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ADOLESCENT DEPRESSION AND ADULT LABOR MARKET OUTCOMES

Jason M. Fletcher

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ABSTRACT

This paper uses recently released data from a national longitudinal sample to present new evidence of the longer term effects of adolescent depression on labor market outcomes. Results suggest reductions in labor force attachment of approximately 5 percentage points and earnings reductions of approximately 20% for individuals with depressive symptoms as an adolescent. These effects are only partially reduced when controlling for channels operating through educational attainment, adult depressive symptoms, or co-occurring illnesses. Further, the unique structure of the data allows for high-school fixed effects as well as suggestive evidence using sibling comparisons, which allows controls for potentially important unobserved heterogeneity. Overall, the results suggest that the links between adolescent depression and labor market outcomes are quite robust and important in magnitude, suggesting that there may be substantial labor market returns to further investments in treatment opportunities during adolescence.

Jason M. Fletcher
Yale School of Public Health
Department of Health Policy and Management
60 College Street, #303
New Haven, CT 06520
and NBER
jason.fletcher@yale.edu

Introduction

Early onset depression is an often crippling mental illness that has been shown to be strongly linked with many important life outcomes, such as educational attainment and labor market outcomes (Fletcher 2010, Berndt et al. 2000, Ettner et al. 1997, Marcotte and Wilcox-Gok 2003). The World Health Organization has recently ranked depression among the most disabling illnesses affecting the world's population; it currently ranks 4th behind lower respiratory infections, diarrheal diseases, and perinatal conditions and is expected to climb to second place by 2020. Depression affects nearly 340 million people worldwide, including 18 million people in the US at any point in time (Murray and Lopez 1996), and it is estimated that the economic burden of depression in 2000 in the US was 83.1 billion dollars (Greenberg et al. 2003). This figure is driven largely by workplace costs, which were estimated to be 51.5 billion dollars. Recent findings suggest that employees treated for depression incur annual health and disability costs of nearly $5,500, which is significantly more than costs for other illnesses such as hypertension and back problems and similar to the costs for diabetes and heart disease (Druss et al. 2000). However, most of these estimates may be partly attributable to environment and family-level confounding factors as well as issues of reverse causality, which may bias upward typical estimates. With such substantial potential costs attached to depression, it is important to further understand how it is linked to labor force outcomes, among other outcomes, by leveraging new data and research designs not typically used in this literature. Also needed is an examination of the potential longer term costs of adolescent depression that have not been explored in the literature.

Chatterji et al. (2008) describe three mechanisms through which psychiatric disorders may limit employment: (1) affect factors such as mood, memory, or motivation (2) employer taste based discrimination and (3) employer's unwillingness to accommodate health problems. In fact, there is some support for a relationship between (contemporaneous) mental illness and impaired productivity as well as work absences (Adler et al. 2006, Bernt et al. 1998, Chatterji et al. 2007, Kessler and Frank 1997). Less proximal factors that could reduce employment or labor market earnings for individuals with depressive symptoms include lower investments in human capital (Fletcher 2008). It could also be the case that depression is not causally linked with labor

market outcomes; instead the correlation may be generated by unobserved heterogeneity, such as long term effects of family background, as well as co-occurring illness. Another reason that past empirical correlations may not be causal is that nearly all current studies link depression to labor market outcomes contemporaneously, which opens up the possibility of reverse causality—individuals may have higher depressive symptoms because of their poor performance in the labor market. It is important for policy purposes as well as increasing our understanding of the determinants of labor market success and failure to provide additional evidence of whether the observed relationship is causal or merely reflects a spurious association.

This paper presents new evidence of the longer term effects of adolescent mental illness on labor market outcomes by using a national longitudinal sample. Linking adolescent measures of depression[1] to adult labor market outcomes assures the direction of association in the estimates. Additionally, the unique structure of the data allows for high-school fixed effects as well as suggestive evidence using sibling comparisons. The richness of the data also allows controls for many co-occurring poor health and health behavior measures, which could have confounded earlier results. Results suggest reductions in labor force attachment of approximately 5 percentage points and earnings reductions of approximately 20% for individuals with depressive symptoms as an adolescent. These effects are only partially reduced when controlling for channels operating through educational attainment and adult depressive symptoms. While the specifications are able to limit the majority of competing hypotheses that may imply non-causal explanation for the depression-labor market associations, attributing the estimates to reflecting causal relationships is likely premature. Overall, the results are suggestive that the links between adolescent depression and labor market outcomes are quite robust and important in magnitude, suggesting that there may be substantial labor market returns to further investments in treatment and opportunities during adolescence.

Literature Review

[1] Throughout I will use "adolescent depression" and "adolescent depressive symptoms" interchangeably, but the reader should note that this paper uses survey data that captures self-reported symptoms rather than diagnosis or treatment for clinical depression.

While there is substantial evidence of robust and important associations between depression and labor market outcomes, there are at least two issues that have limited the ability to assign causality in nearly all of the current literature: (1) reverse causality and (2) unobserved heterogeneity. The first issue is partly a limitation of most currently available data, which measure mental illness contemporaneously (or nearly so) with the labor market outcomes of interest (Marcotte and Wilcox-Gok 2003)[2]. The second issue is also related to data limitations, as most surveys fail to capture important environmental factors that may influence both depression and other outcomes of interest and very few surveys allow sibling comparisons to reduce common influences due to family background.

In fact, nearly all current evidence of the impacts of mental illness on labor market outcomes uses contemporaneous measures of illness. Frank and Gertler (1991) find a 21 percent reduction in earnings due to measures of mental illness. Ettner et al. (1997) find evidence suggesting employment reductions of 11 percentage points for those with mental disorder, though report less consistent evidence on earnings.[3] Chatterji et al. (2008) provide evidence that a contemporaneous psychiatric disorder is related to a reduction of 9-11 points in the labor force participation. Several authors have attempted to solve the issue of reverse causality by either using instrumental variables or assessing the potential magnitude of endogeneity in the estimates. For example, Ettner et al. (1997) and other authors have used parental history of mental illness as an instrument for own mental illness. Alexandre and French (2001) used measures of religiosity as instruments. In many cases in the literature, the instruments are questionable because it is very difficult to find instrument candidates that are plausibly uncorrelated with unobserved determinants of the labor market outcomes.[4]

[2] See Whooley et al. (2002) and Druss et al. (2001) for some recent counterexamples, though the data are not from national samples. For example, the Druss et al. paper uses a two-year window for individuals employed in one of three firms

[3] In results not often highlighted, Ettner et al. (1997) present some findings between psychiatric disorders occurring before age 18 and those occurring as an adult, though the respondents are asked to retrospectively report prior illness.

[4] Tefft (2008) proposes the use of exposure to sunlight as a potential instrument for poor mental health due to Seasonal Affective Disorder (SAD). Fletcher and Lehrer (2009, 2011) examine genetic markers as potential candidates for an instrumental variables design.

A second limitation with much research linking mental illness with labor force outcomes is the inability to control for unobserved heterogeneity. For example, it may be likely that processes at the neighborhood level affect both depressive symptoms and employment outcomes, such as crime rates and unemployment rates. Kling et al. (2007) present experimental evidence that living in a disadvantaged neighborhood may lead to poor mental health as well as low educational attainments. Similarly, family background factors may both increase the chances of poor mental health and also reduce opportunities in the labor market. For example, in addition to using the standard set of instruments to reduce concerns of reverse causality, Chatterji et al. (2008) implement the approach of Altonji et al. (2005), which examines the sensitivity of the results to the magnitude of the endogeneity problem using the rule of thumb that the selection bias based on observable variables may be approximately the same as the selection bias from unobservable characteristics[5]. The authors report relatively robust results for the contemporaneous relationship between mental illness and employment for men, while the results for women are more sensitive to specification.

Finally, there are many illnesses and behaviors that are co-occurring with depression. For adolescents, depression is associated with poor health and behavioral outcomes, including higher risks of disruptive behaviors, anxiety, substance abuse, unsafe sexual practices, and greater likelihood of being involved in fights (Saluja et al. 2004). Likewise, approximately 45 percent of adults with any kind of psychiatric disorder in the past 12 months meet diagnostic criteria for two or more psychiatric disorders (Kessler et al. 2005a). There appears to be little previous research that is able to account for these types of unobserved heterogeneity. Zimmerman and Katon (2005) appears to be one exception, where the authors use the NLSY data and individual fixed effects but focus on estimating robust relationships between employment status and contemporaneous depressive symptoms and do not have many time-varying covariates. [6] Tekin and

[5] This method estimates a bivariate specification and examines the sensitivity of the results based on different values of the correlation coefficient "rho", which is the correlation between the error terms in the two equations

[6] In related literature, Fletcher (2010) uses sibling differences to examine the effects of depression on completed schooling.

Markowitz (2008) use sibling differences in their examination of the association between suicidal behaviors and "productive activities" (either being in school or employed).[7]

This paper is able to overcome several important challenges to previous research. In addition to using a national, longitudinal survey, the structure of the data allows confidence in the direction of the estimated relationships, limiting the issue of reverse causality, and also allows controls for environmental and family unobserved heterogeneity as well as individual level heterogeneity, including health behaviors and conditions that co-occur with depression.

Data

The Add Health is a school-based, longitudinal study of the health-related behaviors of adolescents and their outcomes in young adulthood. Beginning with an in-school questionnaire administered to a nationally representative sample of students in grades 7 through 12 in 1994-95 (Wave 1), the study follows up with a series of in-home interviews of respondents approximately one year (Wave 2; 1996), six years (Wave 3; 2001-2002), and thirteen years later (Wave 4; 2007-2008). Other sources of data include questionnaires for parents, siblings, fellow students, and school administrators. By design, the Add Health survey included a sample stratified by region, urbanicity, school type, ethnic mix, and size.[8] Add Health represents a substantial improvement in previous data for research on depression and labor market outcomes because it: (1) is longitudinal (2) includes an instrument for depression for the full, nationally representative sample of 7-12th graders and (3) provides links to school classmates and siblings in order to control for several sources of unobserved heterogeneity.

[7] While Tekin and Markowitz use the same data as the current paper, there are many important differences in the focus and implementation. First, they focus on suicidal behaviors rather than depression--depression is just a control variable they report in some of their tables. Because depression is not their main focus, they also use an ad-hoc measure of symptoms not related to any clinical cutoffs (whether the symptoms were above the 80th percentile). Second, they use Wave 3 of Add Health and I am able to use Wave 4. The reason they focus on "productive activities" rather than labor market outcomes in their paper is the average age of the respondents is 22 years old in Wave 3, and thus nearly 50% of the sample is still in school, which makes it difficult to focus on wages and employment outcomes. Therefore, they do not examine employment in a traditional way (it is a combined measure of work or school) nor examine wages at all. In contrast, the current paper examines wages and employment outcomes at age 30, when nearly all the individuals have completed their schooling. The current paper is the first to actually examine the associations between adolescent depressive symptoms and wages and employment using a national sample with the ability to compare siblings.

[8] See Udry 2003 for full description of the Add Health data set.

While the original wave 1 sample collected information on over 20,000 respondents, approximately 15,000 were followed longitudinally at wave 3 and wave 4. Limiting the sample to those who appear in waves 1, 3, and 4 allows an analysis sample of over 12,000 individuals[9]. At the same time, the data contain a sub-sample of siblings who have been followed over time; this sample originally numbered approximately 5,400, over half of whom were followed (along with their co-sibling) longitudinally into wave 4, leaving a sample size for the sibling analyses of nearly 2,800[10]. In order to maximize available sample sizes for the analysis, missing family income during high school and maternal education was sample mean-imputed and a dummy variable is controlled. Likewise, in some of the auxiliary regressions, missing birth weight and childhood mistreatment information is imputed in order to retain sample size.[11]

Table 1 reports descriptive statistics for the analysis sample.[12] The earnings data from wave 4 come from the following question and are interval coded[13]: "Now think about your personal earnings. How much income did you receive from personal earnings before taxes—that is, wages."[14] Using this coding procedure, the average earnings for this sample of adults (average age nearly 30) is almost $40,000. Since not all individuals reported earnings or are in the labor force, I use this information to construct a measure

[9] Appendix Table 1A shows summary statistics comparing the sample in Wave 1 with the sample in Wave 4. The similarity of the sample across the waves suggests limited attrition bias for this study. To more fully examine this issue, Appendix Table 2A shows that Wave 1 depression is unrelated to attrition within a regression framework, which suggests that attrition bias is likely minimal.

[10] The reason sample attrition appears more pronounced in the sibling sub-sample than the main sample is that if *either* sibling is missing at follow-up, both siblings are dropped from the sample.

[11] Some family level variables are taken from a parent survey, but over 15% of the parents did not respond to the survey. For the students of these parents, I have imputed family income and maternal education in two ways. First, in the paper I use regression based imputation ("impute" in Stata) and include student level characteristics such as age, race, gender in the regression to predict the missing values and control for missingness. Second, in auxiliary analysis, I simply assign the sample means to the missing responses and control for missingness. In these cases the key results are nearly identical. If I instead drop those with missing data (whose parents failed to respond—which is predicted by disadvantaged characteristics), the results are smaller but very similar. This is what would be expected because I am now dropping those individuals who are more likely to be depressed and have bad outcomes.

[12] Like Currie and Stabile (2006), who use sibling comparisons with other datasets, there is very little difference across sub-samples. Fletcher and Wolfe (2008) also do not find large difference between the full sample and sibling samples using the Add Health data. See Appendix Table 3A.

[13] The midpoint of each interval is used in the analysis. The intervals include: $0, <$5,000, $5,000-9,999, 10,000-14,999, 15,000-19,999, 20,000-24,999, 25,000-29,999, 30,000-39,999, 40,000-49,999, 50,000-74,999, 75,000-99,999, 100,000-149,999, 150,000 or more.

[14] The interval coding does not allow an adequate examination using quantile regression specification, though Marcotte and Wilcox-Gok (2003) use interval-coded earnings data with 23 intervals and assign the midpoint.

of employment, where over 80% of the sample are categorized as working (i.e. report working over 10 hours a week). Over 40% of the sample completed some college, while one-third reports completing college. The wave 1 measure of depression uses 19 of the 20 items of the Center for Epidemiological Studies Depression Scale (CES-D) contained in the Add Health dataset. This measure has been used by several researchers to examine adolescent depression and has been shown to have good measurement properties (Cornwell 2003, Radoff 1977, Roberts et al. 1991). The scale ranges from 0 to 57, and Robert et al. (1991) find that the optimal cut-off scores for depression are 22 for male adolescents and 24 for females. Using these cut-off scores, depression in the sample is approximately 8%.[15] Results that use the same depression cut-off for males and females are nearly identical to those presented in the paper and are available upon request[16].

The data also contains rich information on health conditions and health behaviors. Individuals report behaviors such as tobacco use (25%), sexual activity (38%), alcohol use (41%), obese status (7%), and marijuana use (14%) at wave 1 of the survey. In Wave 3 of the survey, respondents report whether they have ever been diagnosed with asthma (17%) or diabetes (1%), complete an assessment of childhood attention deficit/hyperactivity disorder (AD/HD) symptoms (3% for AD, 2.5% for HD) and childhood mistreatment which is combined into a "mistreatment index" using principal component analysis.[17] Finally, in order to control for skill accumulation (apart from years of schooling information), the analysis uses scores on the Peabody Picture Vocabulary Test (PPVT), which was administered at wave 1.[18]

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[15] Goodman and Whitaker (2002) use Add Health and find depression rates around 8% in waves 1 and 2. Berndt et al. (2000) report that 15.7% of the US population has experienced an episode of major depressive disorder between ages 15 and 24. The lifetime prevalence of major depression in the National Comorbidity Survey Replication is 16.6% and the twelve-month prevalence is 6.6% (Kessler et al. 2003).

[16] Results that examine the effects throughout the symptom distribution are presented in Appendix Table 4A, which suggest that the effects of labor market outcomes may occur below the thresholds typically used. These results will be the subject of future work.

[17] See Fletcher, Green, and Neidell (2010) for details on the asthma questions, Fletcher and Wolfe (2008) for details on the ADHD scale, and Fletcher (2009) for details on the mistreatment data

[18]The Add Health Picture Vocabulary Test (AHPVT) is a computerized, abridged version of the Peabody Picture Vocabulary Test-Revised (PPVT-R). The AHPVT is a test of hearing vocabulary, designed for persons aged 2 1/2 to 40 years old who can see and hear reasonably well and who understand standard English to some degree. The test scores are standardized by age. Some psychologists interpret PVT scores as a measure of verbal IQ. Information on the test is provided online at http://www.cpc.unc.edu/projects/addhealth/files/w3cdbk/w3doc.zip.

In Table 2, descriptive statistics are presented based on wave 1 depression status. The differences foreshadow both some of the results in the paper and empirical issues with comparing depressed vs. non-depressed individuals. Employment rates are 10 percentage points lower for depressed individuals and earnings are over $9,000 lower (conditional on employment). While a similar share of individuals attend college, the results show that 35% of non-depressed individuals graduate from college in comparison to only 15% of depressed individuals. The depression scale at wave 4 is also higher for individuals who experience adolescent depression (4.1) vs. those who do not (2.5). Family background differs along several measures, where individuals with adolescent depression come from poorer families, were less likely to grow up with married parents, and had less educated mothers, on average[19]. These differences in family background as well as unobserved family factors will be controlled in the analysis. Depressed individuals also have several co-occurring illnesses and unhealthy behaviors—they are more likely to be obese, have asthma, smoke marijuana and tobacco, drink alcohol, and be sexually active. The empirical analysis will be able to control for these important differences between depressed and non-depressed individuals.

Empirical Models

Following much of the literature, an examination of labor force participation is accomplished using standard techniques:

$$Employment_t = \beta_0 + \beta_1 Depression_{t-1} + X\beta_2 + \varepsilon \qquad (1)$$

where the outcome is employment at wave 4 (time t), depression is a binary variable at wave 1 (time t-1), the x-vector includes standard sociodemographic variables (age, gender, race, maternal education), and the error term is assumed to be an idiosyncratic innovation. The error term may be correlated with depression, so additional controls are added in order to reduce this potential bias.

[19] An important caveat to these results is that (unobserved in the data) receipt of treatment may also differ by socioeconomic status. If treatment is effective, it would lower depressive symptoms in children from advantaged families so that depressive symptoms may be higher in disadvantaged families due in part to differences in treatment receipt.

Likewise, traditional Mincer models are used to link log(earnings) with depression and other individual and family-level characteristics (X) (following Marcotte and Wilcox-Gok 2003, among others):

$$\log(earnings)_t = \beta_0 + \beta_1 Depression_{t-1} + X\beta_2 + \varepsilon \quad (2)$$

where earnings are measured at time *t* (wave 4) and depression is measured at wave 1. Because some individuals in the sample report zero earnings or do not respond to the question, the analysis will focus on those with measured earnings[20]. Also, this temporal structure reduces concerns with reverse causality in the estimated effects. In order to examine the potential biases from either community (*c*) or family (*f*) level unobserved heterogeneity, the empirical models are expanded to allow for school-of-origin fixed effects or family fixed effects for each outcome, Y_i (employment and earnings):

$$Y_i = \beta_0 + \beta_1 Depression_i + X_i\beta_2 + \tau_c + \varepsilon_{ic} \quad (3)$$

$$Y_i = \beta_0 + \beta_1 Depression_i + Z_i\beta_2 + \mu_f + \varepsilon_{if} \quad (4)$$

where the *Z* vector in equation (4) is limited to individual level variables that vary within families (e.g. gender). A comparison of (2) and (4) will indicate whether baseline methods are driven by omitted variable bias at the family level (Currie and Stabile, 2006; Fletcher and Wolfe, 2008)[21]. Further examinations will include additional individual level variables, including educational outcomes and co-occurring illnesses to further examine potential pathways linking depression and labor market outcomes as well as reduce the chances of individual-level heterogeneity.

Results

Results for Employment

Table 3 presents baseline OLS estimates of the effects of adolescent depression on employment at Wave 4. Column 1 shows evidence that adolescent depression is associated with a 7.5 percentage point decrease in employment. Separating the results by gender (columns 2 and 3) suggests that the effects are nearly twice the magnitude for

[20] If individuals with missing earnings are instead assigned zero earnings, not surprisingly the results are even larger than those reported in the paper.

[21] It is important to note that if the depressive symptoms are measured with error, the use of sibling fixed effects may exacerbate the bias associated with the measurement error.

females (a female-depression interaction in a pooled model was statistically significant; results not shown). In order to control for measures of environmental factors (e.g. local unemployment rates) during adolescence as well as narrow the comparison groups, controls were included for high school of origin fixed effects in column 4; however these controls do not alter the estimates from column 1. A vector of (endogenous) health behaviors and outcomes are controlled in column 5, which shrinks the coefficient on depression by approximately 15%. Asthma and teenage smoking reduces adult employment while alcohol consumption is positively related.[22] This evidence is suggestive that the effects of remaining unobservables that may bias the estimate are modest.

One pathway that may link adolescent depression with employment is human capital accumulation (Fletcher 2008, 2010). Column 6 adds controls for educational attainment, which reduces the coefficient on adolescent depression to 5 percentage points[23]. Finally, a separate pathway linking adolescent depression to employment is the persistence of depression. Column 7 controls for depressive symptoms at wave 4, which reduces the coefficient on adolescent depression symptoms to 3.3 percentage points. Two additional pathways were examined and available upon request—whether the respondent was "ever married" and a measure of skills—the respondent's score on the PPVT test at Wave 3. These variables had no detectable influence on the relationship between adolescent depression and adult employment. These results suggest both a large total impact of adolescent depression on future employment as well as two important pathways—human capital accumulation and the persistence of the illness.

To further examine an alternative potential explanation for the link between depression and employment—shared family background factors—Table 4 examines sibling comparisons. Columns 1 and 2 show that the baseline results from Table 3 are similar for the sibling sub-sample—an 8 percentage point reduction in employment that is largely immune to controlling for high school of origin. Column 3 focuses on within-sibling comparisons by controlling for family fixed effects, reducing the association to

[22] See Fletcher, Green, and Neidell (2010) for further evidence of the employment effects of asthma.
[23] In these and similar results throughout the paper, it is important to recall that adding endogenous intermediate outcomes (such as education) will not allow a clear picture of the potential causal effects of adolescent depression on later labor market outcomes. These analyses are performed to descriptively examine the differences across specifications and control vectors.

under 6 percentage points (p-value < 0.16). Columns 4 and 5 separate the results into brother-pairs and sister-pairs and again finds that the employment effects of depression appear largely concentrated among women, who experience a 10 percentage point reduction (p-value < 0.15). Column 6 attempts to control for individual heterogeneity within families, but these controls actually increase the coefficient to over 6 percentage points (column 6 vs. column 3). Columns 7 and 8 show that some of the effect of adolescent depression and adult employment may be related to the level of education and adult depression. Finally, the sister and brother-pair specifications are revisited in the final two columns to show that the results are similar in magnitude. In results not shown, I examine whether there is evidence that individuals who sought psychological counseling before wave 4 seem to have differential outcomes, but no results are statistically significant (results available upon request).[24] Additionally, I find no interaction effects between reporting a diagnosis of depression by wave 3 and adolescent depressive symptoms (results available upon request).[25] Overall, the effects of adolescent depression on adult employment appear concentrated in women, are only partially explained by education and adult depression, and the magnitude of the coefficient is quite robust to controls for several sources of heterogeneity.

Results for Earnings

Results for log(earnings) are presented in Tables 5 and 6. It is important to note that these empirical models are conditional on employment. Baseline OLS results in column 1 of Table 5 indicate a nearly 23%[26] earnings reduction for those with adolescent depression.[27] Splitting the sample by gender in columns 2 and 3 shows very little difference in effects. The entire black earnings disadvantage appears concentrated in men, while the entire Hispanic earnings premium is concentrated in women. Like previous results, school fixed effects (shown in column 4) do not affect the findings. Adjusting for health behaviors and health conditions in column 5 shows a slight reduction

[24] Unfortunately, the questions for psychological counseling available in the data are not specific to counseling for depression, but are asked for any counseling experience.
[25] Unfortunately, medication information is not available in the data
[26] This calculation uses the exp(beta)-1 formula.
[27] Results using interval regression are nearly identical to those reported in column 1 and are available upon request.

in the depression-earnings association, which now indicates a 20% penalty. Like previous research (Cawley 2004), obesity is found to be associated with lower earnings, as is high school marijuana use and tobacco use, asthma, diabetes and childhood mistreatment. Column 6 adds controls for educational attainment, which shrinks the coefficient on adolescent depression by approximately 25% to a 16% earnings reduction. Controlling for contemporaneous depression reduces the earnings disadvantage to nearly 12%--still a substantial difference, which is similar in magnitude to the adjusted black-white earnings gap. Similar to prior literature, the earnings effect of contemporaneous depression is also important. Finally, two additional pathways were examined, but not reported in the tables—whether the respondent was "ever married" and a measure of adult skills—the respondent's score on the PPVT test at Wave 3. These variables had no detectable influence on the relationship between adolescent depression and adult employment.

Results controlling for family background are presented in Table 6. Column 1 shows that the results for the sibling sample are quite similar to the full sample and also shows that school fixed effects do not change the results—a nearly 30% earnings reduction from adolescent depression. Column 3 adds family fixed effects controls, which reduces the coefficient slightly. Although some coefficients that follow are sometimes not statistically significant at conventional levels, the magnitudes generally follow the results from the baseline specifications, which indicates that they are relatively robust. Interestingly, the adjusted male-female difference in earnings does not change once family fixed effects are controlled. Columns 4 and 5 separate the results by gender and find that, unlike employment, the earnings effects of depression appear heavily concentrated among men, which differs from the results from the full sample without controls for family fixed effects.[28] The difference in results between the basic model and the preferred specification with fixed effects may suggest that, within families, a part of the effect operates through intrahousehold allocations. Moving back to the results for both genders, column 6 controls for additional individual heterogeneity associated with co-occurring health conditions and unhealthy behaviors. The estimated magnitudes of

[28] An interaction between depression and gender in unreported results also suggested that the effects are concentrated on men (statistically significant at the 10% level).

the earnings results are not affected by these controls, nor are they substantially affected by inclusion of human capital accumulation (column 7). Consistent with prior research, birth weight differences are shown to be related to earnings reductions (Black et al. 2007). Even within sibling pairs, obesity is shown to reduce earnings by nearly 20% and adolescent tobacco use is associated with a nearly 14% earnings reduction, though this effect is partially explained by human capital accumulation differences. In column 8, there is some evidence that adolescent depression may reduce wages in part due to the likelihood of adult depression, but again this type of analysis is descriptive rather than definitive.

Conclusion

This paper provides the best available evidence that adolescent depressive symptoms are associated with adult employment and earnings. This evidence advances previous literature because it is immune to issues of reverse causality and also allows controls for unobserved heterogeneity at the environmental and family levels as well as many measures of co-occurring health outcomes and behaviors. Overall, the magnitude (though not always the statistical significance) of the results are quite robust across specifications and suggest that adolescent depression reduces adult employment by approximately 5 percentage points and earnings by 20 percent.[29] Further, the employment reductions appear to be concentrated among the women and the earnings reductions appear to be concentrated among the men. While these results are not conclusive due to remaining threats of unobserved heterogeneity, the ability to control for a range of important factors (e.g. family fixed effects, test scores, co-morbid illness) is highly suggestive that any remaining bias associated with unobservables is likely modest.

To place these results into perspective, Leigh and Gill (1997) present evidence of an 8-10 percent earnings premium associated with community college completion. Currie and Hyson (1999) report wage reductions of between 2-4 percent associated with low birth weight status. Both of these comparisons suggest that interventions that can reduce adolescent depressive symptoms have the potential to be quite cost effective.

[29] As there is some evidence from the literature that the effects of mental illness are differential across the earning distribution (Marcotte and Wilcox-Gok 2003), it would be interesting to pursue this question as continuous earnings data become available in complementary datasets.

While not conclusive, the results could be policy relevant along several dimensions. First, the results suggest that adolescent depressive symptoms may be an important determinant of labor market outcomes. Increasing our understanding of labor market outcomes may allow additional policies to be suggested to increase labor force participation and productivity, which could have long term implications for important life outcomes such as income and wealth accumulation, occupation, and adult population health. Second, the results suggest that interventions that successfully reduce depressive symptoms during adolescence may have downstream benefits that may not be comprehensively measured in many cost-benefit analyses and suggest that further interventions may be desirable. For example, even though depression is generally highly responsive to treatment, adolescents have low rates of recognition and diagnosis (Hirschfeld et al 1997). Increases in treatment options, particularly for high schoolers, may provide substantial long term benefits in terms of future labor productivity.

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Tables

Table 1
National Longitudinal Study of Adolescent Health (Add Health)
Descriptive Statistics (N~12,200)

	Wave	Mean	Std Dev	Min	Max
Employed	4	0.82	0.38	0	1
Earnings ($)	4	35300	43803	0	150000
Log (Earnings)	4	10.17	1.03	0.69	11.9
Some College	4	0.44	0.50	0	1
College Graduate	4	0.33	0.47	0	1
Depressed	1	0.08	0.27	0	1
Depression Scale	4	2.62	2.55	0	15
Depressed	4	0.19	0.39	0	1
Depression Scale	1	11.29	7.59	0	54
Age	3	21.91	1.75	18	27
Female	All	0.55	0.50	0	1
Maternal Education	1	13.23	2.27	0	21
Family Income	1	4.61	4.32	-4	99
Married Parents	1	0.72	0.42	0	1
Hispanic	All	0.15	0.36	0	1
Black	All	0.22	0.41	0	1
PVT Score	1	101.02	14.18	13	138
Rural	1	0.26	0.44	0	1
Missing Family Information	1	0.29	0.45	0	1
Marijuana Use	1	0.14	0.35	0	1
Mistreatment Scale	Pre-1	0.00	0.63	-0.4	4.54
Ever Asthma	3	0.17	0.37	0	1
Obese	1	0.07	0.26	0	1
AD	Pre-1	0.03	0.18	0	1
HD	Pre-1	0.02	0.16	0	1
Low Birth Weight	Pre-1	0.11	0.29	0	1
Sexually Active	1	0.38	0.49	0	1
Ever Diabetes	3	0.01	0.10	0	1
Smoke	1	0.25	0.43	0	1
Drink	1	0.41	0.49	0	1
Mistreatment Missing	3	0.11	0.31	0	1
Birth Weight Missing	1	0.17	0.37	0	1

Table 2
Descriptive Statistics
Comparison Between Depressed vs. Not Depressed at Wave 1

		Not Depressed			Depressed			
	Wave	Obs	Mean	Std Dev	Obs	Mean	Std Dev	
Employed	4	11189	0.83	0.38	957	0.73	0.44	***
Earnings ($)	4	10691	36065.69	44876.15	903	26235.70	26546.25	***
Log (Earnings)	4	10018	10.20	1.01	816	9.84	1.15	***
Some College	4	11186	0.44	0.50	957	0.46	0.50	*
College Graduate	4	11186	0.35	0.48	957	0.15	0.36	***
Depressed	1	11189	0.00	0.00	957	1.00	0.00	***
Depression Scale	4	11186	2.49	2.47	955	4.11	3.02	***
Depressed	4	11189	0.17	0.38	957	0.35	0.48	***
Depression Scale	1	11189	9.79	5.63	957	28.73	5.50	***
Age	3	11189	21.87	1.76	957	22.40	1.64	***
Female	All	11189	0.54	0.50	957	0.66	0.47	***
Maternal Education	1	11189	13.28	2.26	957	12.63	2.33	***
Family Income	1	11189	4.67	4.42	957	3.84	2.82	***
Married Parents	1	11189	0.73	0.42	957	0.66	0.44	***
Hispanic	All	11189	0.15	0.36	957	0.20	0.40	***
Black	All	11189	0.21	0.41	957	0.25	0.44	
PVT Score	1	11189	101.54	14.04	957	94.99	14.49	***
Rural	1	11189	0.26	0.44	957	0.26	0.44	***
Missing Family Information	1	11189	0.28	0.45	957	0.38	0.49	***
Marijuana Use	1	11064	0.13	0.34	934	0.26	0.44	***
Mistreatment Scale	Pre-1	11189	-0.02	0.62	957	0.18	0.78	***
Ever Asthma	3	11178	0.17	0.37	957	0.20	0.40	***
Obese	1	10926	0.07	0.26	935	0.10	0.30	***
AD	Pre-1	11180	0.03	0.17	957	0.06	0.25	**
HD	Pre-1	11180	0.02	0.15	957	0.03	0.18	
Low Birth Weight	Pre-1	11189	0.11	0.29	957	0.12	0.28	***
Sexually Active	1	11129	0.37	0.48	952	0.59	0.49	***
Ever Diabetes	3	11178	0.01	0.10	957	0.02	0.13	***
Smoke	1	11132	0.23	0.42	953	0.43	0.50	***
Drink	1	11185	0.39	0.49	956	0.58	0.49	***
Mistreatment Missing	3	11189	0.10	0.31	957	0.12	0.32	***
Birth Weight Missing	1	11189	0.16	0.37	957	0.23	0.42	***

***1%, **5%

Table 3
Effects of Adolescent Depression on Adult Employment Status: Baseline Results

Outcome	Employed	Employed	Employed	Employed	Employed	Employed	Employed
Sample	Full	Male	Female	Full	Full	Full	Full
Fixed Effects?	None	None	None	School	School	School	School
Column	1	2	3	4	5	6	7
Depressed	-0.075***	-0.055**	-0.088***	-0.080***	-0.071***	-0.059***	-0.041***
	(0.014)	(0.022)	(0.019)	(0.014)	(0.014)	(0.014)	(0.014)
Age	0.006***	0.008***	0.004	-0.001	-0.000	-0.000	-0.001
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Female	-0.081***			-0.080***	-0.078***	-0.094***	-0.085***
	(0.009)			(0.009)	(0.009)	(0.009)	(0.009)
Maternal Education	0.006***	0.002	0.010***	0.004**	0.004**	-0.000	-0.000
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Married Parents	0.033***	0.045***	0.021	0.027***	0.024***	0.018**	0.018**
	(0.009)	(0.014)	(0.013)	(0.009)	(0.009)	(0.009)	(0.009)
Hispanic	0.061***	0.027**	0.092***	0.045***	0.046***	0.044***	0.044***
	(0.012)	(0.013)	(0.018)	(0.012)	(0.012)	(0.012)	(0.012)
Black	0.012	-0.060***	0.066***	0.007	0.011	0.006	0.010
	(0.011)	(0.014)	(0.015)	(0.013)	(0.014)	(0.013)	(0.013)
PVT Score (W1)	0.002***	0.001***	0.003***	0.002***	0.001***	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marijuana Use					-0.020*	-0.014	-0.012
					(0.010)	(0.011)	(0.010)
Asthma					-0.035***	-0.033***	-0.028**
					(0.012)	(0.011)	(0.011)
Sexually Active					-0.019**	-0.008	-0.009
					(0.009)	(0.008)	(0.008)
Smoke					-0.026***	-0.015	-0.012
					(0.009)	(0.009)	(0.009)
Drink					0.019**	0.018**	0.018**
					(0.008)	(0.008)	(0.008)
Some College						0.094***	0.087***
						(0.010)	(0.010)
College Graduate						0.155***	0.143***
						(0.012)	(0.012)
Depression Scale (W4)							-0.015***
							(0.002)
Observations	12146	5487	6659	12146	12146	12146	12146
R-squared	0.031	0.027	0.022	0.056	0.029	0.045	0.055
Number of Schools					144	144	144

Robust standard errors in parentheses, clustered at school. *** p<0.01, ** p<0.05, * p<0.1. Additional Controls: mistreatment missing dummy, birth weight missing dummy, missing family information dummy, rural status, constant, family income during high school, age at wave 3, low birth weight (final three columns, never statistically significant), mistreatment status (final three columns, never statistically significant), diabetes status (final three columns, never statistically significant), AD/HD status (final three columns, never statistically significant) obesity status (final three columns, never statistically significant)

Table 4
Effects of Adolescent Depression on Adult Employment Status: Sibling Results

Outcome	Employed	Employed	Employed	Employed	Employed	Employed	Employed	Employed	Employed	Employed
Sample	Family	Family	Family	Brothers	Sisters	Family	Family	Family	Brothers	Sisters
Fixed Effects?	None	School	Family	Family	Family	Family	Family	Family	Family	Family
Column	1	2	3	4	5	6	7	8	9	10
Depressed	-0.077***	-0.080***	-0.053	-0.063	-0.092	-0.047	-0.044	-0.028	-0.057	-0.069
	(0.028)	(0.029)	(0.039)	(0.076)	(0.064)	(0.038)	(0.038)	(0.038)	(0.071)	(0.061)
Female	-0.087***	-0.088***	-0.058**			-0.059**	-0.086***	-0.079***		
	(0.016)	(0.017)	(0.024)			(0.024)	(0.024)	(0.024)		
PVT Score (W1)	0.002***	0.002**	0.003**	0.002	0.002	0.003***	0.002**	0.002**	0.003	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Obese						-0.081*	-0.088**	-0.081*	-0.039	-0.234***
						(0.044)	(0.043)	(0.043)	(0.069)	(0.075)
Low Birth Weight						0.085**	0.082**	0.083**	0.102*	0.094
						(0.037)	(0.036)	(0.036)	(0.058)	(0.058)
Sexually Active						-0.027	-0.026	-0.026	-0.032	-0.118***
						(0.025)	(0.025)	(0.025)	(0.033)	(0.044)
Smoke						-0.091***	-0.070**	-0.066**	-0.112***	-0.070
						(0.029)	(0.029)	(0.029)	(0.043)	(0.054)
Some College							0.145***	0.142***	-0.008	0.174***
							(0.028)	(0.028)	(0.045)	(0.053)
College Graduate							0.233***	0.223***	0.027	0.300***
							(0.037)	(0.037)	(0.058)	(0.075)
Depression Scale (W4)								-0.013***	-0.016**	0.005
								(0.004)	(0.007)	(0.007)
Observations	2796	2796	2796	792	1044	2796	2796	2796	792	1044
R-squared	0.037	0.115	0.013	0.011	0.007	0.040	0.068	0.075	0.097	0.093
Number of Families			1354	399	517	1354	1354	1354	399	517

Robust standard errors in parentheses, clustered at family level. *** p<0.01, ** p<0.05, * p<0.1. Note: Same controls as Table 3 except family controls are omitted in family fixed effects specifications. Variables that are never statistically significant from columns 6-10 are omitted but available upon request.

Table 5
Effects of Adolescent Depression on Adult Wages: Baseline Results

Outcome	Log(Earnings)	Log(E)	Log(E)	Log(E)	Log(E)	Log(E)	Log (E)
Sample	Full	Male	Female	Full	Full	Full	Full
Fixed Effects?	None	None	None	School	School	School	School
Column	1	2	3	4	5	6	7
Depressed	-0.266***	-0.266***	-0.271***	-0.260***	-0.218***	-0.173***	-0.126***
	(0.041)	(0.065)	(0.045)	(0.041)	(0.042)	(0.041)	(0.040)
Age	0.053***	0.059***	0.046***	0.039***	0.039***	0.036***	0.035***
	(0.008)	(0.009)	(0.010)	(0.008)	(0.009)	(0.008)	(0.008)
Female	-0.286***			-0.295***	-0.297***	-0.362***	-0.338***
	(0.031)			(0.032)	(0.030)	(0.031)	(0.031)
Maternal Education	0.029***	0.019***	0.038***	0.023***	0.022***	0.005	0.004
	(0.007)	(0.007)	(0.009)	(0.007)	(0.006)	(0.006)	(0.006)
Family Income (W1)	0.015***	0.022***	0.011***	0.010***	0.009***	0.006***	0.006***
	(0.003)	(0.005)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)
Married Parents	0.075***	0.068*	0.074**	0.056**	0.044	0.021	0.019
	(0.027)	(0.036)	(0.036)	(0.027)	(0.027)	(0.026)	(0.025)
Hispanic	0.136***	-0.001	0.266***	0.030	0.035	0.031	0.030
	(0.034)	(0.052)	(0.052)	(0.031)	(0.030)	(0.029)	(0.029)
Black	-0.129***	-0.275***	-0.013	-0.135***	-0.130***	-0.138***	-0.129***
	(0.038)	(0.051)	(0.043)	(0.037)	(0.038)	(0.036)	(0.036)
PVT Score (W1)	0.007***	0.005***	0.009***	0.007***	0.004***	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Marijuana Use					-0.094***	-0.066**	-0.060*
					(0.032)	(0.030)	(0.031)
Mistreatment					-0.040**	-0.023	-0.012
					(0.017)	(0.016)	(0.016)
Asthma					-0.094***	-0.080***	-0.066**
					(0.025)	(0.026)	(0.025)
Obese					-0.118***	-0.083**	-0.077**
					(0.040)	(0.036)	(0.035)
Smoke					-0.121***	-0.071***	-0.066***
					(0.024)	(0.024)	(0.024)
Drink					0.045**	0.045**	0.045**
					(0.020)	(0.019)	(0.019)
Some College						0.228***	0.215***
						(0.025)	(0.025)
College Graduate						0.607***	0.580***
						(0.028)	(0.028)
Depression Scale (W4)							-0.040***
							(0.005)
Observations	10836	5100	5736	10836	10836	10836	10836
R-squared	0.075	0.057	0.055	0.108	0.062	0.099	0.108
Number of Schools					144	144	144

Robust standard errors in parentheses, clustered at school. *** p<0.01, ** p<0.05, * p<0.1. Additional Controls: mistreatment missing dummy, birth weight missing dummy, missing family information dummy, rural status, constant, AD and HD (final three columns, never statistically significant), low birth weight, diabetes, and sexually active (final three columns, statistically significant once at 10% level)

Table 6
Effects of Adolescent Depression on Adult Wages: Sibling Results

Outcome	Log(Earnings)	Log(E)	Log(E)	Log(E)	Log(E)	Log(E)	Log(E)	Log(E)	Log(E)	Log (E)
Sample	Family	Family	Family	Brothers	Sisters	Family	Family	Family	Brothers	Sisters
Fixed Effects?	None	School	Family	Family	Family	Family	Family	Family	Family	Family
Column	1	2	3	4	5	6	7	8	9	10
Depressed	-0.337***	-0.332***	-0.277**	-0.301	-0.128	-0.254**	-0.244**	-0.194*	-0.224	-0.055
	(0.081)	(0.089)	(0.117)	(0.254)	(0.180)	(0.117)	(0.116)	(0.117)	(0.233)	(0.196)
Age	0.060***	0.051**	0.074***	0.095***	0.068**	0.067***	0.063***	0.060***	0.075**	0.062*
	(0.017)	(0.020)	(0.016)	(0.027)	(0.027)	(0.018)	(0.017)	(0.017)	(0.033)	(0.034)
Female	-0.293***	-0.302***	-0.277***			-0.259***	-0.317***	-0.303***		
	(0.045)	(0.050)	(0.069)			(0.069)	(0.069)	(0.069)		
PVT Score (W1)	0.007***	0.008***	0.010***	0.006	0.012**	0.009***	0.008**	0.008**	0.004	0.010**
	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
Obese						-0.223*	-0.238*	-0.216*	-0.092	-0.339*
						(0.132)	(0.133)	(0.130)	(0.200)	(0.180)
Low Birth Weight						-0.174**	-0.156*	-0.155*	-0.112	-0.265**
						(0.083)	(0.083)	(0.084)	(0.128)	(0.118)
Some College							0.083	0.083	0.146	-0.033
							(0.086)	(0.086)	(0.127)	(0.140)
College Graduate							0.456***	0.440***	0.425***	0.564***
							(0.105)	(0.105)	(0.160)	(0.170)
Depression Scale (W4)								-0.036***	-0.046**	-0.023
								(0.012)	(0.022)	(0.016)
Constant	7.814***	7.985***	7.647***	7.633***	7.251***	7.851***	7.989***	8.171***	7.732***	7.728***
	(0.371)	(0.449)	(0.483)	(0.810)	(0.713)	(0.497)	(0.489)	(0.490)	(0.836)	(0.750)
Observations	2471	2471	2471	740	872	2471	2471	2471	740	872
R-squared	0.084	0.150	0.056	0.046	0.037	0.074	0.096	0.104	0.154	0.136
Number of Families			1327	394	494	1305	1305	1304	392	479

Robust standard errors in parentheses, clustered at family level. *** p<0.01, ** p<0.05, * p<0.1. Note: Same controls as Table 3 except family controls are omitted in family fixed effects specifications. Variables that are never statistically significant from columns 6-10 are omitted but available upon request

Appendix Tables

Descriptive Statistics Comparison
Wave 1 Sample versus Wave 4 Analysis Sample
Table 1A

	Wave	Obs	Mean	Std Dev	Obs	Mean	Std Dev
Depressed	1	12146	0.08	0.27	19242	0.08	0.27
Depression Scale	1	12146	11.29	7.59	19242	11.38	7.61
Female	All	12146	0.55	0.50	19242	0.51	0.50
Maternal Education	1	12146	13.23	2.27	19242	13.15	2.26
Family Income	1	12146	4.61	4.32	19242	4.46	4.07
Married Parents	1	12146	0.72	0.42	19242	0.70	0.42
Hispanic	All	12146	0.15	0.36	19242	0.17	0.37
Black	All	12146	0.22	0.41	19242	0.22	0.42
PVT Score	1	12146	101.02	14.18	19242	99.87	14.87
Rural	1	12146	0.26	0.44	19242	0.25	0.43
Missing Family Information	1	12146	0.29	0.45	19242	0.32	0.47
Marijuana Use	1	11998	0.14	0.35	18918	0.15	0.35
Mistreatment Scale	Pre-1	12146	0.00	0.63	19242	0.00	0.54
Ever Asthma	3	12135	0.17	0.37	14078	0.17	0.37
Obese	1	11861	0.07	0.26	18758	0.07	0.25
AD	Pre-1	12137	0.03	0.18	14083	0.03	0.18
HD	Pre-1	12137	0.02	0.16	14083	0.02	0.16
Low Birth Weight	Pre-1	12146	0.11	0.29	19242	0.11	0.28
Sexually Active	1	12081	0.38	0.49	19087	0.40	0.49
Ever Diabetes	3	12135	0.01	0.10	14082	0.01	0.10
Smoke	1	12085	0.25	0.43	19124	0.25	0.43
Drink	1	12141	0.41	0.49	19231	0.41	0.49
Mistreatment Missing	3	12146	0.11	0.31	19242	0.35	0.48
Birth Weight Missing	1	12146	0.17	0.37	19242	0.19	0.39

Predictors of Attrition between Wave 1 and Wave 4

Table 2A

Outcome	Attrition	Attrition
Sample	Full	Full
Depressed (W1)	0.016	0.015
	(0.010)	(0.010)
Age	0.008***	0.007***
	(0.003)	(0.003)
Female	-0.084***	-0.082***
	(0.007)	(0.006)
Maternal Education	-0.000	-0.001
	(0.002)	(0.002)
Family Income (W1)	-0.001	-0.001
	(0.001)	(0.001)
Married Parents	-0.028***	-0.024***
	(0.008)	(0.008)
Hispanic	0.019	0.017
	(0.015)	(0.014)
Black	-0.015	-0.018
	(0.012)	(0.013)
PVT Score (W1)	-0.003***	-0.002***
	(0.000)	(0.000)
Rural	-0.039***	-0.036***
	(0.009)	(0.009)
Missing Family Information	0.056***	0.056***
	(0.008)	(0.008)
Marijuana Use		0.015
		(0.009)
Obese		-0.049***
		(0.012)
Low Birth Weight		0.008
		(0.012)
Sexually Active		0.013
		(0.008)
Smoke		-0.008
		(0.009)
Drink		-0.011
		(0.008)
Constant	0.427***	0.412***
	(0.060)	(0.060)
Observations	19242	18266
R-squared	0.030	0.028

Notes: This table regresses attrition from the sample by wave 4, when earnings are collected, on wave 1 characteristics.

Descriptive Statistics Comparison
Siblings Sample versus Full Sample
Table 3A

	Wave	Obs	Mean	Std Dev	Obs	Mean	Std Dev
Employed	4	12146	0.82	0.38	2793	0.81	0.39
Earnings ($)	4	11594	35300.08	43803.83	2665	32387.67	36586.90
Log (Earnings)	4	10834	10.17	1.03	2469	10.12	1.01
Some College	4	12143	0.44	0.50	2793	0.43	0.50
College Graduate	4	12143	0.33	0.47	2793	0.30	0.46
Depressed	1	12146	0.08	0.27	2793	0.09	0.28
Depression Scale	4	12141	2.62	2.55	2792	2.74	2.64
Depressed	4	12146	0.19	0.39	2793	0.19	0.39
Depression Scale	1	12146	11.29	7.59	2793	11.81	7.67
Age	3	12146	21.91	1.75	2793	21.85	1.76
Female	All	12146	0.55	0.50	2793	0.54	0.50
Maternal Education	1	12146	13.23	2.27	2793	13.13	2.25
Family Income	1	12146	4.61	4.32	2793	4.49	4.35
Married Parents	1	12146	0.72	0.42	2793	0.71	0.42
Hispanic	All	12146	0.15	0.36	2793	0.14	0.34
Black	All	12146	0.22	0.41	2793	0.24	0.43
PVT Score	1	12146	101.02	14.18	2793	99.33	13.77
Rural	1	12146	0.26	0.44	2793	0.28	0.45
Missing Family Information	1	12146	0.29	0.45	2793	0.28	0.45
Marijuana Use	1	11998	0.14	0.35	2768	0.13	0.34
Mistreatment Scale	Pre-1	12146	0.00	0.63	2793	0.02	0.66
Ever Asthma	3	12135	0.17	0.37	2791	0.17	0.38
Obese	1	11861	0.07	0.26	2727	0.07	0.26
AD	Pre-1	12137	0.03	0.18	2791	0.03	0.18
HD	Pre-1	12137	0.02	0.16	2791	0.02	0.16
Low Birth Weight	Pre-1	12146	0.11	0.29	2793	0.20	0.38
Sexually Active	1	12081	0.38	0.49	2778	0.37	0.48
Ever Diabetes	3	12135	0.01	0.10	2790	0.01	0.10
Smoke	1	12085	0.25	0.43	2774	0.26	0.44
Drink	1	12141	0.41	0.49	2792	0.40	0.49
Mistreatment Missing	3	12146	0.11	0.31	2793	0.11	0.32
Birth Weight Missing	1	12146	0.17	0.37	2793	0.17	0.37

Appendix Table 4A
Examination of Full Scale of Depressive Symptoms

Outcome	Employment	Log (Earnings)	Employment	Log (Earnings)
Depression Specification	Linear	Linear	Decile of Scale	Decile of Scale
Depression Scale (W1)	-0.003***	-0.014***		
	(0.001)	(0.001)		
Depression Scale (2nd Decile)			-0.003	-0.046
			(0.014)	(0.040)
Depression Scale (3rd Decile)			-0.003	-0.100***
			(0.014)	(0.037)
Depression Scale (4th Decile)			-0.010	-0.108**
			(0.013)	(0.044)
Depression Scale (5th Decile)			-0.016	-0.143***
			(0.015)	(0.046)
Depression Scale (6th Decile)			-0.006	-0.178***
			(0.014)	(0.042)
Depression Scale (7th Decile)			-0.031**	-0.176***
			(0.015)	(0.045)
Depression Scale (8th Decile)			-0.032*	-0.244***
			(0.017)	(0.047)
Depression Scale (9th Decile)			-0.015	-0.260***
			(0.016)	(0.046)
Depression Scale (10th Decile)			-0.087***	-0.406***
			(0.018)	(0.044)
Constant	0.435***	8.113***	0.421***	8.121***
	(0.070)	(0.194)	(0.070)	(0.200)
Observations	12146	10836	12146	10836
R-squared	0.031	0.080	0.032	0.080

Notes: Demographic controls used