



Childhood mistreatment and adolescent and young adult depression[☆]

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ABSTRACT

In this paper, I use a nationally representative sample of adolescents from the United States to examine the association between childhood mistreatment (sexual abuse and physical abuse) and depression during adolescence and young adulthood. Researchers have implicated childhood mistreatment as one of the most important predictors of depression. An alternative mechanism linking childhood mistreatment with adolescent and young adult depression is community and family disadvantage (or other factors) that affect both outcomes. Using data from the restricted version of the U.S. National Longitudinal Study of Adolescent Health (Add Health), this paper outlines several findings of the relationship between mistreatment and depression as well as the gender differences in depression. First, I find very limited evidence that controlling for common environmental factors at the school or neighborhood level explain the relationship between mistreatment and depression. Also, I show that controlling for common family factors decreases the predictive power of childhood mistreatment on depression. Results in this paper generally support previous research that shows the link between childhood mistreatment and depression is most important for females, even within families. Finally, results suggest that the effects of child mistreatment on depression may increase as individuals age.

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Introduction

There is a large literature showing the substantial negative effects of depression across several domains for both individuals and society more generally. The World Health Organization has categorized depression as among the most disabling clinical diagnoses in the world, ranking 4th, and it is predicted to climb to second place by 2020. Depression is estimated to affect nearly 340 million people worldwide, including 18 million people in the United States at any one time (Murray & Lopez, 1996). Early onset depression (before the age of 21) has been of particular concern. This concern arises because individuals with early onset depression have longer first episodes, higher rates of recurrence, longer hospitalizations, and higher overall rates of comorbid disorders,

including substance use disorders (Greden, 2001). For adolescents and young adults, depression is associated with poor health and poor behavioral outcomes, including higher risks of disruptive behaviors, anxiety, and substance abuse, among other outcomes (Needham, 2007; Saluja et al., 2004). Education outcomes also suffer as a result of depression, including lower achievement on tests, lower teacher-rated grades, and poorer peer relations (Roesser, Eccles, & Strobel, 1998). Depression during adolescence may also lead to decreased human capital accumulation (i.e. lower achievement, fewer years of completed schooling), which would have negative implications for lifetime income, occupational options, and socioeconomic status (Berndt et al., 2000; Ettner, Frank, & Kessler, 1997; Fletcher, 2008; Fletcher, 2007; Hamilton, Merrigan, & Dufresne, 1997; Kessler, Foster, Saunders, & Stang, 1995).

Discovering critical determinants of adolescent depression has also been the subject of large literatures across many social sciences and medical fields. Depression has been shown to have an important genetic component as well as be determined by social and cultural circumstances (Bierut et al., 1999; Mazure & Keita, 2006; Silberg et al., 1999). Specifically, principal determinants of depression include family history and genetic factors, cognitive style, hormonal and neurotransmitter interactions, and environmental stress and cumulative adversity such as exposure to violence (Mazure & Keita, 2006). In particular, mistreatment in childhood, specifically sexual abuse, has been shown to be one of the most robust and important determinants of depression (Bifulco, Brown,

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& Alder, 1991; Cheasty, Clare, & Collins, 1998; Molnar, Buka, & Kessler, 2001; Mullen, Romans-Clarkson, Walton, & Herbison, 1988).

The mechanisms linking adversity to depression suggested by this research include disruptions in the development of a child's sense of self, in ability to regulate reaction to stressors, and other emotional and social problems (see Johnson, 2004 and Molnar et al., 2001 for evidence and references). Though the conceptual link between childhood mistreatment and later depression is strong, it is difficult to empirically estimate causal effects of the relationship because of potential confounding influences that affect both the likelihood of exposure to childhood mistreatment and depression, such as living in disadvantaged neighborhoods and/or families. With some important exceptions (for example Molnar et al., 2001), much work in this area has also used clinical or convenience samples, which may limit the external validity of the results.

In this paper, I contribute to the literature that focuses on childhood mistreatment as a key determinant of depression by using a national longitudinal survey of adolescents from the United States that allows classmate comparisons and sibling comparisons to outline several important findings. I find very limited evidence that controlling for common environmental factors at the school or neighborhood level explains the relationship between mistreatment and depression. I also show that controlling for common family factors decreases the predictive power of childhood mistreatment on adolescent depression but not depression as a young adult. Like previous research, this paper provides some evidence that the link between childhood mistreatment and depression is generally more important for females, even within families.

Evidence of the effects of childhood stress on depression

There is a voluminous amount of research across the social sciences and medical literatures documenting a strong and robust link between many measures of childhood stress and contemporaneous or later depressive symptoms (Mazure, 1998; Nolen-Hoeksema, 2006). For example, Schilling, Aseltine, and Gore (2008) find that cumulative adversity during childhood have substantial effects on adult mental health. In particular, they find that the severity of the adversity measures rather than the number of stressors led to poor mental health outcomes. Further, they showed that specific adversities most highly associated with depressive symptoms for both genders included sexual abuse, physical abuse, and serious neglect.

In addition to the strong evidence that exposure to adversity and stress may lead to poor mental health outcomes, there has been much interest in whether the impacts differ by gender. In fact, there is mixed evidence that the effects of stress on depression may vary by gender (Gershon, Minor, & Hayward, 2008). Cutler and Nolen-Hoeksema (1991) outline several potential mechanisms that might lead to these gender differentials, including that the seriousness of the abuse may differ by gender, females may internalize and blame themselves for the abuse more than males, and females may have coping styles that are different than males. For example, physical and sexual abuse during childhood has been shown to disproportionately affect females (Heim et al., 2000; Kendler et al., 2000). While many researchers have provided evidence that women are more vulnerable to the effects of violence than men (Baker et al., 2005; Thompson, Kingree, & Desai, 2004), other studies have found no gender differences (Pimlott-Kubiak & Cortina, 2003; Roy & Janal, 2006). Often the effects depend on the type of violence or stressor. For example, Romito and Grassi (2007) present evidence that the health effect of physical violence within families is similar for

college age men and women, and the effect of sexual violence is larger for college age women.

There are also several limitations with much of the previous evidence. First, many studies use convenience or clinical samples. For example, Schilling et al. (2008) examine 1300 students from 9 public schools in Boston. Romito and Grassi (2007) study 500 university students in Italy. A second limitation is potential confounding. For example, it is well known that childhood sexual abuse co-occurs with other adverse family and neighborhood conditions, including marital conflict, parental substance abuse, mental problems of family members, and neighborhood crime and poverty (see Molnar et al., 2001 and included references). Ross (2000) shows evidence that residents of poor neighborhoods had higher levels of depression. Latkin and Curry (2003) find that neighborhood characteristics such as the presence of litter, vacant housing, and crime are predictive of later depressive symptoms. Kling, Liebman, and Katz (2007) use the Moving to Opportunity residential relocation experiment to show effects of moving to a better neighborhood on adult mental health outcomes. These and other research findings suggest that without controlling for a rich set of neighborhood and family characteristics, the estimated effects of childhood physical or sexual abuse on depression will likely be biased upwards due to the co-occurrence of other stressors.

Overcoming these limitations is important both for increasing our understanding of the most important and robust determinants of depression as well as guiding policies that focus on decreasing the incidence of depression. For example, while it is uncontroversial to promote policies that are aimed at decreasing child mistreatment, it is important to understand whether decreasing the rates of child mistreatment will have downstream benefits on rates of depression and other physical and mental health issues. Increasing the external validity and limiting potential confounding in empirical analyses that link childhood mistreatment with adolescent and young adult depression will move us forward in our understanding of these important issues and well as suggest additional policies that may further reduce the burden of depression for adolescents, young adults, and society.

Method

Data

The data in this study come from the restricted version of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a school-based, longitudinal study of the health-related behaviors of adolescents and their outcomes in young adulthood. Beginning with an in-school questionnaire administered to a nationally representative sample of students in grades 7 through 12 in 1994–1995, the study follows up with a series of in-home interviews of students approximately 1 year and 6 years later. Add Health represents a substantial improvement in previous data for research on the determinants of adolescent depression because it (1) is longitudinal (2) includes a symptom scale for depressive symptoms for the full, nationally representative sample of 7–12th graders (3) contains rich information on self-reported childhood mistreatment, and (4) allows comparisons of both classmates in the same schools and adolescent siblings. Other sources of data include questionnaires for parents, school administrators, and information from the Census.¹

The number of observations in the restricted Add Health data set with valid school identification codes who are followed

¹ See Udry (2003) for full description of the Add Health data set.

longitudinally is approximately 15,000 (of the 20,000 respondents in wave 1). There are approximately 14,500 observations with valid childhood mistreatment and mental health outcomes. There are approximately 4000 individuals in the siblings and twins sub-sample with complete information, including nearly 600 sister pairs and nearly 500 brother pairs. In order to maximize the available sample, I use single imputation techniques to estimate missing family income and maternal education variables and a dummy variable is included in the empirical models to control for this imputation. As mentioned above, the restricted Add Health data allows community-level variables from the Census Bureau to be matched to the individuals in the data set. I include poverty and education related county-level variables. In addition to including individual-level data that describes whether the household resides in a rural setting, I use the proportion of the county population below the poverty level, the proportion without a high school diploma, and the median county-level income. Summary statistics are shown in Table 1. Descriptive statistics comparing the full sample and family sample are quite similar and are available upon request.

Approximately 5% of the sample reports having been sexually abused prior to sixth grade and over 6% meet the criterion of physical abuse (slapped, hit, or kicked more than 10 times before sixth grade). The prevalence of depression during adolescence is 8% and 15% during young adulthood. Gender differences in the sister pairs and brother pair sub-samples are shown in Appendix in Table 1A. As is well known, females are more likely to be depressed (9% vs. 6% during adolescence and 19% vs. 11% as young adults). Contrary to some previous research, there are not substantial differences in childhood mistreatment in the brother and sister pairs sub-samples. Females and males each report sexual abuse at a rate of 5%, and there are slightly higher reported rates of physical abuse for males (8%) than females (6%). These differences in the descriptive statistics in comparison to other data may partially stem from the ages that the mistreatment data is collected—before sixth grade. Table 2A in Appendix shows descriptive differences in

depressive symptoms for those exposed to abuse in comparison to those not exposed. As is well documented in other samples, the results suggest strong links between abuse and depressive symptoms.

Measures

Dependent variable: depression

The depression scale uses 19 of the 20 items of the Center for Epidemiological Studies Depression Scale (CES-D) contained in the Add Health data set. This methodology has been used by several researchers to examine adolescent depression and has been shown to have good measurement properties (Cornwell, 2003; Radoff, 1977; Roberts, Lewinsohn, & Seeley, 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%.² In wave 3 of the survey, a subset of nine items on the CES-D scale were asked. A cut-point of 10 is used, following previous research (Irwin, Artin, & Oxman, 1999).

Childhood mistreatment

Each survey respondent was asked a series of questions regarding mistreatment by adults before they began the sixth grade. The questions were asked retrospectively during wave 3 of data collection when respondents were on average 22 years old (range 18–26). The respondents were asked questions about emotional abuse, neglect, physical abuse, and sexual abuse. I focus on physical abuse and sexual abuse in this paper. Specifically, respondents were asked “How often had your parents or other adult care-givers slapped, hit, or kicked you?” by the time you were in sixth grade. I follow Currie and Tekin (2006) and dichotomize this measure to reflect physical abuse if the respondent reports 10 or more occurrences. For the measure of sexual abuse, respondents are asked, “How often had one of your parents or other adult-care givers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations?” by the time you were in sixth grade. I dichotomize this measure so that any instances are categorized as sexual abuse. While recall bias is an important consideration for these measures, the bias could be small for several reasons. First, the respondents were young adults when asked about childhood mistreatment. This has the advantage that young adults are mature enough to understand and report on such events (see Perkonig, Kessler, Storz, & Wittchen, 2000). Another advantage is that the time window over which the respondents recall past events is relatively short (10 years on average). Finally, respondents answered these sensitive questions using laptop computers rather than directly to interviewers, which may reduce bias in the data.

Analysis outline

In order to examine the relationship between measures of childhood mistreatment and adolescent and young adult depression, I estimate several variants of the following specification using standard OLS regression analysis:

$$\text{Depression}_{it} = \beta_0 + \beta_1 \text{Mistreatment}_{it0} + \beta_2 X_{it} + \beta_3 N_{it} + \epsilon_{it} \quad (1)$$

Table 1
Descriptive statistics. National Longitudinal Study of Adolescent Health ($N = 14,500$)

| Variable | Wave | Mean | Std. Dev. | Min | Max |
|---------------------------------------|-------|-------|-----------|-----|-----|
| Depressed | 1 | 0.08 | 0.27 | 0 | 1 |
| Depressed | 3 | 0.15 | 0.35 | 0 | 1 |
| Depression scale | 1 | 11.26 | 7.59 | 0 | 54 |
| Depression scale | 3 | 7.89 | 2.91 | 0 | 27 |
| Ever depressed | 3 | 0.23 | 0.42 | 0 | 1 |
| Sexual abuse | Pre-1 | 0.05 | 0.21 | 0 | 1 |
| Physical abuse (times) | Pre-1 | 1.29 | 2.76 | 0 | 10 |
| Physical abuse (>9) | Pre-1 | 0.06 | 0.24 | 0 | 1 |
| Age | 1 | 17.07 | 1.71 | 14 | 20 |
| Age = 15 | 1 | 0.13 | 0.33 | 0 | 1 |
| Age = 16 | 1 | 0.16 | 0.37 | 0 | 1 |
| Age = 17 | 1 | 0.19 | 0.39 | 0 | 1 |
| Age = 18 | 1 | 0.20 | 0.40 | 0 | 1 |
| Age = 19 | 1 | 0.18 | 0.38 | 0 | 1 |
| Age = 20 | 1 | 0.07 | 0.25 | 0 | 1 |
| Female | All | 0.53 | 0.50 | 0 | 1 |
| Black | All | 0.22 | 0.42 | 0 | 1 |
| Hispanic | All | 0.16 | 0.37 | 0 | 1 |
| Birth order | All | 1.85 | 1.20 | 1 | 13 |
| Maternal education ^a | All | 13.21 | 2.30 | 0 | 21 |
| Family income (\$10,000) ^a | All | 4.56 | 4.13 | 0 | 99 |
| Married parents | All | 0.63 | 0.48 | 0 | 1 |
| Missing parent Information | All | 0.31 | 0.46 | 0 | 1 |
| Rural status | All | 0.26 | 0.44 | 0 | 1 |
| % Poverty | Pre-1 | 14.06 | 6.98 | 2 | 40 |
| % No high school degree | Pre-1 | 25.66 | 9.04 | 5 | 61 |
| Median income (\$10,000) | Pre-1 | 30.30 | 7.79 | 13 | 55 |

^a Imputed Variable. Childhood maltreatment questions asked in wave 3.

² 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 U.S. 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).

Table 2
Associations between childhood sexual abuse and depression. Comparison results with prior research

| Outcome | Depression | Depression | Depression | Depression | Depression | Depression | Depression | Depression |
|------------------------|------------------|------------------|-------------------|------------------|------------------|-------------------|-----------------|-------------------|
| Wave | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| Sample | Full | Family | Family/males | Family/females | Full | Family | Family/males | Family/females |
| Childhood sexual abuse | 1.876* (0.19) | 1.736* (0.28) | 1.806** (0.51) | 1.717* (0.36) | 1.769* (0.20) | 1.581** (0.35) | 1.296 (0.52) | 1.725** (0.46) |
| Observations | 14228 | 4048 | 1914 | 2134 | 14240 | 4045 | 1912 | 2133 |

Odds Ratios reported from logistic regression analysis. *1%, **5% level of statistical significance.

Robust standard errors clustered at the school level. Additional controls (not shown): age dummies, race, maternal education, family income, male sex, birth order, rural status, constant, marital status of parents, neighborhood poverty, neighborhood education, median county income.

where depression status for individual i at time t is determined by a vector of individual and family-level characteristics (X) including age, gender, race, birth order, maternal education, family income, and family structure, neighborhood-level characteristics (N), including rural status, proportion of the census tract in poverty, the proportion of the census tract with less than a high school education, and the county median income level, and an idiosyncratic error term. The β s are the coefficients to be estimated and represent vectors of coefficient and t refers to two time periods—wave 1 of the survey and wave 3 of the survey when respondents were on average 17 and 22, respectively. As discussed above, one potential limitation of Eq. (1) is the presence of confounding variables that affect both the likelihood of childhood mistreatment and depression. While I control for several neighborhood-level variables, the possibility of confounding variables remains. Therefore, I proceed by controlling for all time-invariant school-level factors common to individuals who attended the same school at wave 1. Thus, a school fixed effect (θ) for students in school s is included:

$$\text{Depression}_{ist} = \alpha + \beta \text{Mistreatment}_{it0} + \lambda X_{it} + \theta_s + \epsilon_{ist} \quad (2)$$

While Eq. (2) will control for potentially important community-level confounding factors, there could also be important family-level determinants that could also confound the relationship. Therefore, in the final set of analyses, I include family-level fixed effects (δ) and only include individual-level characteristics in Z that vary between siblings.

$$\text{Depression}_{ift} = \alpha + \beta \text{Mistreatment}_{it0} + \lambda Z_{it} + \delta_f + \epsilon_{ift} \quad (3)$$

Thus, Eq. (3) will be able to examine whether previous results were driven by unobserved family-level factors that affect both the likelihood of mistreatment during childhood and future depressive symptoms (Currie & Stabile, 2006; Fletcher & Wolfe, 2008). I also use Eqs. (1)–(3) to examine results stratified by gender.

Results

Before presenting results from the preferred set of analyses, it is useful to examine whether the features of the Add Health data produce estimates that are at odds with prior research. Table 2 presents results that examine the associations between depression measured at wave 3 (average age = 22) as well as wave 1 (average age = 17). As a baseline, I compare the results with those estimated by Molnar et al. (2001), who use the National Comorbidity Survey (NCS) and focus on the relationship between retrospective reports of sexual abuse during childhood and depression during adulthood. They report prevalence of sexual abuse of 13.5% for females and 2.5% for males. The differences in prevalence between the NCS and Add Health could reflect the differences in ages of the populations (and the recall window) as well as the differences in when the abuse could have occurred—prior to 6th grade in the Add Health

sample but not constrained in the NCS. Molnar et al. (2001) report adjusted odds ratios in the association between childhood sexual abuse and depression of 1.80 [1.4, 2.3] for females and 1.80 [0.9, 3.7] for males (Table 2 in Molnar et al., 2001). With the important differences in samples outlined above, it is fortunate that the Add Health results are quite close in magnitude with those from Molnar et al. (2001), which should alleviate some concerns with some of the survey design features of the Add Health sample that differ from other national samples. Results are presented in Table 2. The main results show a very similar association between depression in young adulthood and experiences of sexual abuse as Molnar et al. (2001). The odds ratio range from 1.72 to 1.88 for the full sample, family sample, and samples stratified by gender. Results predicting adolescent depression are also quite similar but lower for males (columns 5–8). Full results are available upon request.

The results also suggest that there is a large age gradient in depression during adolescence that disappears as the individuals become adults. Black individuals are just as likely to be depressed during adolescence at wave 1 as whites, but more likely during young adulthood; in contrast Hispanic individuals are more likely than whites at wave 1 to be depressed, but this difference disappears over time. Family characteristics such as income, education and family structure decrease the likelihood of adolescent.³ Interestingly, and foreshadowing later results of the unimportance of neighborhood-level confounders, neighborhood characteristics such as poverty, education, and income are not related to depression.

Results for adolescent depression

In Table 3, I move to the preferred specifications and examine the association between childhood physical abuse and adolescent depression (columns 1–3) and between childhood sexual abuse and adolescent depression (columns 4–6). While this table uses the family sample in the Add Health, a comparison with results using the full sample and Table 3 indicates that the basic results are similar for the full sample (results available upon request). Column 1 shows that for the family sample, individuals who report experiencing physical abuse during childhood are nearly 3 percentage points more likely to be depressed during adolescence. Columns 2 and 3 indicates that this relationship is entirely driven by females, and no effect is found for males (results available upon request show that the gender-abuse interaction is statistically significant).

Column 4 shows evidence that sexual abuse during childhood increases the chances of adolescent depression by 4.3 percentage points, and again this effect is much larger for females

³ In interpreting these results, the reader should note that the single imputation techniques used for maternal education and family income may produce smaller standard errors on these coefficients.

Table 3
Association between childhood mistreatment and adolescent depression. Family sample and gender differences

| Outcome sample | Depressed family | Depressed sisters | Depressed brothers | Depressed family | Depressed sisters | Depressed brothers |
|--------------------------|------------------|-------------------|--------------------|------------------|-------------------|--------------------|
| Female | 0.031* (0.010) | | | 0.031* (0.010) | | |
| Childhood physical abuse | 0.029*** (0.016) | 0.043 (0.041) | 0.001 (0.029) | 0.043*** (0.024) | 0.090*** (0.050) | 0.031 (0.055) |
| Childhood sexual abuse | | | | | | |
| Black | −0.001 (0.017) | −0.022 (0.027) | −0.002 (0.024) | −0.002 (0.017) | −0.014 (0.027) | −0.011 (0.024) |
| Hispanic | 0.033* (0.011) | 0.081* (0.026) | 0.008 (0.024) | 0.036* (0.012) | 0.073* (0.025) | 0.018 (0.023) |
| Birth order | 0.005 (0.003) | 0.020** (0.009) | 0.003 (0.005) | 0.006*** (0.004) | 0.018** (0.009) | 0.002 (0.005) |
| Maternal education | −0.009* (0.002) | −0.004 (0.005) | −0.010* (0.003) | −0.008* (0.002) | −0.003 (0.005) | −0.009* (0.003) |
| Family income | −0.000 (0.001) | −0.001 (0.002) | −0.000 (0.001) | −0.001 (0.001) | −0.001 (0.001) | −0.000 (0.001) |
| Married parents | −0.028* (0.010) | −0.026 (0.020) | −0.032*** (0.018) | −0.028* (0.010) | −0.024 (0.019) | −0.028 (0.017) |
| Rural | −0.005 (0.009) | 0.004 (0.023) | −0.019 (0.016) | −0.006 (0.008) | 0.006 (0.024) | −0.018 (0.017) |
| Neighborhood % poverty | −0.000 (0.001) | −0.002 (0.002) | 0.002 (0.003) | −0.000 (0.001) | −0.002 (0.002) | 0.003 (0.003) |
| Neighborhood education | 0.001 (0.001) | 0.001 (0.001) | 0.001 (0.001) | 0.001 (0.001) | 0.001 (0.001) | 0.001 (0.001) |
| Median county income | −0.000 (0.001) | −0.001 (0.002) | 0.001 (0.001) | −0.000 (0.001) | −0.001 (0.002) | 0.001 (0.002) |
| Observations | 3994 | 1164 | 957 | 4045 | 1189 | 987 |
| R-squared | 0.03 | 0.04 | 0.04 | 0.03 | 0.04 | 0.04 |

*1%, **5%, ***10% level of statistical significance.
Robust standard errors clustered at the school level. Age dummies and a constant also controlled.

(9 percentage points) than males (3 percentage points), though the interaction effect estimated in an auxiliary specification is not statistically significant.

In Table 4, I examine whether confounding at the neighborhood or family level explains the previous results. In the first set of results in Table 4, school fixed effects are controlled, which allows the comparison of students who attended the same school but had different experiences with mistreatment and different likelihoods of depression. The results indicate that while the gender differential in depression remains the same after controlling for school fixed effects, the relationship between physical abuse and depression shrinks to 1.4 percentage points. Again, the effect is much larger for females than males and the interaction effect is statistically significant (results available upon request). In contrast, the relationship between sexual abuse and depression is largely unchanged after controlling for school fixed effects. These results suggest that neighborhood characteristics likely confound part of the estimated relationship between physical abuse and adolescent depression.

In the second set of results in Table 4, family fixed effects are added to the empirical models. These specifications examine the relationship of differences between siblings in reports of childhood mistreatment and differences between siblings in adolescent depression. The results suggest that the gender differences in

depression shrink by nearly 1/3 and the effects of both measures of childhood mistreatment on depression are eliminated. However, these null average effects mask important, though statistically insignificant, gender differences. For both physical and sexual abuse, the results show that abuse increases the likelihood of depression in females by 3 percentage points but does not increase the likelihood for males, and neither interaction effect is statistically significant (results available upon request). These results suggest that 50% or more of traditional estimates of the effects of abuse on depression for females could be due instead to other family-level characteristics, but that important effects remain.

Results for young adult depression

Table 5 examines the determinants of young adult depression. Physical abuse is found to increase the chances of depression by nearly 6 percentage points, and the gender difference is substantial. Physical abuse increase the likelihood of depression by over 14 percentage points for females but only 2 percentage points for males, a statistically significant difference (results available from the author). Sexual abuse also increases the chances of depression, by 8.5 percentage points, although the gender differences are muted and not statistically different.

Table 4
Association between childhood mistreatment and adolescent depression. Evidence using school or family fixed effects

| Sample | Family | Females | Males | Family | Females | Males |
|--|----------------|---------------|----------------|----------------|---------------|----------------|
| Results using neighborhood fixed effects | | | | | | |
| Female | 0.033* (0.010) | | | 0.032* (0.010) | | |
| Childhood physical abuse (slapped) | 0.014 (0.018) | 0.057 (0.045) | −0.011 (0.034) | | | |
| Childhood sexual abuse | | | | 0.041 (0.028) | 0.082 (0.053) | 0.032 (0.064) |
| Observations | 3287 | 1165 | 958 | 3368 | 1190 | 988 |
| R-squared | 0.02 | 0.03 | 0.04 | 0.02 | 0.03 | 0.04 |
| Number of schools | 143 | 135 | 130 | 143 | 136 | 131 |
| Results using family fixed effects | | | | | | |
| Female | 0.023 (0.022) | | | 0.024 (0.021) | | |
| Childhood physical abuse (slapped) | 0.001 (0.039) | 0.031 (0.082) | −0.026 (0.061) | | | |
| Childhood sexual abuse | | | | −0.018 (0.049) | 0.029 (0.094) | −0.062 (0.086) |
| Observations | 3287 | 1165 | 958 | 3368 | 1190 | 988 |
| R-squared | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Number of families | 1615 | 578 | 483 | 1620 | 580 | 486 |

*1%, **5%, ***10% level of statistical significance.
Robust standard errors clustered at the school level or family level.
Control variables include those in Table 3 in neighborhood fixed effects results.
Control variables include age, birth order and a constant in family fixed effects results.

Table 5
Association between childhood mistreatment and young adult depression. Family sample and gender differences

| Outcome | Depressed | Depressed | Depressed | Depressed | Depressed | Depressed |
|--------------------------|-------------------|------------------|-----------------|------------------|------------------|-----------------|
| Wave | 3 | 3 | 3 | 3 | 3 | 3 |
| Sample | Family | Sisters | Brothers | Sample | Sisters | Brothers |
| Female | 0.063* (0.011) | | | 0.063* (0.011) | | |
| Childhood physical abuse | 0.057** (0.025) | 0.146* (0.055) | 0.020 (0.043) | | | |
| Childhood sexual abuse | | | | 0.085* (0.031) | 0.017 (0.054) | 0.046 (0.064) |
| Black | 0.026 (0.018) | 0.012 (0.037) | 0.054 (0.038) | 0.025 (0.017) | 0.019 (0.035) | 0.048 (0.037) |
| Hispanic | 0.001 (0.017) | 0.007 (0.031) | -0.026 (0.029) | -0.002 (0.017) | 0.004 (0.031) | -0.026 (0.030) |
| Birth order | 0.002 (0.004) | 0.003 (0.008) | -0.006 (0.006) | 0.001 (0.004) | 0.001 (0.008) | -0.008 (0.007) |
| Maternal education | -0.008* (0.003) | -0.009 (0.007) | -0.013* (0.005) | -0.008** (0.003) | -0.008 (0.007) | -0.014* (0.005) |
| Family income | -0.002*** (0.001) | -0.004** (0.002) | -0.000 (0.002) | -0.002** (0.001) | -0.004** (0.002) | -0.001 (0.002) |
| Married parents | -0.016 (0.013) | -0.060** (0.027) | 0.033 (0.021) | -0.017 (0.013) | -0.069** (0.028) | 0.028 (0.019) |
| Rural | 0.004 (0.012) | 0.003 (0.023) | 0.011 (0.032) | 0.007 (0.012) | 0.013 (0.024) | 0.009 (0.029) |
| Neighborhood % poverty | 0.003 (0.002) | 0.002 (0.003) | 0.004 (0.004) | 0.003 (0.002) | 0.000 (0.003) | 0.003 (0.004) |
| Neighborhood education | 0.000 (0.001) | 0.001 (0.002) | 0.001 (0.002) | 0.000 (0.001) | 0.001 (0.002) | 0.001 (0.002) |
| Median county income | 0.003** (0.001) | 0.001 (0.003) | 0.005** (0.002) | 0.003** (0.001) | 0.002 (0.003) | 0.005** (0.002) |
| Observations | 3997 | 1159 | 954 | 4048 | 1184 | 984 |
| R-squared | 0.02 | 0.04 | 0.04 | 0.02 | 0.03 | 0.04 |

*1%, **5%, ***10% level of statistical significance.

Robust standard errors clustered at the school level. Age dummies and constant are also controlled.

Table 6 examines whether confounding at the neighborhood or family level explains the previous results for young adult depression. In the first set of results in Table 6, school fixed effects are controlled. The results indicate that both the gender differential in depression and the relationship between physical abuse and depression remain largely unchanged. Again, the effect is much larger for females than males and statistically different. The results for sexual abuse are also nearly identical. In the second set of results in Table 6, family fixed effects are added to the empirical models. The results suggest that the gender differences in depression only slightly shrink. Additionally the effects of both measures of childhood mistreatment on depression remain robust. While previous results suggested that the relationships between mistreatment and depression could be largely explained by school and family-level confounders, the results in Table 6 suggest that the consequences of childhood mistreatment could become larger as individuals age. In particular, the effects of childhood mistreatment on young adult depression are found to be quite robust, even when controls for all common family factors are used. The results are also suggestive that physical abuse increases long term depression for females while sexual abuse increases long term depression for males.

Limitations and conclusions

In this paper, data from a large national longitudinal survey of classmates and siblings was used to examine several research questions that focus on the effects of childhood mistreatment on later depression and gender differentials in childhood mistreatment and depression. While the results in this paper contribute in several ways to the literature, several limitations should be outlined. First, as with all retrospective surveys, the assessment of childhood mistreatment may be subject to recall bias and may be misreported. There are two features of the survey design that may minimize these biases. First, as suggested by Schilling et al. (2008), the relatively close proximity of age and the relatively severe mistreatment measures used may minimize respondents forgetting these events. The data collection is also done using laptop computers for sensitive questions, which likely reduces the stigma associated with reporting physical or sexual abuse to the interviewer. An additional limitation is the use of non-clinical measures of depression as well as the use of measures of mistreatment that have not been verified through administrative data or other sources. Like other surveys, non-response and attrition could lead to the sample not capturing information from

Table 6
Association between childhood mistreatment and young adult depression. Evidence using school or family fixed effects

| Sample | Family | Females | Males | Family | Females | Males |
|--|-----------------|-----------------|----------------|------------------|----------------|---------------|
| Results using neighborhood fixed effects | | | | | | |
| Female | 0.062* (0.012) | | | 0.061* (0.013) | | |
| Childhood physical abuse (slapped) | 0.063** (0.026) | 0.147** (0.067) | -0.011 (0.042) | | | |
| Childhood sexual abuse | | | | 0.080** (0.033) | 0.003 (0.059) | 0.043 (0.076) |
| Observations | 3274 | 1160 | 955 | 3354 | 1185 | 985 |
| R-squared | 0.02 | 0.04 | 0.03 | 0.02 | 0.03 | 0.03 |
| Number of schools | 143 | 135 | 130 | 143 | 136 | 131 |
| Results using family fixed effects | | | | | | |
| Female | 0.059** (0.028) | | | 0.056** (0.027) | | |
| Childhood physical abuse (slapped) | 0.050 (0.056) | 0.122 (0.115) | 0.023 (0.091) | | | |
| Childhood sexual abuse | | | | 0.099*** (0.058) | -0.017 (0.106) | 0.070 (0.103) |
| Observations | 3274 | 1160 | 955 | 3354 | 1185 | 985 |
| R-squared | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 |
| Number of families | 1615 | 578 | 483 | 1620 | 580 | 486 |

*1%, **5%, ***10% level of statistical significance.

Robust standard errors clustered at the school level or family level.

Control variables include those in Table 3 in neighborhood fixed effects results.

Control variables include age, birth order and a constant in family fixed effects results.

the most disadvantaged (and potentially most abusive) households.

With these limitations in mind, there are several contributions to the literature indicated by the results. Overall, the results suggest that even when comparing classmates in the same school or even when comparing siblings, childhood mistreatment predicts substantial increases in adolescent and young adult depression. Additionally, the results in this paper outline several findings. Very limited evidence is found for the presence of important confounders at the school or neighborhood level for this population. In contrast, family-level confounders seem to explain large proportions of the associations between childhood mistreatment and adolescent depression, although important effects and important gender differences in the effects remain. While the data set and methods used in this paper have several caveats, as outlined above, this paper does overcome several important limitations in much previous work by controlling for confounding at the neighborhood and family levels and using a large national sample. Therefore, the results are valuable both for increasing our understanding of two of the most important and robust determinants of depression as well as guiding policies that focus on decreasing the incidence of depression. The results suggest that decreasing rates of child mistreatment will indeed have downstream benefits on rates of depression. Additionally, these results may prove helpful in suggesting alternative interventions that may further reduce the burden of depression for adolescents, young adults, and society.

Appendix

Table 1A. Descriptive statistics. Comparison of sister pairs and brother pairs samples

| Variable | Wave | Obs | Mean | Std. Dev. | Obs | Mean | Std Dev |
|---------------------------------------|-------|------|-------|-----------|-----|-------|---------|
| Depressed | 1 | 1190 | 0.09 | 0.29 | 988 | 0.06 | 0.24 |
| Depressed | 3 | 1185 | 0.19 | 0.39 | 985 | 0.11 | 0.32 |
| Depression scale | 1 | 1190 | 12.57 | 8.15 | 988 | 10.61 | 6.73 |
| Depression scale | 3 | 1185 | 8.31 | 3.19 | 985 | 7.61 | 2.70 |
| Ever depressed | 3 | 1190 | 0.29 | 0.45 | 988 | 0.19 | 0.39 |
| Sexual abuse | Pre-1 | 1190 | 0.05 | 0.22 | 988 | 0.05 | 0.22 |
| Neglect | Pre-1 | 1130 | 1.60 | 2.92 | 926 | 1.77 | 3.09 |
| Physical abuse (times) | Pre-1 | 1165 | 1.31 | 2.76 | 958 | 1.55 | 3.02 |
| Physical abuse (>9) | Pre-1 | 1165 | 0.06 | 0.24 | 958 | 0.08 | 0.27 |
| Age | 1 | 1190 | 16.97 | 1.71 | 988 | 17.09 | 1.73 |
| Age = 15 | 1 | 1190 | 0.14 | 0.35 | 988 | 0.14 | 0.34 |
| Age = 16 | 1 | 1190 | 0.17 | 0.37 | 988 | 0.15 | 0.35 |
| Age = 17 | 1 | 1190 | 0.19 | 0.39 | 988 | 0.20 | 0.40 |
| Age = 18 | 1 | 1190 | 0.20 | 0.40 | 988 | 0.18 | 0.39 |
| Age = 19 | 1 | 1190 | 0.15 | 0.36 | 988 | 0.18 | 0.38 |
| Age = 20 | 1 | 1190 | 0.06 | 0.24 | 988 | 0.07 | 0.26 |
| Female | All | 1190 | 1.00 | 0.00 | 988 | 0.00 | 0.00 |
| Black | All | 1190 | 0.25 | 0.43 | 988 | 0.20 | 0.40 |
| Hispanic | All | 1190 | 0.13 | 0.34 | 988 | 0.15 | 0.36 |
| Birth order | All | 1190 | 2.05 | 1.30 | 988 | 2.00 | 1.34 |
| Maternal education ^a | All | 1190 | 12.95 | 2.10 | 988 | 13.25 | 2.36 |
| Family income (\$10,000) ^a | All | 1190 | 4.50 | 4.95 | 988 | 4.50 | 3.85 |
| Married parents | All | 1190 | 0.62 | 0.49 | 988 | 0.65 | 0.48 |
| Missing parent information | All | 1190 | 0.31 | 0.46 | 988 | 0.30 | 0.46 |
| Rural status | All | 1189 | 0.27 | 0.44 | 988 | 0.26 | 0.44 |
| % Poverty | Pre-1 | 1190 | 14.17 | 7.16 | 988 | 13.81 | 6.90 |
| % No high school degree | Pre-1 | 1190 | 25.47 | 9.15 | 988 | 25.18 | 8.96 |
| Median income (\$10,000) | Pre-1 | 1190 | 29.74 | 7.45 | 988 | 30.08 | 7.51 |

^a Imputed.

Table 2A. Descriptive differences of depressive symptoms by exposure to abuse

| | Sexual abuse | No sexual abuse | Physical abuse | No physical abuse |
|-----------------------|--------------|-----------------|----------------|-------------------|
| Adolescent depression | | | | |
| Full sample | 0.14 | 0.08* | 0.12 | 0.08* |
| Females | 0.15 | 0.09* | 0.16 | 0.09* |
| Males | 0.11 | 0.06* | 0.08 | 0.06 |
| Adult depression | | | | |
| Full sample | 0.24 | 0.14* | 0.20 | 0.14* |
| Females | 0.29 | 0.17* | 0.23 | 0.17* |
| Males | 0.16 | 0.11* | 0.16 | 0.11* |

*1% significance.

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