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D. Mark Anderson
Resul Cesur
Erdal Tekin

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D. Mark Anderson
Montana State University

Resul Cesur
University of Connecticut

Erdal Tekin
Georgia State University,
NBER and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Youth Depression and Future Criminal Behavior*

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. In this paper, we examine the effect of depression during adolescence on the probability of engaging in a number of criminal behaviors using data from the National Longitudinal Study of Adolescent Health (Add Health). 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 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 about 219 million dollars per year.

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Corresponding author:

Erdal Tekin
Department of Economics
Andrew Young School of Policy Studies
Georgia State University
Suite 560, P.O. Box 3992
Atlanta, GA 30302-3992
USA
E-mail: tekin@gsu.edu

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I. Introduction

Major depression is a serious public health problem both 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 poor mental health are wide-ranging and long-lasting. For example, 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 (Fletcher 2009, Chatterji et al., 2011; 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 runs high. It has been estimated that treatment and disability payments are roughly $83.1 billion per year, while the indirect costs associated with productivity loss are approximately $51.5 billion per year (Greenberg et al., 2003; Ettner et al., 1997). Because of the substantial economic and social costs that mental health problems impose on society, the U.S. Department of Health and Human Services has identified improving mental health as a vital objective. Accordingly, the goal is set by the government to achieve a 10

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

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. Several studies have identified negative emotions, such as depression, as a motivating factor for delinquent behavior (e.g., Broidy and Agnew, 1997; Piquero and Selock, 2004). Others have 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; Elbogen and Johnson, 2009; Teplin et al., 2005; 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] Even those with less severe mental health problems perform poorly in terms of behavioral outcomes. For example, persons with low self-esteem are more likely to display aggressive, delinquent, and criminal behaviors (e.g., Donnellan et al., 2005; Trzesniewski et al., 2006). On the other hand, there are also a number of studies to argue that depression may be less likely to motivate delinquent behavior because it decreases an individual's energy and desire to act (Agnew, 1992, Broidy, 2001; Mazerolle and Piquero, 1997).

While an association between depression and delinquent behavior has been widely considered in the literature, the existing studies contain a number of 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 (e.g.,

[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.

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 depression 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 cohort studies generally use data from outside the United States and rely on a limited number of controls to account for differences across individual characteristics that could be correlated with both depression and criminal behavior. Therefore, it is not straightforward to move from a positive correlation between depression and crime to a statement about causality in these studies due to a multitude of omitted factors, such as financial stress and 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 depression. For example, mental health problems may be a consequence of incarceration (Marcotte and Markowitz, 2011; Vermeiren et al., 2000). Cross-sectional or observational studies cannot account for this problem. Furthermore, the crime and depression variables often used in these studies are based on arrest or incarceration records and official reports of clinical depression. Consequently, many individuals engaging in criminal acts and/or suffering from mental health problems 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 the relationship between depression and criminal behavior. First, we focus on the effect of adolescent depression on adult criminal behavior using data from a longitudinal survey. Specifically, the National Longitudinal Survey of Adolescent Health (Add Health) employed here 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 facilitate 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. Finally, focusing on the long-term consequences of depression on crime minimizes concerns associated with reverse causality from crime to depression.

Second, we improve upon the existing literature by employing a series of fixed effects estimators to control for unobserved heterogeneity at the neighborhood and family levels. 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 characteristics such as household poverty, parenting style, and home environment that are typically shared by all siblings in a household. As a result, our estimates are more likely to be purged of sources of unobserved heterogeneity that have plagued previous studies.

The findings in this paper have important implications for understanding the potential for policy to improve outcomes for children and their families. The cost of crime imposed on society is substantial across social, economic, and health dimensions. According to the U.S. Department of Justice, law enforcement agencies recently made a total of 13.7 million arrests, of which 1.9 million were juveniles.[5] 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 substantially increased probability of engaging in property crime. We find little 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 economic cost of property crime associated with adolescent depression is about 219 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 discuss the estimation strategy. 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 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

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

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

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 particularly 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. Aside from containing a diagnostic instrument for depression, a 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.

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.[7] Respondents were asked such questions as how often they felt "lonely", "depressed", or "too tired to do things."[8] 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 sum the coded responses to generate a score between 0 and 54.[9] Then, we rescale the score to be out of 60 so that it would correspond with 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,

[7] 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.

[8] 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.

[9] 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."

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).

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. [10] 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.[11] 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 worth more than $50?*; and (iii) *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 one if the respondent committed one of these three acts at least once in the past 12 months, and 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?*; and (ii) *how often did you hurt someone badly enough in a physical fight that he or she needed care from a doctor or nurse?* Again, we coded the variable *Violent* as one if the respondent

[10] 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, while Mocan and Rees (2005) demonstrate that the extent of juvenile crime calculated from Add Health data is similar to those obtained from other sources.

[11] 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.

committed one of these two acts at least once in the past 12 months, and 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, the variable *Non-drug* takes on the value of one if the respondent reports committing either a property or a violent crime in the past 12 months, and zero otherwise. Note that these criminal acts comprise the 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. 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 our samples who report committing illegal acts goes down substantially between Waves I and IV. As shown in column (1), over 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.

Columns (2) and (3) in Table 1 present the fraction of Add Health respondents reporting various forms of criminal acts by depression status. As expected, 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 much 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 much 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.

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

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 that individuals engage in crime based on a comparison of the expected utility from criminal activity to the utility associated with legal options. 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 in turn increase 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 that they may 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 such a link empirically 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 to confound the relationship. One can imagine a myriad of personal, family, school, and community factors that are likely associated with both depression and crime. To

address this empirical challenge, we employ four separate 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 particular 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.[12] Because the Add Health is a school-based survey, the standard errors are corrected for clustering at the school level.[13]

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 mental illness face a

[12] OLS estimates in linear probability models are consistent estimates of average probability derivatives, but the standard error estimates are biased due to heteroskedasticity. Therefore, we report standard errors corrected for heteroskedasticity.

[13] 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.

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.

Another possible channel through which mental health problems may lead to criminal behavior is by affecting individuals' ability to evaluate the true costs and benefits associated with risk taking. Individuals' decisions to engage in crime are 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 mental health problems 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:[14]

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

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

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 unlikely in this case due to reasons mentioned above, even after controlling for a large number of covariates. One particular concern is neighborhood-level unobservables. For instance, adolescents in economically disadvantaged 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 both mental health 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:

[14] 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 management, business and financial operations, 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, construction, maintenance and repair occupations, production occupations, and transportation and moving occupations.

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

where λ_s is a vector of school fixed effects. Note that identification in equation (3) comes from mental health differences between individuals who attend the same school.

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

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

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 any remaining unobserved heterogeneity that may be simultaneously correlated with adolescent depression and subsequent criminal behavior (e.g., Cesur et al., 2011; 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 still possible that unobserved factors at the family level that are correlated with both depression and subsequent criminal behavior exist. For example, a poor home environment might simultaneously increase the likelihood a child is depressed and commits crime later in life. Estimates of the impact of adolescent depression on crime that omit these types of factors would be biased upward. To

control for unobserved characteristics at the family and neighborhood levels, we estimate family fixed effects models of the following form:

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

where *i* indexes the individual in family *f*. In this specification, ν_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, and weight). 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. We also estimate 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 into 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).[15]

IV. Results

Table 2 presents results from the estimation of equations (1) – (4). Panel A presents the baseline OLS estimates for the relationship between adolescent depression and subsequent criminal behavior for each of the four crime outcomes.[16] As shown, depression during adolescence is a statistically significant predictor of all four types of crime. The estimates

[15] 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.

[16] In the interest of space, we only present the coefficient estimates for the depression variable. The results for the other 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 the Appendix Table 2 for the most comprehensive specifications.

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 month period in Wave IV. In addition to being statistically significant, these estimates are also substantial in size, corresponding to effect sizes of approximately 66 percent for property crime, 15 percent for violent crime, 32 percent for the selling of drugs, and 23 percent for non-drug crime.

Panel B 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 C 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 crime after controlling for family and individual characteristics.[17]

Finally, we present the estimates from the specifications that also control for criminal behavior during Wave I. Not surprisingly, adolescents who 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 D 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 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.[18]

While the results presented in Table 2, especially those in panel D, are suggestive of a causal relationship between adolescent depression and future criminal behavior, they may still suffer from bias due to unobserved heterogeneity. To further guard against potential bias, 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. The OLS estimates using the sibling sample are shown in Panel A. 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

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

[18] Full results from the specification in Panel D are presented in Appendix Table 2.

of Table 2 in order to assess how changing samples affects the estimates. Panel A of Table 3 indicates that the OLS estimates are uniformly larger in the sibling subsample than in the full sample; however, we cannot reject that the coefficients are the same given the larger standard errors in the sibling models. [19] As shown in Panel B, the estimates for the relationship between adolescent depression and future criminality change little when we add the potential mediators.

The models that control for family fixed effects are shown in Panels C and D of Table 3. In Panel C, we present fixed effects estimates from specifications with potential mediators and basic controls that differ between siblings. In panel D, we include the right-hand-side variables from Panel C and add a lagged dependent variable. These estimates show that adolescent depression is still a statistically significant predictor of adult property crime. The estimate size in Panel D represents a 5.6 percentage-point increase in the propensity to commit a property crime and is statistically significant at the 5 percent level.[20] 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 D of Table 3 has little impact on the estimated effect of adolescent depression on future crime. To the extent that the family fixed effects account for unobserved family-level factors that affect both the likelihood of depression during childhood and future criminality, there may be little relevant variation remaining in the data. The fact that the estimate on property crime remains robust and sizeable after using the sibling sample and controlling for education, employment, risk

[19] The full set of results from the specification in Panel D is presented in Appendix Table 3.

[20] One possible explanation for the more sizeable estimates in the sibling subsample may be due to non-linearity in the 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. 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.

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.

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 usually manifests itself in internalizing patterns of behaviors among girls such as passivity, while it is more likely to be manifested in externalizing patterns of behavior among males, such as aggression and conduct disorder. Therefore, we include an interaction between gender and depression status to our most comprehensive specifications (i.e. models with family fixed effects).[21] As illustrated in Table 4, the estimate on the interaction term is never statistically significant and is zero for all practical purposes for property crime. Looking at non-drug crime in column (4), we see that the interaction term is sizeable, but is statistically indistinguishable from zero. Taken together, we interpret these results as no clear evidence of a gender specific relationship between adolescent depression and adult criminal behavior, especially for property crime.

Finally, we conduct analyses controlling for co-morbid conditions including anxiety and attention deficit hyperactivity disorder (ADHD) that may be correlated with both depression during adolescence and future criminality. Prior research has established a link between ADHD and criminal behavior (e.g., Fletcher and Wolfe, 2009; Sourander et al., 2007; Manuzza et al., 2004, 2008). To conduct this analysis, we construct a binary indicator for whether the respondent had ever been diagnosed with ADHD. The proportion of the sample who reported

[21] It would be natural to estimate the family fixed effects models separately for males and females. However, doing this substantially reduces the variation in our sample to the extent that the depression coefficients are imprecisely estimated. Instead, we report models in which we control for an interaction term between gender and depression status.

having ever been diagnosed with ADHD is about 5 percent. The prevalence of this condition is more common among the depressed sample (6.8 percent) than the non-depressed sample (4.7 percent). We also consider a binary indicator for whether the respondent reported having ever been diagnosed with anxiety. The proportion of the sample who reported having ever been diagnosed with anxiety is about 11 percent. Similar to ADHD, the prevalence of anxiety is more common among the depressed sample (19.3 percent) than the non-depressed sample (10.8 percent). These variables are included in the most comprehensive specifications from Tables 2 and 3 and the results are illustrated in Table 5. As shown in both panels, the estimates are highly robust to the inclusion of these conditions and are nearly identical to the corresponding estimates from Tables 2 and 3. These findings suggest that the association between adolescent depression and adult criminal behavior does not operate through these other conditions.

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 primary 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.[22] An estimate for the annual per victim cost of depression associated with property crime can be obtained by multiplying this dollar amount by our preferred effect of 0.056 (from Panel D of Table 3) and then multiplying the resulting figure by the incidence of adolescent depression in our sample of 0.104 (= 917*0.056*0.104 = 5.34 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 219 million dollars per year. Note, however, that the cost of 5.34 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 219 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, 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

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

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.

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Table 1 - Descriptive Statistics

Variable	Full Sample	Full Sample Not-Depressed	Full Sample Depressed	Sibling Sample	Sibling Sample Not-Depressed	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)
Observations	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 from OLS and School Fixed Effects

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: OLS with Basic Controls			
Depressed	0.047***	0.020**	0.013**	0.045***
	(0.009)	(0.010)	(0.005)	(0.011)
Observations	15,570	15,571	15,582	15,560
R^2	0.026	0.010	0.027	0.022
	Panel B: OLS with Basic Controls + Potential Channels			
Depressed	0.043***	0.015	0.007	0.037***
	(0.009)	(0.010)	(0.005)	(0.011)
Observations	15,570	15,571	15,582	15,560
R^2	0.037	0.016	0.047	0.028
	Panel C: School Fixed Effects + Basic Controls + Potential Channels			
Depressed	0.042***	0.015	0.008	0.036***
	(0.009)	(0.010)	(0.005)	(0.011)
Observations	15,570	15,571	15,582	15,560
R^2	0.050	0.026	0.059	0.039
	Panel D: 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)
Observations	15,467	15,464	15,494	15,504
R^2	0.058	0.027	0.070	0.043

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. Models also include missing binary indicators for each of the control variables.

Table 3 – Estimates from Family Sample - OLS and Family Fixed Effects

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: OLS with Basic Controls			
Depressed	0.074***	0.027	0.018	0.068***
	(0.019)	(0.023)	(0.013)	(0.027)
Observations	3,114	3,111	3,116	3,110
R^2	0.035	0.019	0.022	0.033
	Panel B: OLS with Basic Controls + Potential Channels			
Depressed	0.068**	0.034	0.005	0.077*
	(0.027)	(0.036)	(0.022)	(0.040)
Observations	3,114	3,111	3,116	3,110
R^2	0.620	0.558	0.538	0.592
	Panel C: Family Fixed Effects + Basic Controls + Potential Channels			
Depressed	0.057**	0.033	0.002	0.064
	(0.027)	(0.036)	(0.023)	(0.041)
Observations	3,112	3,109	3,114	3,108
R^2	0.635	0.571	0.551	0.600
	Panel D: Family Fixed Effects + Basic Controls + Potential Channels + Lagged Dependent Variable			
Depressed	0.056**	0.032	0.001	0.063
	(0.027)	(0.036)	(0.023)	(0.040)
Crime in Wave I	0.040**	0.065**	0.070**	0.049*
	(0.020)	(0.028)	(0.034)	(0.028)
Observations	3,097	3,096	3,105	3,103
R^2	0.635	0.571	0.554	0.601

Notes: Robust standard errors are in parentheses. Standard errors are also corrected for clustering at the school level in panels A and B . *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Models also include missing binary indicators for each of the control variables.

Table 4: Gender Specific Family Fixed Effects Estimates of the Relationship between Adolescent Depression and Adult Criminal Behavior

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
Depressed	0.057*	0.063	0.028	0.098**
	(0.034)	(0.045)	(0.025)	(0.050)
(Male)x(Depressed)	-0.006	-0.084	-0.073	-0.100
	(0.053)	(0.069)	(0.046)	(0.074)
Observations	3,097	3,096	3,105	3,103
R^2	0.636	0.573	0.557	0.603

Notes: Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Models also include missing binary indicators for each of the control variables.

Table 5: Controlling for Co-morbid Conditions (Anxiety and ADHD)

Variable	(1) Property	(2) Violent	(3) Selling Drugs	(4) Nondrug
	Panel A: School Fixed Effects with Full Controls and Comorbidities			
Depressed	0.032***	0.011	0.002	0.024**
	(0.009)	(0.010)	(0.005)	(0.011)
Observations	15,466	15,463	15,493	15,503
R^2	0.061	0.028	0.072	0.045
	Panel B: Family Fixed Effects with Full Controls and Comorbidities			
Depressed	0.054**	0.033	-0.003	0.063
	(0.027)	(0.036)	(0.022)	(0.040)
Observations	3,097	3,096	3,105	3,103
R^2	0.635	0.571	0.561	0.601

Notes: Robust standard errors are in parentheses. Standard errors are also corrected for clustering at the school level in panel A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Models also include missing binary indicators for each of the control variables.

Appendix Table 1: Descriptive Statistics by Depression Status

Variable	Full Sample	Full Sample		Family Sample	Family Sample	
		Not-Depressed	Depressed		Not-Depressed	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)
Missing info: Race/Ethnicity	0.001	0.001	0.001	0.002	0.002	0.000
	(0.038)	(0.038)	(0.035)	(0.040)	(0.042)	0.000
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)
Missing info: Hispanic	0.003	0.003	0.002	0.001	0.001	0.000
	(0.051)	(0.051)	(0.043)	(0.031)	(0.033)	0.000
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)
Missing Info: Only Child	0.014	0.013	0.015	0.004	0.004	0.000
	(0.115)	(0.115)	(0.121)	(0.062)	(0.066)	0.000
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)
Missing Info: Birth-weight	0.231	0.224	0.286	0.220	0.216	0.249
	(0.421)	(0.417)	(0.452)	(0.414)	(0.412)	(0.433)
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)
Missing Info: Height	0.009	0.009	0.011	0.010	0.010	0.012
	(0.094)	(0.093)	(0.102)	(0.101)	(0.100)	(0.110)
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)
Missing Info: Weight	0.017	0.017	0.019	0.016	0.016	0.015
	(0.128)	(0.128)	(0.135)	(0.126)	(0.126)	(0.123)

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)
Missing Data: Education	0.000	0.000	0.000	0.000	0.000	0.000
	(0.008)	(0.009)	0.000	0.000	0.000	0.000
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)
Missing Info: Employed	0.000	0.000	0.000	0.001	0.001	0.000
	(0.020)	(0.021)	0.000	(0.025)	(0.027)	0.000
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)
Missing Info: Personal Earnings	0.049	0.046	0.073	0.043	0.040	0.067
	(0.215)	(0.209)	(0.261)	(0.202)	(0.196)	(0.250)
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)
Missing Info: Gut Feeling	0.004	0.004	0.006	0.004	0.004	0.000
	(0.061)	(0.060)	(0.075)	(0.062)	(0.066)	0.000
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)
Mission Info: Low Chance to Live to Age 35	0.003	0.003	0.008	0.001	0.001	0.000
	(0.057)	(0.052)	(0.089)	(0.036)	(0.038)	0.000
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)
Missing Info: Marriage	0.001	0.001	0.001	0.000	0.000	0.000
	(0.027)	(0.027)	(0.025)	0.000	0.000	0.000
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)
Missing Info: PPVT Score	0.048	0.048	0.047	0.042	0.042	0.049
	(0.213)	(0.213)	(0.211)	(0.201)	(0.200)	(0.215)
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)
Missing Data: Religion	0.003	0.003	0.004	0.002	0.001	0.006
	(0.054)	(0.053)	(0.066)	(0.044)	(0.038)	(0.078)

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)
Missing Information: Parental Marital Status	0.135	0.132	0.167	0.126	0.121	0.161
	(0.342)	(0.338)	(0.373)	(0.331)	(0.327)	(0.368)
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)
Missing Info: Mother's Education	0.100	0.093	0.156	0.091	0.084	0.146
	(0.300)	(0.291)	(0.363)	(0.287)	(0.277)	(0.354)
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)
Missing Info: Biological Father is Present at Wave I	0.144	0.141	0.174	0.132	0.127	0.176
	(0.351)	(0.348)	(0.379)	(0.338)	(0.333)	(0.382)
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)
Missing Info: Parental Income	0.240	0.236	0.278	0.216	0.213	0.240
	(0.427)	(0.425)	(0.448)	(0.411)	(0.409)	(0.428)
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)
Missing Info: Biological Father Spent Time in Jail	0.070	0.069	0.083	0.046	0.047	0.040
	(0.255)	(0.253)	(0.275)	(0.210)	(0.212)	(0.195)
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)
Number of Observations	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: Full Results from Panel D of Table 2

Variable	(1) Property	(2) Violent	(3) Drug	(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)
Observations	15,467	15,464	15,494	15,504
R^2	0.058	0.027	0.070	0.043

Notes: Robust 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: Full Results from Panel D of Table 3

Variable	(1) Property	(2) Violent	(3) Drug Selling	(4) Nondrug
Depressed	0.056**	0.032	0.001	0.063
	(0.027)	(0.036)	(0.023)	(0.040)
Crime Wave I	0.040**	0.065**	0.070**	0.049*
	(0.020)	(0.028)	(0.034)	(0.028)
26 yrs. old or younger at wave IV	0.057	-0.038	0.010	-0.011
	(0.052)	(0.088)	(0.030)	(0.097)
27 yrs. old at wave IV	0.023	-0.067	-0.025	-0.059
	(0.050)	(0.086)	(0.030)	(0.096)
28 yrs. old at wave IV	0.035	-0.017	0.006	0.009
	(0.049)	(0.080)	(0.030)	(0.090)
29 yrs. old at wave IV	0.005	0.001	-0.008	-0.033
	(0.046)	(0.080)	(0.026)	(0.089)
30 yrs. old at wave IV	0.001	-0.014	-0.020	-0.017
	(0.048)	(0.081)	(0.028)	(0.090)
31 yrs. old at wave IV	0.009	-0.019	0.011	-0.026
	(0.050)	(0.080)	(0.029)	(0.090)
Male	0.048**	0.026	0.041**	0.046
	(0.023)	(0.033)	(0.020)	(0.037)
Birthweight in 250 grams	0.005	0.003	0.001	0.008
	(0.005)	(0.007)	(0.004)	(0.008)
Height in inches	-0.002	-0.002	0.001	-0.000
	(0.003)	(0.005)	(0.003)	(0.005)
Weight in Pounds	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)
Education: High School	0.010	-0.058	0.005	-0.031
	(0.029)	(0.046)	(0.030)	(0.054)
Education: Some College or Vocational Training	-0.018	-0.005	-0.003	-0.018
	(0.030)	(0.043)	(0.028)	(0.051)
Education: College Degree	-0.012	-0.011	-0.017	-0.011
	(0.036)	(0.053)	(0.033)	(0.062)
Education: Graduate or Professional Degree	-0.057	0.003	-0.013	-0.047
	(0.045)	(0.066)	(0.037)	(0.077)
Employed	-0.001	-0.025	0.012	-0.010
	(0.014)	(0.023)	(0.013)	(0.025)
Log of Personal Earnings	-0.002	0.008*	-0.003	0.005
	(0.003)	(0.004)	(0.002)	(0.005)
Relies on Gut Feeling in Decision Making Wave I	0.004	-0.033	0.037*	-0.007
	(0.026)	(0.037)	(0.022)	(0.040)
Believes Low Chance to Live to Age 35 at Wave I	0.008	-0.002	-0.001	0.023
	(0.020)	(0.032)	(0.016)	(0.034)
Currently Married	-0.018	0.006	-0.029**	-0.021
	(0.017)	(0.023)	(0.014)	(0.027)
Divorced	-0.011	0.015	-0.029	0.021
	(0.028)	(0.043)	(0.031)	(0.049)
Observations	3,097	3,096	3,105	3,103
R-squared	0.635	0.571	0.554	0.601

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

Appendix Table 4: Descriptive Statistics - Male Sample

Variable	Full Sample	Full Sample Not-Depressed	Full Sample Depressed	Family Sample	Family Sample Not-Depressed	Family Sample Depressed
Wave I						
Property	0.360	0.349	0.475	0.359	0.359	0.354
	(0.480)	(0.477)	(0.500)	(0.480)	(0.480)	(0.480)
Violent	0.301	0.286	0.464	0.279	0.266	0.417
	(0.459)	(0.452)	(0.499)	(0.449)	(0.442)	(0.495)
Drug	0.105	0.096	0.208	0.096	0.094	0.117
	(0.307)	(0.294)	(0.406)	(0.295)	(0.292)	(0.323)
Nondrug	0.495	0.480	0.662	0.475	0.468	0.551
	(0.500)	(0.500)	(0.473)	(0.500)	(0.499)	(0.499)
Wave IV						
Property	0.103	0.100	0.143	0.095	0.092	0.126
	(0.305)	(0.300)	(0.351)	(0.293)	(0.289)	(0.333)
Violent	0.143	0.141	0.161	0.146	0.145	0.158
	(0.350)	(0.348)	(0.368)	(0.354)	(0.353)	(0.366)
Drug	0.066	0.065	0.069	0.053	0.054	0.047
	(0.248)	(0.247)	(0.253)	(0.224)	(0.225)	(0.212)
Nondrug	0.241	0.238	0.274	0.230	0.228	0.244
	(0.427)	(0.426)	(0.446)	(0.421)	(0.420)	(0.431)
Depressed	0.084	0.000	1.000	0.085	0.000	1.000
	(0.277)	0.000	0.000	(0.279)	0.000	0.000
CES-D Scale	11.282	9.839	27.089	11.510	10.110	26.597
	(7.178)	(5.387)	(5.030)	(7.101)	(5.476)	(4.695)
Observations	7,290	6,680	610	1,508	1,380	128

Note: Standard deviations are in parentheses.

Appendix Table 5: Descriptive Statistics - Female Sample

Variable	Full Sample	Full Sample Not-Depressed	Full Sample Depressed	Family Sample	Family Sample Not-Depressed	Family Sample Depressed
Wave I						
Property	0.236	0.218	0.374	0.219	0.194	0.393
	(0.425)	(0.413)	(0.484)	(0.414)	(0.396)	(0.490)
Violent	0.131	0.116	0.244	0.124	0.111	0.215
	(0.338)	(0.320)	(0.430)	(0.330)	(0.315)	(0.412)
Drug	0.048	0.041	0.102	0.041	0.030	0.114
	(0.215)	(0.199)	(0.302)	(0.197)	(0.170)	(0.319)
Nondrug	0.305	0.281	0.482	0.289	0.259	0.498
	(0.461)	(0.450)	(0.500)	(0.453)	(0.438)	(0.501)
Wave IV						
Property	0.050	0.045	0.088	0.044	0.032	0.124
	(0.219)	(0.208)	(0.283)	(0.204)	(0.176)	(0.331)
Violent	0.125	0.121	0.153	0.135	0.129	0.174
	(0.331)	(0.326)	(0.360)	(0.342)	(0.336)	(0.380)
Drug	0.021	0.019	0.040	0.021	0.016	0.055
	(0.144)	(0.135)	(0.196)	(0.144)	(0.127)	(0.228)
Nondrug	0.173	0.167	0.223	0.176	0.162	0.269
	(0.379)	(0.373)	(0.416)	(0.381)	(0.369)	(0.444)
Depressed	0.121	0.000	1.000	0.125	0.000	1.000
	(0.326)	0.000	0.000	(0.331)	0.000	0.000
CES-D Scale	13.361	11.022	30.369	13.568	11.248	29.807
	(8.779)	(6.143)	(5.823)	(8.743)	(6.252)	(6.045)
Observations	8,294	7,291	1,003	1,608	1,407	201

Note: Standard deviations are in parentheses.