
	(0.010)	(0.018)	(0.009)	(0.017)
Male	0.049***	0.018**	0.030***	0.064***
	(0.007)	(0.007)	(0.005)	(0.008)
Black	0.006	0.025**	0.024***	0.027**
	(0.008)	(0.011)	(0.007)	(0.012)
Other Race	-0.003	0.018**	-0.002	0.019*
	(0.007)	(0.008)	(0.005)	(0.011)
Hispanic	-0.003	-0.003	0.002	0.002
	(0.008)	(0.014)	(0.008)	(0.014)
Born in U.S.	0.004	0.029***	0.005	0.035***
	(0.008)	(0.008)	(0.006)	(0.012)
Only Child	0.007	0.011	0.009*	0.027***
	(0.006)	(0.008)	(0.005)	(0.010)
Birthweight in 250 grams	-0.000	-0.002	-0.000	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)
Height in inches	-0.001	-0.002**	0.000	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Weight in Pounds	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Education: High School	-0.007	-0.014	-0.003	-0.003
	(0.012)	(0.013)	(0.009)	(0.016)
Education: Some College or Vocational Training	0.004	-0.018	-0.011	0.006
	(0.010)	(0.012)	(0.008)	(0.013)
Education: College Degree	-0.013	-0.023*	-0.027***	-0.015
	(0.010)	(0.014)	(0.008)	(0.014)
Education: Graduate or Professional Degree	-0.005	-0.025	-0.020**	-0.013
	(0.013)	(0.016)	(0.010)	(0.017)
Employed	0.004	-0.009	0.005	-0.001
	(0.005)	(0.006)	(0.004)	(0.007)
Log of Personal Earnings	-0.002**	0.000	-0.002***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)

Relies on Gut Feeling in Decision Making Wave I	0.014	0.021**	0.018***	0.030**
	(0.009)	(0.010)	(0.006)	(0.012)
Believes Low Chance to Live to Age 35 at Wave I	-0.003	0.009	0.000	0.008
	(0.006)	(0.009)	(0.005)	(0.010)
Currently Married	-0.033***	0.009	-0.028***	-0.023***
	(0.004)	(0.007)	(0.003)	(0.007)
Divorced	-0.011	0.029***	-0.011	0.022*
	(0.009)	(0.010)	(0.009)	(0.013)
Standardized Add Health Picture Vocabulary Test Score	0.001**	-0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Religion: Protestant	-0.007	-0.021**	-0.014**	-0.029***
	(0.007)	(0.009)	(0.006)	(0.011)
Religion: Catholic	0.001	-0.007	-0.005	-0.009
	(0.008)	(0.008)	(0.006)	(0.011)
Religion: Other Christian	-0.012*	-0.008	-0.018***	-0.016
	(0.007)	(0.008)	(0.005)	(0.010)
Religion: Other	0.008	0.010	-0.002	0.013
	(0.010)	(0.010)	(0.007)	(0.013)
Parents are Married at Wave I	-0.004	-0.017*	0.006	-0.017*
	(0.007)	(0.010)	(0.005)	(0.010)
Mother Has a High School Degree of Equivalent	0.001	0.022**	-0.005	0.016
	(0.008)	(0.010)	(0.006)	(0.010)
Mother Has more Schooling than High School	0.006	0.020*	0.001	0.019*
	(0.008)	(0.010)	(0.006)	(0.011)
Biological Father is Present at Wave I	0.011	-0.006	-0.007	0.001
	(0.006)	(0.009)	(0.005)	(0.009)
Total HH income in Wave I is between 40k and 80k	-0.009	0.010	-0.001	0.001
	(0.006)	(0.008)	(0.004)	(0.009)
Total HH income in Wave I is greater than 80k	-0.013	0.005	0.011	-0.002
	(0.010)	(0.012)	(0.007)	(0.015)
Biological Father Spent Time in Jail	0.023***	0.008	0.019***	0.031***
	(0.008)	(0.008)	(0.006)	(0.010)
Mean	0.075	0.133	0.042	0.204
N	15,467	15,464	15,494	15,504

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table 4: Estimates of the Relationship between Adolescent Depression and Adult Crime – Full Results from Panel F of Table 3

Variable	(1) Property	(2) Violent	(3) Drug	(4) Nondrug
Depressed	0.058*	0.025	-0.001	0.059
	(0.034)	(0.047)	(0.031)	(0.054)
Crime in Wave I	0.043	0.063	0.070*	0.043
	(0.031)	(0.040)	(0.036)	(0.034)
26 yrs. old or younger at wave IV	0.039	-0.063	0.018	-0.045
	(0.061)	(0.111)	(0.039)	(0.128)
27 yrs. old at wave IV	0.008	-0.085	-0.022	-0.087
	(0.060)	(0.115)	(0.037)	(0.132)
28 yrs. old at wave IV	0.025	-0.032	0.007	-0.011
	(0.060)	(0.097)	(0.036)	(0.115)
29 yrs. old at wave IV	-0.003	-0.005	-0.011	-0.045
	(0.057)	(0.108)	(0.033)	(0.119)
30 yrs. old at wave IV	0.001	-0.014	-0.026	-0.020
	(0.050)	(0.098)	(0.027)	(0.111)
31 yrs. old at wave IV	0.011	-0.012	0.006	-0.021
	(0.062)	(0.119)	(0.041)	(0.132)
Male	0.047*	0.028	0.042	0.047
	(0.024)	(0.052)	(0.028)	(0.053)
Birthweight in 250 grams	0.005	0.004	0.000	0.010
	(0.006)	(0.009)	(0.005)	(0.010)
Height in inches	-0.002	-0.002	0.001	-0.001
	(0.004)	(0.006)	(0.004)	(0.006)
Weight in Pounds	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Education: High School	0.015	-0.056	0.003	-0.027
	(0.037)	(0.055)	(0.041)	(0.057)
Education: Some College or Vocational Training	-0.015	0.001	-0.004	-0.008
	(0.038)	(0.056)	(0.043)	(0.062)
Education: College Degree	-0.006	-0.005	-0.018	-0.000
	(0.044)	(0.070)	(0.042)	(0.076)
Education: Graduate or Professional Degree	-0.050	0.008	-0.015	-0.036
	(0.058)	(0.084)	(0.049)	(0.095)
Employed	0.000	-0.023	0.013	-0.008
	(0.018)	(0.033)	(0.015)	(0.032)
Log of Personal Earnings	-0.003	0.008	-0.004*	0.005
	(0.004)	(0.006)	(0.002)	(0.007)
Relies on Gut Feeling in Decision Making Wave I	0.005	-0.041	0.037	-0.016
	(0.045)	(0.045)	(0.025)	(0.059)
Believes Low Chance to Live to Age 35 at Wave I	0.007	0.004	0.002	0.024
	(0.025)	(0.039)	(0.018)	(0.040)
Currently Married	-0.019	0.005	-0.028	-0.022
	(0.020)	(0.025)	(0.022)	(0.031)

Divorced	-0.012	0.021	-0.028	0.028
	(0.039)	(0.053)	(0.053)	(0.066)
Have an Older Sibling	0.016	0.031	-0.004	0.037
	(0.020)	(0.027)	(0.017)	(0.031)
Parent Favors Myself	-0.039	0.033	0.005	0.007
	(0.028)	(0.039)	(0.026)	(0.040)
Parent Favors my Sibling	0.035	0.100	0.030	0.124*
	(0.052)	(0.062)	(0.047)	(0.069)
Mean	0.068	0.140	0.036	0.201
N	3,100	3,097	3,102	3,096

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table 5: Estimates of the Relationship between Adolescent Depression and Adult Crime with Cutoffs for "Mild" and "Severe" Depression

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: School Fixed Effects with Full Controls			
Mildly Depressed	0.035***	0.002	0.008	0.017
	(0.012)	(0.012)	(0.008)	(0.015)
Severely Depressed	0.035***	0.026*	-0.001	0.044**
	(0.013)	(0.015)	(0.009)	(0.017)
Mean	0.075	0.133	0.042	0.204
N	15,467	15,464	15,494	15,504
	Panel B: Family Fixed Effects with Full Controls			
Mildly Depressed	0.084*	0.010	0.014	0.052
	(0.046)	(0.051)	(0.038)	(0.059)
Severely Depressed	0.015	0.045	-0.029	0.068
	(0.038)	(0.074)	(0.048)	(0.083)
Mean	0.068	0.140	0.036	0.201
N	3,114	3,111	3,116	3,110

Notes: Standard errors, corrected for clustering at the school level, are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table 6: Probit Estimates for the Probability of Depression from the Propensity Score Matching Analysis

Variable	Depressed
Male	-0.205***
	(0.028)
Black	-0.063
	(0.038)
Other Race	0.122***
	(0.044)
Hispanic	0.023
	(0.044)
Born in the U.S.	0.129**
	(0.056)
Only Child	0.046
	(0.036)
Birth-weight in 250 grams	0.006
	(0.007)
Standardized Add Health Picture Vocabulary Test Score	-0.012***
	(0.001)
Religion: Protestant	-0.144***
	(0.043)
Religion: Catholic	-0.103**
	(0.046)
Religion: Other Christian	-0.095**
	(0.044)
Religion: Other	0.052
	(0.056)
Parents are Married at Wave I	-0.009
	(0.041)
Mother Has a High School Degree of Equivalent	-0.124***
	(0.043)
Mother Has more Schooling than High School	-0.155***
	(0.043)
Biological Father is Present at Wave I	-0.112***
	(0.040)
Total HH income in Wave I is between 40k and 80k	-0.107***
	(0.039)
Total HH income in Wave I is greater than 80k	-0.100*
	(0.059)
Biological Father Spent Time in Jail	0.076*
	(0.039)
N	15,584

Notes: Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.