

Effects of Peers and Social Environment on Adolescent Psychological Well-Being

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ABSTRACT

We use data from Add Health to estimate models of peer effects and effects of social environment on adolescent psychological well-being. Past literature has focused mostly on the role of peers on adolescents, notably on schooling (GPA, high school graduation, etc.) and risk behavioral (smoking, drinking, drug use, etc.) outcomes. Our study's core innovation lies in the conceptual testing of the hypothesis that an enlarged adolescent social environment encompasses support from peers, school, parents, and the neighborhood. In this paper, we isolate the effects of each of these groups on adolescent psychological well-being and find significant effects of support from schools and parents. However, peer effects are insignificant except for the baseline Ordinary Least Squares (OLS) model. Separate models for males and females and different age groups are also estimated and similar results are found, although the effects are greatest during late adolescence. Given the likely endogeneity of peer group formation, we also use an instrumental variables (IV) approach. The IV results indicate that peer effects are not statistically significant, but otherwise mimic OLS estimates, supporting the presence of a multi-faceted social network influencing adolescent health. These results, reinforced by further statistical testing, suggest that past work limiting influence on adolescent behavior or outcome to only the peers tends to be incomplete.

JEL Classification: I10, J10

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1. Introduction

Depression is one of the major mental health problems for adolescents. Current statistics indicate, among others, that 20% of adolescents undergo a phase of depression before adulthood, some 10 to 15% display signs and symptoms of depression at a given time, 20 to 40% experience more than one episode of depression in a two-year period and 15% of the adolescents suffering from depression will eventually contract the bipolar disorder (Knowtheteens.com, 2011). Despite these statistics, a growing body of research also suggests that social ties or group networks in the social environment tend to have a significant effect on an individual's behavior, health states, and economic outcomes. The peer effects literature in particular supports the hypothesis that peers have an influence on one's academic performance (Foster, 2006; Arcidiacono and Nicholson, 2005; Hanushek *et al.*, 2003; Robertson and Symons, 2003; Zimmerman, 2003; Sacerdote, 2001; Hoxby, 2000), substance use and other risky behaviors (Harris and Lopez-Valcarcel, 2008; Clark and Loheac, 2007; Lundborg, 2006; Gaviria and Raphael, 2001), and teenage pregnancy and school drop-out behavior (Gaviria and Raphael, 2001; Evans *et al.*, 1992). More recent studies found statistically significant "social network" effects on weight status and obesity (Halliday and Kwak, 2009; Fowler and Christakis, 2008; Renna *et al.*, 2008; Trogdon *et al.*, 2008; Christakis and Fowler, 2007).

Peer groups have been variously defined in the literature. Broad definitions of peer groups are based on neighborhood and geographic proximity (Evans *et al.*, 1992; Case and Katz, 1991) or school and/or grade levels (Clark and Loheac, 2007; Lundborg, 2006; Powell *et al.*, 2005; Gaviria and Raphael, 2001). One of the novel goals of our current study is to simultaneously investigate not only the effects of one's self-nominated peers, but also the effect of perceived supports from other groups constituting one's broader social environment on adolescent psychological-well being, an increasingly important outcome that has yet to receive substantial attention in the health economics literature.

Given the absence of a natural experiment within Add Health (our database) and the lack of good instruments for social support, the emphasis of our paper is not purging endogeneity or selection issues entirely from the model, but on quantifying and comparing the relative effects of different types of social groups. Nonetheless, the inclusion of a rich set of control variables should help to minimize potential endogeneity issues. Also, the tendency for endogeneity with respect to adolescents is likely to be less problematic when looking at school, parental or neighborhood effects. Nonetheless, for peer groups (the social network component that is most likely to suffer from endogeneity), we implement the IV method in addition to the OLS estimation.

Mental health is a key indicator of an adolescent's current and future well being. Ill mental health could lead to mental disorders, poor general health, risk behavioral outcomes, disruptive and criminal behaviors (Fletcher, 2009; Needham, 2007; Saluja *et al.*, 2004), decreased human capital accumulation and thus lower academic outcomes and lower socioeconomic status (Fletcher, 2008, 2007; Ettner *et al.*, 1997). The adolescent transition period linking the childhood to adulthood life-cycle stages is critical as individuals experience major physical, cognitive, emotional, and social changes that highlight the importance of protective factors during that period (Dumont and Provost, 1998; Cohen, 1987; Cohen and Wills, 1985). However, establishing a causal effect on an individual's mental health is more challenging than for other health outcomes (Kawachi and Berkman, 2001).

The goals of our innovative study are multi-dimensional and integrative. Foremost, using data from the National Longitudinal Survey of Adolescent Health (Add Health), a US nationally representative sample of young adults initially in grades 7 through 12, we add to the growing literature by theorizing, specifying, and econometrically estimating a model that includes peer effects and the effects of support from school, peers, parents, and the neighborhood on teenage psychological well-being, for males and females separately, and for three different cohorts of a nationally representative dataset. Second, the empirical work on peer effects to date has focused mostly on academic and risk behavioral outcomes of adolescents, with little or no attention on the increasingly important mental health outcomes. Therefore, our study fills the increasingly important void on the relevant aspects of adolescent mental health research. Third, the limited studies on social network groups as determinants of adolescent mental well-being tend to focus on each group separately and most of these studies are cross-sectional, constrained by additional data issues, or cover a very specific or narrowly defined sub-population. Our current study is not so constrained.

More specifically, our study's core innovation lies in the conceptual testing of the hypothesis that an enlarged multi-dimensional social network encompasses peers, parents, teachers, and neighborhood as we strive to isolate and compare the effects of each of these groups on adolescent psychological well being. The richness and longitudinal nature of the data enable us to exploit relevant information on support from multiple social groups, and investigate psychological well-being as an outcome. Moreover, it allows us to control for a rich set of covariates at the individual level. We use two alternative indicators as our outcome variables. First is the Center for Epidemiological Studies Depression (CES-D) scale, and second is the abridged version of the Rosenberg Self Esteem (RSE) scale. Peers' psychological well-being is generated in a similar fashion and averaged over up to 10 self-nominated friends. We create indices for support from peers, teachers, parents, and residential neighborhood using survey data on the respondents' perceptions about these groups. To allow for theoretically plausible differential effects by gender and age, separate models are estimated for males and females, and for adolescents in grades 7-8, 9-10, and 11-12.

We find significant peer effects for the CES-D score. However, when we also control for support from other social groups, peer effects become insignificant, suggesting that the appropriately measured adolescent social environment consists not just of peers, but also school, parents, and neighborhood. We find significant effects of support from school, and parents on the CES-D score and significant effects of support from school, parents, and neighborhood on the RSE score. In general, the effects are higher for females than for males and are also higher

for the middle cohort. We obtain similar results when using instrumental variables to control for the endogeneity of peer group formation.

The rest of the paper proceeds as follows. Section 2 discusses the data, section 3 lays out our empirical strategy, section 4 presents and discusses the empirical results, and section 5 offers some concluding remarks on the unique insights novel to this study.

2. Data

We use data from the National Longitudinal Survey of Adolescent Health (Add Health) that was conducted by the Carolina Population Center of the University of North Carolina at Chapel Hill. Add Health is a longitudinal survey of nationally representative sample of young adults and is one of the largest national surveys containing detail information about adolescents' personal characteristics, daily activities, families, friends, romantic partners, health, risk behavior, schools, neighborhoods, and communities.¹ The initial wave of interviews was conducted in 1994/95 when adolescents were in grades 7 through 12. There were follow-up interviews in three subsequent waves (1996, 2002, and 2008). In addition, there are separate questionnaires for parents, school administrators, siblings, and self-nominated friends. The richness of the data allows us to control for a large set of individual, family, school, and environmental characteristics in our analysis. Our outcome variables and the independent variables in our models are all derived from Wave I data.

2.1 Outcome variable – adolescent psychological well-being

We use two different measures of adolescent psychological well-being. For the first measure, we rely on nineteen of the twenty questions from the Center of Epidemiological Studies Depression (CES-D) scale. Adolescents were asked to report how often in the past week they experienced each of the nineteen symptoms, and received a score between 0 and 3 for each question. A score of 0 indicates "never or rarely", 1 indicates "sometimes", 2 indicates "a lot of the time", and 3 indicates "most of the time or all of the time". The scoring of the positive items was reverse coded. The CES-D scale, constructed by adding up the values from each of the nineteen questions (thus ranging between 0 and 57), has been widely used in past research to examine depression (Fletcher, 2009, 2008; Roberts *et al.*, 1991; Radoff, 1977). Thus, a high CES-D score indicates poor mental well-being. The second measure of adolescent mental-well being is the abridged version of the Rosenberg Self-Esteem (RSE) Scale. We use 5 of the 10 questions originally described by Rosenberg (1965). The abridged version has also been used by many researchers as a measure of psychological well-being (Rees and Sabia, 2010; Sabia and Rees, 2008; Shrier *et al.*, 2001). Respondents were asked how much they agree or disagree to each of the five items and received a score between 1 and 5 for each of the items. A score of 1 indicates "strongly disagree", 2 indicates "disagree", 3 indicates "neither agree nor disagree", 4 indicates "agree", and 5 indicates "strongly agree". The abridged RSE scale is constructed by adding up the responses to each of the 5 questions and the scores range between 0 and 25, where a higher value indicates better mental well-being².

2.2 Peer groups

One of the distinct features of the Add Health data set is the extensive information available about friendship networks. Adolescents were asked to nominate up to five male and five female friends, both in the same school and outside of school. The nominated friends who were in the same school were also interviewed, but those outside school were not. Thus we do not include friends who do not belong to the sample schools in our analysis. Adolescents were not constrained to nominate ten friends and in most cases, less than five male and five female friends were nominated. There are also cases where no friend was nominated. The friendship nominations could also include romantic partners. Using data on friends nominated in Wave I, we constructed average friends' scores on CES-D and RSE scales in a similar fashion to that used for individual respondents. In addition to these variables, we created a peer support measure using survey responses regarding one's perceptions about friends' caring nature (with a score of 1 indicating "not at all" and 5 indicating "very much") and how much time one

¹ For a comprehensive description of the Add Health data set, see Udry (2003).

² To construct both the CES-D and RSE scales, we only use those items that are available within the data set. Given that the CES-D and RSE scores are aggregates of various items indicating psychological well-being and not just the individual items, it could be possible that there is a social multiplier effect on psychological well-being. In the literature on psychological well-being, the aggregate scores on CES-D and RSE have been used, thus we restrict our analysis to these scores and not on the individual items that constitute these scales.

spends with friends. In consideration of a lack of natural scale for these items, we use factor analysis to generate an index for peer support.

2.3 School support

All respondents were asked questions about their progress and general feelings about school. We created the school support index based on answers to 6 questions, again using factor analysis. Students were asked to evaluate on a scale of 1 through 5 how much they agree or disagree to each of these questions. A score of 1 indicates 'strongly agree', 2 indicates 'agree', 3 indicates 'neither agree nor disagree', 4 indicates 'disagree' and 5 indicates 'strongly disagree'. The answers to questions regarding negative aspects of the school environment were reverse coded to maintain consistency in the meaning of responses. Thus, a higher value of school support index indicates higher support from school and a lower value indicates lower support.

2.4 Parental support

We relied on adolescents' perceived relationship with their parents in creating the parental support index. Specifically, we utilized survey responses regarding the degree to which an individual agreed with certain statements, again each on a scale of 1 through 5, where 1 indicates 'strongly agree' and 5 indicates 'strongly disagree'. We used 5 such items for relationship with mother and 3 for relationship with father, and used factor analysis to compute the combined parental support index.

2.5 Neighborhood support

For the neighborhood support index we relied on answers to 6 questions regarding respondents' perception about them being a part of the neighborhood. The scores of two of these, as before, ranged on a scale of 1 through 5, and the remaining 4 were binary responses. We construct the neighborhood support index using factor analysis on these 6 items. A higher score indicates higher support from neighborhood and a lower score indicates lower support.

In other words, a lower CES-D score and a higher RES score for peers indicates better psychological well being of friends, and for all of our support groups, namely peers, school, parents, and neighborhood, a higher value indicates higher support from each of these groups.³

2.6 Other independent variables

In our regression analysis, we control for a wide array of adolescent characteristics and behaviors at or before the time of the first survey. We include demographic variables, namely age, gender, racial background, and number of siblings. Since the number of reported friends might itself be influenced by one's perceived degree of peer support, we control for the number of friends one has nominated by including a dummy variable indicating nomination of more than one friend. Adolescents were queried in detail about their school and daily activities which enables us to include the number of days they skipped school without an excuse, indicators of whether they repeated any grade, had difficulty paying attention in class, had difficulty getting homework done, and number of hours spent watching television. We also control for their GPAs at the time of the initial survey, and indicators of whether they played sports, went to church, whether they indulged in risky behaviors like smoking, drinking, drug use and sexual activities, and whether they were obese or overweight. Moreover, we include an index representing their general health. We further include mother's education levels, whether mother and father work full time, total family income, information about friction in parents' relationship, and parents' alcohol consumption. Rather than being self-reported by respondents, information about parents was mostly obtained from the parent questionnaire collected in Wave I.

2.7 Sample selection

We draw our sample from the 20,745 adolescents who were interviewed for the initial in-home survey. While nominating friends, we drop friends who did not go to the sample schools as the respondents. Finally, conditioning on non-missing values for all of our included covariates resulted in a sample size of 1,909. Furthermore, in parts of our analysis we divide individuals by gender, and in three different groups based on grades 7-8, 9-10, and 11-12.

³ It should be noted that while the indices for all support variables were created using a factor analysis, however, the standard CES-D and RSE scores were used in our analysis. We also ran our analysis where a factor analysis was conducted to create the CES-D and RSE scores, and found similar results. We restrict our analysis using the standard CES-D and RSE scores for consistency with the literature. However, we use the factor analyzed scores on all other support variables to emphasize the importance of the item with the highest factor loading.

3. Methods

We seek to establish the effects on peer groups' psychological well-being and perceived support from peers, schools, parents and neighborhoods on adolescent psychological well-being.

Our basic model takes the following form:

$$Y = \beta Peer + \alpha_1 PR + \alpha_2 SCH + \alpha_3 PAR + \alpha_4 NGH + X + \varepsilon$$

where

Y = CES-D and RSE scores, $Peer$ = CES-D or RSE of peers, PR = peer support, SCH = school support, PAR = parental support, NGH = neighborhood support, X is a set of covariates, and ε is a random error term.

We also investigate possible interactions among each of the support group variables, in which case our model takes the following form:

$$Y = \beta Peer + \alpha_1 PR + \alpha_2 SCH + \alpha_3 PAR + \alpha_4 NGH + \alpha_{11}(PR)^2 + \alpha_{22}(SCH)^2 + \alpha_{33}(PAR)^2 + \alpha_{44}(NGH)^2 + \alpha_{12}(PR)(SCH) + \alpha_{13}(PR)(PAR) + \alpha_{14}(PR)(NGH) + \alpha_{23}(SCH)(PAR) + \alpha_{24}(SCH)(NGH) + \alpha_{34}(PAR)(NGH) + X + \varepsilon$$

In order to better compare the magnitudes of influence of support from each social group, we normalize the indexes for peer mental health and peer, school, parents, and neighborhood support to a mean of zero and a standard deviation of one. Thus, the marginal effects of support from each of the groups reduce to simply α_1 , α_2 , α_3 , and α_4 respectively. These represent the effects on one's own CES-D or RSE scores of increasing their support from one group (or CES-D or RSE scores of one's peers) by one standard deviation.

Beyond investigating possible nonlinearities and interactions of the effects, we also analyze the impact on psychological well-being for males and females separately and for different age groups. Since adolescents go through physical, psychological, and social changes while growing up, males and females are likely to react differently. Moreover, they react differently at different age groups. Consequently, we divide our sample into three categories: those in grades 7 and 8, those in grades 9 and 10, and the oldest cohort of those in grades 11 and 12 during the time of the initial survey.

In addition to carrying out OLS regressions, since peer group formation is likely to be endogenous, we use an IV approach with information on friend's parents' characteristics as instruments. Specifically, we use information about friction in friends' parents' relationship and their parents' alcohol consumption as instruments. Unsuccessful attempts were made at finding valid instruments for the other social groups, namely school, parents, and neighborhood. We therefore necessarily treat these variables as being exogenous. However, the effect of endogeneity is likely to be less severe than in the case of direct peer effects, since a young adult either cannot or typically do not choose their parents, school, or neighborhood. Further, our hope is that with the inclusion of a rich set of individual, family and school level controls, any remaining biases will be minimal.

4. Empirical Results

4.1 Ordinary Least Squares (OLS) estimation results

Table I presents the baseline OLS results for the CES-D and RSE scores for the full sample. The first column for each outcome variable presents the results for the restricted model with only the peer effects and covariates. Significant peer effects are observed on the CES-D score but not on the RSE score, suggesting that the less mentally well one's friends are, the less mentally well the individual is. To test our hypothesis that an enlarged adolescent social environment encompasses peers, school, parents, and neighborhood, we include perceived support variables from each of these groups in our unrestricted model along with the peer effect variable. The results are presented in the second column of both outcome variables. We find that peer effects are no longer statistically significant, while more support from school and parents significantly reduces the CES-D score and increases the RSE score, implying reported support from these groups positively impacts adolescents' psychological well being. Neighborhood support has a positive significant impact only on the RSE score. We carried out the likelihood ratio Chi-square test (see bottom of Table I) to compare the fit of the restricted and unrestricted models. The restricted (peer effects only) model was strongly rejected in favor of the more general specification encompassing the broader set of social ties influencing adolescent mental well being.

The insightful estimation results for several of the covariates are also worth noting. In general, according to their CES-D and RSE scores, males are more likely to be psychologically better off, while Hispanics and Asians tend to have higher CES-D scores (suggesting lower well being). It is interesting (and perhaps surprising) to note that

nominating more than one friend significantly increases the CES-D score and decreases RSE score. Also, mother's education level significantly reduces the CES-D score while father's work status reduces the RSE score. Other covariates like difficulty paying attention in school, trouble getting homework done, using drugs and indulging in sexual activities significantly increases one's CES-D score and reduces the RSE score. Cumulative GPA is also negatively associated with the CES-D score. Furthermore, a good general health has negative and statistically significant effects on the CES-D score and a positive and significant effect on the RSE score, as expected.

We now expand our regression model to include first order interaction terms across the support groups.⁴ These results are shown in Table II. The main findings from each model are very similar except for significant peer effects for the CES-D score and a positive and significant effect of the neighborhood support on the RSE score. In terms of magnitudes (normalized to represent the effect of a standard deviation change), perceptions about school support and parent support remain the primary drivers of adolescent psychological well-being. For CES-D score, we also observe beneficial interactions between support from school and parents, as well as peers and parents, and peers and school. The interaction between peers and neighborhood, however, significantly increases CES-D score. The interaction terms appear to be less relevant in terms of explaining RSE score, although, surprisingly, the interaction term involving peers and parents significantly reduces the RSE score. However, despite the statistical significance of some of the interaction terms in both outcome specifications, their inclusion did not greatly change the coefficient estimates of the solitary support variables.

We next investigate how our main regression results may differ across gender or age. Table III presents the results for males and females separately. We find similar effects across gender. Both peers' well being measures and perceived support from peers are statistically insignificant in both the female and male regressions. School and parental support remain as important predictors of psychological well being for both males and females. However, the relationship between parental support and either outcome measure is stronger for females than for males. On the other hand, unlike females, males' RSE score is influenced positively by neighborhood support.

In order to investigate the possibility that each component of social environment affects psychological well-being differentially depending on an adolescent's age, we carried out a similar analysis using sub-samples of varying grade levels. The results for both the CES-D and RSE scores are presented in Table IV. Some differences across grade levels are found. Peer effects are significant for the CES-D score for adolescents in grades 7 – 8 and for RSE score for those in grades 9 – 10, but are highly insignificant for both measures for the oldest cohort. Interestingly, peer support for the RSE score has a positive and significant effect for those in grades 7 – 8 and a negative and significant effect for those in grades 9 – 10. School and parental support have negative and significant effects on the CES-D score for all cohorts. The same variables similarly influence RSE score, but not for the youngest cohort. Although smaller in magnitude in our baseline regressions, we now see that the effect of neighborhood support is rather significant and isolated to the oldest cohort, those in grades 11 and 12. One possible explanation for the generally observed smaller effects for individuals in grades 7 – 8 is that these younger adolescents simply do not face the same social pressures as those in high school who are closer to being young adults. Another possibility is that the variance in actual social support environments is smaller for the younger group.

4.2 Instrumental Variables (IV) estimation results

Our results so far show no significant effects of peer group using CES-D and RSE scores on one's scores except for those individuals in grades 7 – 8. Furthermore, the point parameter estimates for this variable have generally been smaller than those found on the other social support variables. As previously discussed, peer group formation is likely to be endogenous, which would lead to biased estimates. With a large number of control variables, we have attempted to minimize this bias. However, to the extent an endogeneity problem could remain, it is likely to bias upward the estimates, suggesting that the generally insignificant or small peer effects we have found would tend to be reasonable indicators of the linkage of friends' psychological well being and one's own well being, at least as reflected in concurrent CES-D or RSE measures.

Nonetheless, we now turn to an IV approach. We use information from two survey question responses as instruments: 1) information about friction in friends' parents' relationship; and 2) alcohol consumption of friends' parents. In the parent questionnaire, parents were asked about how much they fight with each other and how often they consume alcohol. These responses were averaged over up to ten reported friends to obtain the

⁴ Only the coefficients for the support groups are reported, however the full set of results is available upon request.

instruments for peer group CES-D and RSE scores. In order to be valid instruments, these variables must be correlated with friends' scores on the CES-D and RSE scales (conditional on all of the covariates), and must be otherwise unrelated to the individuals' scores. The instruments are highly significant in the first stage for most of the specifications. While the exogeneity assumption of the instruments is not directly testable, the two instruments pass the test for over-identifying restrictions. The p -values of the Sargan test are greater than 0.1 in all cases, implying a failure to reject the null hypothesis.

Table V presents the results for the full sample.⁵ Encouragingly, the results are generally consistent with those found using OLS. There is no evidence of peer effects on either CES-D or RSE score, and the school and parental support variables remain as significant predictors of adolescent psychological well-being. Moreover, neighborhood support has a marginally positive and significant effect on the RSE score.

5. Conclusion

Mental or psychological health is a key indicator of adolescent well being. Ill mental health may lead to mental disorders, delinquent and risky behaviors, and poor academic and economic outcomes, among others. As a result it is essential to understand the correlates of ill mental health and how influences from social groups could affect adolescent psychological well-being. While past literature has mostly focused on the importance of social groups on adolescent outcomes such as academic achievement, risk behavior, and obesity, mental health as an increasingly pivotal health outcome has received anemic attention. Moreover, most of the literature focuses on social groups separately and not on all of the social influences and their interactions at the same time. Our paper attempts to fill these important voids in the literature.

Specifically, this paper investigates the effects of an enlarged adolescent social environment comprising of peers, schools, parents, and neighborhoods on adolescent psychological well-being measured by the CES-D and RSE scores. Using data from the National Longitudinal Survey of Adolescent Health, one of the largest national longitudinal data set of young adults, allows us to control for a rich set of covariates including demographics, detail daily activities, risk behaviors, and parental characteristics. To investigate possible heterogeneous effects, we also divide our sample into males and females and three groups comprising adolescents in grades 7 – 8, 9 – 10, and 11 – 12. Apart from the baseline OLS estimations, we also construct and estimate models including interaction terms and using an IV approach.

We find evidence that an adolescent's perceived support from schools and parents are important predictors of their mental well-being. Moreover, the effects of each of these support groups are approximately equal in magnitude (in terms of relative deviations within their distributions of responses). Conversely, measures of peers' mental well-being and peer support are not significant predictors of psychological well-being when controlling for one's larger social support environment, when using either OLS or IV approaches. The estimated effects of school support and parental support are greatest for adolescents in grades 9 – 10, and also substantial in grades 11 – 12, perhaps suggesting that schools and parents are more important during the years involving transition into high school and young adulthood.

This study is a first successful attempt at understanding the influences of an enlarged social environment on adolescent psychological well-being, in which we have aimed to identify the individual importance and relative magnitudes of the effects of multiple groups that may offer (or fail to offer) psychological support for adolescents. However, we caution that the psychological well-being indicators, namely CES-D and RSE scores in the Add Health survey data are self-reported and so should be interpreted in this light. Moreover, the perceived social support measures, although self-reported, are treated as exogenous due to the lack of adequate instrumental variables. Despite our inclusion of a rich set of covariates aimed at minimizing potential selection or endogeneity issues, our model may still contain some of the effects. Thus, future research should strive to deal with the potential endogeneity of these groups or identify and use other nationally representative data sources (the Add Health database in our study is also frequently used by researchers to investigate peer-group effects on

⁵ Only the coefficients for the support groups are reported, however the full set of results is available upon request. First stage results are not reported, but are available upon request.

defined outcomes) if they contain clinically measured or exogenous proxies of social support groups. Such other data sets are very rare, however.

REFERENCES

- Arcidiacono P, Nicholson S, 2005. Peer effects in medical school. *Journal of Public Economics*, 89: 327-350.
- Case A, Katz L, 1991. The company you keep: The effects of family and neighborhood on disadvantage youths. NBER WP 3705.
- Christakis NA, Fowler JH, 2007. The spread of obesity in a large social network over 32 Years. *The New England Journal of Medicine*, 357: 370-379.
- Clark AE, Loheac Y, 2007. It wasn't me, it was them! Social influence in risky behavior by adolescents. *Journal of Health Economics*, 26: 763-784.
- Cohen F, 1987. Measurement of coping. In Kasl, S. V. and C. L. Cooper (eds.), *Stress and Health: Issues in Research Methodology*. Wiley, New York, 283-303.
- Cohen S, Wills TA, 1985. Stress, social support, and the buffering hypothesis. *Psychology Bulletin*, 98: 310-357.
- Dumont M, Provost A, 1999. Resilience in adolescents: Protective role of social support, coping Strategies, self-esteem, and social activities on experience of stress and depression. *Journal of Youth and Adolescence*, 28: 343-363.
- Ettner S, Frank F, Kessler R, 1997. The impact of psychiatric disorders on labor market outcomes. *Industrial and Labor Relations Review*, 51: 64-81.
- Evans WN, Oates WE, Schwab RM, 1992. Measuring peer group effects: A study of teenage behavior., *The Journal of Political Economy*, 100: 966-991.
- Fletcher JM, 2009. Childhood mistreatment and adolescent and young adult depression. *Social Science and Medicine*, 68: 799-806.
- Fletcher JM, 2008. Adolescent depression: Diagnosis, treatment, and educational attainment. *Health Economics*, 17: 1215-1235.
- Fletcher JM, 2007. Adolescent depression and educational attainment: Evidence using sibling fixed effects. Yale University Working Paper.
- Foster G, 2006. It's not your peers, and it's not your friends: Some progress toward understanding the educational peer effect mechanism. *Journal of Public Economics*, 90: 1455-1475.
- Fowler JH, Christakis NA, 2008. Estimating peer effects on health in social networks. *Journal of Health Economics*, 27: 1-16.
- Gaviria A, Raphael S, 2001. School-based peer effects and juvenile behavior. *The Review of Economics and Statistics*, 83: 257-268.
- Halliday TJ, Kwak S, 2009. Weight gain in adolescents and their peers. *Economics and Human Biology*, 7: 181-190.
- Hanushek EA, Kain JF, Markman JM, Rivkin SG, 2003. Does peer ability affect student achievement? *Journal of Applied Econometrics*, 18: 527-544.
- Harris JE, Lopez-Valcarcel BG, 2008. Asymmetric peer effects in the analysis of cigarette smoking among young people in the United States, 1992-1999. *Journal of Health Economics*, 27: 249-264.

- Hoxby C, 2000. Peer effects in the classroom: Learning from gender and race variation. NBER, WP 7867.
- Kawachi I, Berkman LF, 2001. Social ties and mental health. *Journal of Urban Health*, 78: 458-467.
- Knowtheteens, 2011, February 4. Teen mental health: Statistics of depression and suicide. [<http://www.knowtheteens.com/teen-mental-health-statistics-of-depression>]
- Lundborg P, 2006. Having the wrong friends? Peer effects in adolescent substance use. *Journal of Health Economics*, 25: 214-233.
- Needham B, 2007. Gender differences in trajectories of depressive symptomatology and substance use during the transition from adolescence to young adulthood. *Social Science and Medicine*, 65: 1166-1179.
- Powell LM, Tauras JA, Ross H, 2005 The importance of peer effects, and cigarette prices and tobacco control policies for youth smoking behavior. *Journal of Health Economics*, 24: 950-968.
- Radloff LS, 1977. The CES-D Scale: a self report depression scale for research in the general population. *Applied Psychological Measurement*, 1: 385-401.
- Rees DI, Sabia JJ, 2010. Exercise and adolescent mental health: New evidence from longitudinal data. *Journal of Mental Health Policy and Economics*, 13: 13-25.
- Renna F, Grafova IB, Thakur N, 2008. The effect of friends on adolescent body weight. *Economics and Human Biology*, 6: 377-387.
- Roberts R, Lewinsohn P, Seeley J, 1991. Screening for adolescent depression: a comparison of depression scales. *Journal of the American Academy for Child Adolescent Psychiatry*, 30: 58-66.
- Robertson D, Symons J, 2003. Do peer groups matter? Peer group versus schooling effects on academic achievement. *Economica*, 70: 31-53.
- Rosenberg M, 1965 *Society and the Adolescent Self-Image*. Princeton University Press, Princeton, NJ.
- Sabia JJ, Rees DI, 2008. The effect of adolescent virginity status on psychological well-being. *Journal of Health Economics*, 27: 1368-1381.
- Sacerdote B, 2001. Peer effects with random assignment: Results for Dartmouth roommates. *The Quarterly Journal of Economics*, 116: 681-704.
- Saluja G, Iachan R, Scheidt P, Overpeck M, Sun W, Giedd J, 2004. Prevalence of and risk factors for depressive symptoms among young adolescents. *Archives of Pediatrics and Adolescent Medicine*, 158: 760-765.
- Shrier LA, Harris SK, Sternberg M, Beardslee WR, 2001. Associations of depression, self-esteem, and substance use with sexual risk among adolescents. *Preventive Medicine*, 33: 179-189.
- Trogdon JG, Nonnemaker J, Pais J, 2008. Peer effects in adolescent overweight. *Journal of Health Economics*, 27: 1388-1399.
- Udry JR, 2003. *The National Longitudinal Survey of Adolescent Health (Add Health), Waves I and II, 1994-1996; Wave III, 2001-2002*. Carolina Population Center, University of North Carolina at Chapel Hill, Chapel Hill, NC.
- Zimmerman DJ, 2003. Peer effects in academic outcomes: Evidence from a natural experiment. *The Review of Economics and Statistics*, 85: 9-23.

Table I: OLS Estimation Results For Full Sample (with & without support groups)

	CES-D Scale		RSE Scale	
Peer effects	0.310** (0.136)	0.185 (0.130)	0.080 (0.051)	0.037 (0.049)
Peer support		0.019 (0.135)		-0.005 (0.052)
School support		-1.152** (0.155)		0.253** (0.060)
Parental support		-1.416** (0.144)		0.509** (0.056)
Neighborhood support		-0.093 (0.144)		0.138** (0.056)
One friend		-1.161** (0.324)	0.068 (0.131)	
More than one friend	1.360** (0.340)			-0.004 (0.126)
Age	0.035 (0.097)	-0.042 (0.093)	0.001 (0.037)	0.034 (0.036)
Males	-2.207** (0.274)	-1.521** (0.266)	1.021** (0.105)	0.804** (0.103)
Blacks	-0.141 (0.546)	-0.283 (0.524)	0.498** (0.209)	0.555** (0.203)
Asians	3.524** (0.581)	3.238** (0.554)	0.262 (0.222)	0.372* (0.215)
Hispanics	2.100** (0.578)	2.052** (0.553)	-0.205 (0.220)	-0.154 (0.214)
Other races	8.055 (5.803)	6.253 (5.542)	-6.279** (2.226)	-5.881** (2.155)
Siblings	0.059 (0.113)	-0.038 (0.108)	-0.156** (0.043)	-0.133** (0.042)
Mother's education	-0.155** (0.072)	-0.153** (0.069)	-0.006 (0.027)	-0.009 (0.026)
Mother works	0.487 (0.337)	0.649** (0.321)	-0.121 (0.129)	-0.184 (0.125)
Father works	0.693 (0.607)	0.511 (0.579)	-0.687** (0.232)	-0.616** (0.225)
Family income	-0.004 (0.003)	-0.004 (0.03)	0.001 (0.001)	0.001 (0.001)
GPA	-0.523** (0.220)	-0.591** (0.210)	-0.032 (0.084)	0.000 (0.082)
Skips school	0.022 (0.026)	0.021 (0.025)	0.013 (0.010)	0.014 (0.009)
Grade repeated	0.922** (0.396)	0.880** (0.378)	0.441** (0.152)	0.456** (0.147)

(continued)

Table I (contd.): OLS Estimation Results For Full Sample (with & without support groups)

	CES-D Scale		RSE Scale	
Attention problem	1.383** (0.167)	0.966** (0.162)	-0.470** (0.064)	-0.333** (0.063)
Trouble with HW	0.725** (0.167)	0.437** (0.161)	-0.184** (0.064)	-0.078 (0.062)
Watch TV	0.040** (0.010)	0.033** (0.010)	-0.006 (0.004)	-0.004 (0.004)
Private School		0.205 (0.499)	-0.639** (0.199)	-0.865** (0.194)
Urban	-0.608 (0.507)	-0.413 (0.483)	0.288 (0.194)	0.247 (0.188)
Rural	-0.589 (0.380)	-0.200 (0.364)	0.211 (0.146)	0.113 (0.142)
West	1.653** (0.492)	1.614** (0.468)	0.073 (0.189)	0.102 (0.182)
South	1.526** (0.392)	1.322** (0.374)	-0.176 (0.151)	-0.116 (0.146)
Northeast	0.567 (0.468)	0.840* (0.447)	0.284 (0.179)	0.235 (0.174)
Smoke	0.237 (0.449)	-0.294 (0.431)	0.358** (0.172)	0.506** (0.167)
Alcohol	0.451 (0.333)	-0.110 (0.321)	0.001 (0.128)	0.185 (0.125)
Drugs	0.954** (0.394)	0.804** (0.376)	-0.772** (0.151)	-0.703** (0.146)
Sex	1.367** (0.372)	1.377** (0.355)	-0.024 (0.142)	-0.032 (0.138)
Plays sports	-0.135 (0.283)	0.034 (0.270)	0.044 (0.108)	-0.015 (0.105)
Goes to church	-0.522* (0.286)	-0.324 (0.273)	0.153 (0.109)	0.095 (0.106)
Health	-1.349** (0.173)	-1.055** (0.166)	0.563** (0.066)	0.467** (0.064)
Obese/Overweight	-1.094** (0.313)	-1.018** (0.299)	-0.133 (0.120)	-0.167 (0.116)
Friction among parents	0.493** (0.210)	0.616** (0.200)	-0.057 (0.080)	-0.097 (0.078)
Parents' alcohol consumption	-0.119 (0.139)	-0.096 (0.132)	0.127** (0.053)	0.115** (0.051)
N	1909	1909	1907	1907
R²	0.311	0.378	0.194	0.252
F Stat. (p-value)	24.24 (0.000)	29.20 (0.000)	12.93 (0.000)	16.17 (0.000)
LR Test χ^2 (p-value)		194.93 (0.000)		141.83 (0.000)

** indicates significance at 5% level, * indicates significance at 10% level

Table II: OLS Results For Full Sample With Interaction Terms

	CES-D Scale	RSE Scale
Peer effects	0.217* (0.129)	0.029 (0.049)
Peer support	0.118 (0.144)	-0.048 (0.056)
School support	-0.916** (0.166)	0.312** (0.064)
Parental support	-1.525** (0.173)	0.395** (0.067)
Neighborhood support	-0.211 (0.163)	0.187** (0.063)
Peers & school	-0.282** (0.145)	-0.037 (0.056)
Peers & parents	-0.448** (0.132)	-0.103** (0.051)
Peers & neighborhood	0.298** (0.139)	0.014 (0.054)
School & parents	-0.301** (0.152)	0.091 (0.059)
School & neighborhood	0.176 (0.160)	-0.025 (0.062)
Parents & neighborhood	0.152 (0.136)	-0.088* (0.053)
N	1909	1907
R²	0.392	0.264
F Stat. (p-value)	24.49 (0.000)	13.63 (0.000)

Notes: Regressions also contained full set of covariates, as in Table I. ** indicates statistical significance at 5% level or better, and * indicates statistical significance at 10% level.

Table III: OLS Estimation Results By Gender

	CES-D Scale		RSE Scale	
	Males	Females	Males	Females
Peer effects	0.260 (0.164)	0.114 (0.205)	-0.033 (0.063)	0.110 (0.077)
Peer support	-0.231 (0.173)	0.138 (0.210)	0.031 (0.067)	-0.011 (0.082)
School support	-1.372** (0.204)	-0.905** (0.244)	0.215** (0.079)	0.454** (0.095)
Parental support	-1.019** (0.195)	-1.649** (0.219)	0.322** (0.076)	0.562** (0.085)
Neighborhood support	0.071 (0.181)	-0.386 (0.242)	0.306** (0.070)	-0.046 (0.094)
N	1016	893	1014	893
R²	0.398	0.408	0.221	0.295
F Stat. (p-value)	17.52 (0.000)	15.54 (0.000)	7.49 (0.000)	9.40 (0.000)

Notes: The regressions also contained full set of covariates, as in Table I.

** indicates statistical significance at 5% level or better, and * indicates statistical significance at 10% level.

Table IV: OLS Estimation Results, by Grade Level

	CES-D Scale			11-	RSE Scale		
	Grades 7-8	Grades 9-10	Grades 12		Grades 7-8	Grades 9-10	Grades 12
Peer effects	0.797** (0.265)	0.153 (0.211)	0.002 (0.194)		-0.114 (0.109)	0.160** (0.081)	0.023 (0.073)
Peer support	0.287 (0.291)	-0.221 (0.219)	0.206 (0.212)		0.288** (0.129)	-0.208** (0.084)	0.041 (0.082)
School support	-0.919** (0.332)	-1.844** (0.275)	-1.028** (0.235)		-0.131 (0.147)	0.691** (0.105)	0.161* (0.090)
Parental support	-1.451** (0.331)	-1.576** (0.238)	-1.472** (0.212)		0.219 (0.147)	0.720** (0.091)	0.541** (0.081)
Neighborhood support	0.198 (0.291)	0.211 (0.268)	-0.540** (0.213)		0.132 (0.129)	-0.060 (0.103)	0.307** (0.082)
N	300	674	935		300	674	933
R²	0.530	0.443	0.402		0.326	0.376	0.280
F Stat. (p-value)	8.01 (0.000)	13.33 (0.000)	16.34 (0.000)		3.43 (0.000)	10.10 (0.000)	9.42 (0.000)

Notes: Regressions also contained full set of covariates, as in Table I. ** indicates statistical significance at 5% level or better, and * indicates statistical significance at 10% level.

Table V: 2SLS Estimation Results

	CES-D Scale	RSE Scale
Peer effects	0.992 (2.980)	-1.905 (1.353)
Peer support	0.015 (0.135)	0.090 (0.096)
School support	-1.109** (0.222)	0.327** (0.095)
Parental support	-1.385** (0.185)	0.611** (0.103)
Neighborhood support	-0.081 (0.151)	0.145* (0.075)
N	1909	1907
R²	0.365	0.360
F Stat. (p-value)	28.56 (0.000)	8.93 (0.000)
Sargan Statistic	0.491	1.238
(p-value)	(0.483)	(0.265)

Notes: Regressions also contained the full set of covariates, as in Table I.

** indicates statistical significance at 5% level or better, and * indicates statistical significance at 10% level.