

Peer Effects in Adolescent Mental Health

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Abstract

This paper investigates the impact of peer mental health on adolescents' mental health, academic achievement, physical health, and behavioral outcomes. Mental illness is prevalent among children and adolescents, and can have significant consequences on various outcomes. To estimate peer effects, the study uses the friends-of-friends method, finding that a one standard deviation increase in the mental health index of friends is associated with a 0.73 standard deviation increase in one's own mental health. Additionally, the study reveals significant negative effects of peer mental health on academic achievement, physical health, and risky behavior. Overall, this research highlights the importance of understanding peer effects in mental health and its implications for adolescent well-being.

JEL Classification: D85, Z13, J0

Keywords: Social network; Peer effects; Instrumental variable; Add Health dataset

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1 INTRODUCTION

Research on child mental health recognizes the prevalence of mental illness among children and adolescents. A large number of children suffer from some form of mental illnesses. Approximately one third of school children reported some sort of mental health challenges (United States Department of Health and Human Services 2021) and about one in five adults lived with mental illness in 2020 (Center for Behavioral Health Statistics and Quality 2022).¹ Also, social networks and the role of peers is important to many policies, such as busing and affirmative action. Peer effects have been studied to explain the variation in crime rates (Glaeser, Scheinkman, and Sacerdote 2003), school achievements (Sacerdote 2001), academic cheating (Carrell, Malmstrom, and West 2008). Consequently, understanding peer effects in adolescent mental health has significant consequences on academic achievement, behavior, and policies targeting youth's mental health.

Estimating peer effects is marred with endogeneity (Manski 1993). One approach to estimate peer effects is random assignment (Sacerdote 2001; Zimmerman 2003). I use an instrumental variable approach that takes advantage of the unique network data that Add Health provides by using the mental health score of friends' friends of a student who are not their friends (henceforth friends-of-friends) as an instrument for peers' mental health. Mental health can have numerous consequences on academic, health, behavioral, and labor market outcomes.² Moreover, the economics literature documents the existence of peer effects on many outcomes. Economist have shown the existence of peer effects in risky behavior (Card and Giuliano 2013), academic achievement (Sacerdote 2001; Zimmerman 2003), and academic cheating (Carrell, Malmstrom, and West 2008). Thus, it is surprising that little attention has been paid to peer effects in mental health. This is specially true when considering the incidence of mental health problems among adolescents and their devastating consequences (Charpignon et al. 2022). Consequently, there is a gap in the literature that could be potentially filled.

I aim to fill this gap in the literature by investigating the influence of social relationships on adolescent mental health and how it consequently affects academic achievement, physical health, and behavioral issues. I address endogeneity issues and causal inference through an instrumental variable approach. I estimate the peer

1. Mental illness is also a major cause of disability. It is the number one cause of years lived with disability, affecting one in eleven people worldwide (Vos et al. 2012; World Health Organization 2010). Moreover, mental illness carries a large economic cost. The economic cost of depression alone was estimated to be \$83.1 billion in 2005, \$210.5 billion in 2010, and \$326.2 billion in 2018. These costs are incurred through missed days of work, lost productivity, suicide, and direct medical costs of depression (Greenberg et al. 2015; Greenberg et al. 2021).

2. The instrumental variable approach follows the works of Jackson and Rogers (2007) and Bramoullé, Djebbari, and Fortin (2009) by using partially overlapping social network—non-mutual friends-of-friends (henceforth friends-of-friends).

effects in mental health among a representative sample of adolescents using a mental health measure based on 15 questions from the Center for Epidemiologic Studies Depression Scale (CES-D). I focus on how the mental health of peers could affect an adolescent's own mental health, and consequently affect their academic achievement, physical health, and behavioral issues.

Suicides among teens began increasing after years of decline (Charpignon et al. 2022). Moreover, mental health problems are more prevalent among children and adolescents than physical issues, and they have significant long-run effects on human capital accumulation, labor market outcomes, and health. Therefore, understanding how the mental health of adolescents is important for a couple of reasons. First, understanding the effect of peers' mental health on each other could help determine how mental health affects the outcomes of adolescents in a school setting. Second, it could have important policy implication, one of which a targeted treatment of adolescents in schools could decrease mental health prevalence. Third, to the extent that people with mental health problem could face worse labor market outcomes as adults, understanding how we could help them early in their lives could have significant positive long run effects on their outcomes.

The results of this paper suggest that the presence of friends with worse mental health has a negative effects on the mental health of adolescents, academic achievements, behavioral issues, and physical health. I find that a one standard deviation increase in the mental health issues index of peers causes an increase in adolescents' mental health by 0.76.³ A one standard deviation increase in the mental health of peers decreases the GPA of a student by 0.33, increases the probability of missing school for health reason by 15 percentage points, smoking cigarettes by 40 percentage points, intoxication by 30 percentage points, and missing school by 15 percentage points.

This paper fits in two strands of the literature. First, is the economic literature on peer effects. Economics investigated the existence of peer effects in drug use and sexual behavior (Duncan et al. 2005), risky behavior (Card and Giuliano 2013; Urberg et al. 2003; Sotoudeh, Conley, and Mullan Harris 2017), academic outcomes (Zimmerman 2003; Sacerdote 2001; Burke and Sass 2013; Bursztyn and Jensen 2014), and cheating (Carrell, Malmstrom, and West 2008). Absent from the literature is the role of peer effects in mental health of adolescent'

Second, the literature on mental health. Mental health and its effect on several aspects of life, and the consequences of treating mental illnesses gaining popularity in economics. Economists studied the effect of treatment or access to mental health services on several outcomes. Klick and Markowitz (2006) show that mental health mandates are not effective in reducing suicides among adults, and Cuellar and Markowitz

3. A mental health index is scored based on the answers of 15 questions. A higher score indicates worse mental health.

(2006) find that Medicaid eligibility expansions lowers youth suicides. Baranov et al. (2020)—using a cluster-randomized controlled trial—study the effect of treating rural Pakistani mother’s maternal depression and its effect on depression and financial empowerment. They find that psychotherapy reduced depression by 17% and improved women’s financial empowerment.

Kessler et al. (1995) find that people with early onset psychiatric problems were less likely to finish high school or go to college, while Goodman, Joyce, and Smith (2011) find that childhood psychological problems reduced their earnings by 28% as adults—the results were not causal. Other find that mental illness among adolescents causally by comparing siblings, in the United States and Canada, has significant negative effects on labor market, educational, academic outcomes, and maternal education (Fletcher 2013; Currie and Stabile 2007). Cuellar, Markowitz, and Libby (2004) study the association between mental health and juvenile crime. The authors find that that access to treatment to adolescents reduced crime. Peng, Meyerhoefer, and Zuvekas (2013) find that depression reduces the likelihood of employment, but no causal effect on hourly wages and weekly hours worked. They also find that depression increases the annual work loss by 1.4 days—a loss to productivity that is equal to \$700 million to \$1.4 billion. I contribute to this literature by introducing a new channel in which mental illness could affect the academic, health, and social behavior of adolescents, and the labor market, educational, social outcomes of adults.

The rest of this paper is structured as follows. First, I describe the data I use in section 2. Second, I introduce an empirical model section 3. Third, I summarize and discuss the results in section 4. Finally, I conclude in section 5.

2 DATA

2.1 THE ADD HEALTH DATA SET

I use data from waves 1 through 5 in home survey and wave 1 of the in-school survey of the restricted National Longitudinal Study of Adolescent Health (Add Health). Add Health collected information for a sample of adolescents in the U.S. that were in seventh through twelfth grade. The in-home survey began in 1994-1995 and collected data on a sample of over 20,000 pupils for five waves.⁴ The in-school survey was carried on in the 1994-1995 school year, and collected data on more than 90,000 students (Harris et al. 2019). The study is a random sample of 80 high schools paired with the biggest middle schools that fed into them. Add Health—both the in-home and

4. Participants have been followed through adolescence and into adulthood with five in-home interviews in 1995 (Wave I), 1996 (Wave II), 2001–02 (Wave III), 2008–09 (Wave IV) and 2016–18 (Wave V).

in-school—collected plethora of unique data including friendship network. Summary statistics of the sample are shown in Table 1.

2.2 FRIENDSHIP DATA AND CONSTRUCTION OF FRIENDS-OF-FRIENDS

Both the in-home and in-school collected data on friends in wave 1. In both surveys, students were asked to list up to five friends of each gender. I use this information to match friends with each other, allowing me to construct a data set with information on the respondent and their friends. To construct a data set with information on the non-mutual friendships (henceforth friends-of-friends), I match a person’s friendships with the friendships of all the listed connections, and I drop those that were also listed by the target. These steps resulted in a sample of $n = 64,168$ students from the in-school survey and a sample of $n = 12,088$ students from the in-home survey.⁵

2.3 CONSTRUCTING THE MENTAL HEALTH VARIABLE

A measure of mental health is essential for this paper. I construct a measure of mental health from a battery of psychological questions that are collected by Add Health. The questions are based on the Center for Epidemiologic Studies Depression Scale (CES-D), a self-reported scaled that measures depressive symptoms in the general population (Radloff 1977). The CES-D scale is a 20 question test on symptoms in which a person answers how frequently they have felt it during the past week.⁶ 15 out of the 20 questions are asked in the in-school survey, all of the questions were asked in wave 1 and 2, and about half of the questions were asked in waves 3, 4, and 5. A table of the in-school questions is in in Table 2.

Using the CES-D questions, I calculate an average mental health variable. The variable is based on the series of question. I quantify the answers by giving a higher value as the frequency of symptoms being felt increase. I divide the numerical value to each question by the number of possible answer as to convert it to a 0 to 1 scale. For example, the question ‘how often have you been moody?’ have five answers from 0 (never) to 4 (everyday). If the answer was 1 (rarely), then the value to the question will be $1/5 = 0.2$. I sum the answers to all the questions and then normalize the mental health variable to have mean 0 and standard deviation of 1.

5. The sample in the analysis might vary as a result of missing values of certain questions.

6. The frequency choices are: rarely or none of the time (less than 1 day), some or a little of the time (1-2 days), occasionally or a moderate amount of time (3-4 days), and most or all of the time (5-7 days).

3 EMPIRICAL MODEL

3.1 EXPLANATION AND JUSTIFICATION OF THE FRIENDS-OF-FRIENDS METHODOLOGY

In this section, I introduce the empirical model of estimating the peer effects of mental health on a person's own mental health, and consequently its effect on academic achievement, physical health, and risky behavior. Estimating peer effects is difficult as it is hard to differentiate between endogenous and exogenous effects (Manski 1993). Thus, to identify peer effects an instrument of some sort is needed. Bramoullé, Djebbari, and Fortin (2009) provide the necessary and sufficient conditions for identification of estimating peer effects in a social network. The authors show that the endogenous and exogenous effects are identified when using partially overlapping networks. Thus, peer effects will be identified when using the characteristics of friends-of-friends as an instrumental variable to identify the impact of friends.

The characteristics of friends-of-friends (friends' friends of a student who are not their friends), in this case their average mental health score, are exogenous to the characteristics of a student. This stems from the fact that friendships form endogenously, i.e. two people meet and they would become friends if they match on some vector of characteristics. Similarly, friendships do not form endogenously, making the characteristics of those that are friends-of-friends a valid instrument to estimate peer effects that would effect the student themselves through their friends only.⁷

3.2 STATISTICAL ESTIMATION

Let Y_{ia} be the outcome of interest for student i at school a . Depression $_{ia}^{friends}$ is the average normalized mental health among i 's friends and ϕ_a is school specific fixed effects. The equation of interest could be written as:

$$Y_{ia} = \alpha_{0a} + \lambda_1 \text{Depression}_{ia}^{friends} + X'_{ia}\pi + \phi_a + \mu_{ia} \quad (1)$$

Regression 1 estimates the peer effects of mental health on a student's own outcomes. This estimation, however, will suffer from the endogenous and exogenous effects outlined in Manski (1993). Depression of friends could be endogenous with a concern that OLS estimate of λ_1 will be inconsistent. Consequently, I use the following first stage of IV estimation using the average depression score of friends-of-friends as an instrument:

7. This is similar to using lags of a variable x_i as instruments for y_{i-1} even with the existence of serial correlation in panel data.

$$1^{\text{st}} \text{ stage: } \text{Depression}_{ia}^{\text{friends}} = \delta_{0a} + \theta_1 \text{Depression}_{ia}^{\text{friends-of-friends}} + X'_{ia}\pi + \omega_a + r_{ia} \quad (2)$$

Where the dependent variable $\text{Depression}_{ia}^{\text{friends}}$ is the average mental health score among friends. The independent variable $\text{Depression}_{ia}^{\text{friends-of-friends}}$ is the average mental health score among friends-of-friends. X_{ia} is a vector of student specific controls.⁸

4 RESULTS AND DISCUSSION

Tables 3-9 and figures 1-14 present the results of my analysis. Table 3 shows the results for the OLS estimation of 1, reduced form regression that estimates the reduced form, first stage and the 2SLS. The rest of the tables show the results for the 2SLS estimation of regression 1 on academic, behavioral, health, social, criminal, risky behavior, and labor market outcomes.

4.1 REDUCED FORM, FIRST STAGE, IV ESTIMATION, AND THE SOCIAL MULTIPLIER

Table 3 shows the results of estimating the reduced form (column 1), first stage (column 2) and IV (column 3). There is a strong relation between the friends-of-friends instrument and the mental health of a student. A one standard deviation increase in the average mental health score among friends-of-friends is associated with 0.187 standard deviations increase in the mental health score of the student themselves. There is also a strong relationship between the mental health of friends-of-friends and friends. A 1 standard deviation increase in the average mental health of friends-of-friends is associated with a 0.254 standard deviations increase in the average mental health score among friends. Finally, the IV regression shows that there is a significant and large peer effects in mental health. A one standard deviation increase in the mental health of friends causes a 0.734 standard deviations increase in the mental health score of a peer.

The F-Statistic test of the first stage in my 2SLS model is equal to 1,610—greater

8. For the analysis that uses the in-school survey, I control for sex, race, age, parental education, parental employment, parental occupation, and number of friends. For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends.

than 10—indicating that the instrument is not weak.⁹ Moreover, numerous studies explore the existence and estimation of a social multiplier in the presence of spillovers (Becker and Murphy 2003; Glaeser, Scheinkman, and Sacerdote 2003; Graham 2008; Carrell, Malmstrom, and West 2008). For example, in a college network, new fraternity or sorority members will influence their peers, which will create more members. In this paper, the social multiplier implies that a new student with mental health problems will exert influence on their peers, which will create more students with worse mental health. If we allow of multiple round in which new students with poorer mental health enter and beget students with worse mental health. If this process continued infinitely and partial students with deteriorating mental health could be created, the social multiplier would approach $1/(1 - \lambda_1)$ as the sample increases in size, where λ_1 is the estimated coefficient of peer effects in mental health. Estimating the social multiplier from the IV regression estimating peer effects in mental health on own mental health—Table 3—yields a value of 3.75. Consequently, my model estimates that adding one student with worse mental health will create approximately four students with worse mental health, in full equilibrium.

4.2 EFFECT OF PEERS' MENTAL HEALTH ON ACADEMIC, AND BEHAVIORAL OUTCOMES

I report in Figures 1 and 2 the results of peer effects in mental health on academic and behavioral outcomes. I find that a one standard deviation increase in mental health of peers is associated with a 0.34 points decrease in grade point average (GPA). Also, a one standard deviation increase in the mental health score of peers is associated with a 24 percentage points (p.p.) and 15 p.p. increase in the chances of skipping school for no reason and missing school for physical or mental health reason respectively. Finally, a one standard deviation increase in the mental health of peers is associated with a 40 and 30 pp increase in the chances of smoking cigarettes and getting intoxicated. Thus, peer effects in mental health has significant negative effects on academic and behavioral outcomes.

4.3 EFFECT OF PEERS' MENTAL HEALTH ON ACADEMIC, AND BEHAVIORAL OUTCOMES

I report in Figures 3 and 4 the results of peer effects in mental health on physical health outcomes. I find that a one standard deviation increase in mental health of peers is associated with a 9 pp increase in the probability that a pupil would report

9. The F-Statistic of the first stage in the other specification where the dependent variables are not own mental health are also greater than 10.

poor health and 14 pp decrease in the probability of seeing a therapist. Also, a one standard deviation increase in the mental health score of peers is associated with a 12, 19, and 15 pp increase in the chances of reporting feeling sick, tired, or missing school for health or mental reasons during the last month.

4.4 EFFECT OF PEERS' MENTAL HEALTH ON SOCIALIZATION, ALCOHOL AND DRUG CONSUMPTION

I report in Figures 7, 8, 9 the results of peer effects in mental health on socialization, alcohol, and drug consumption. I find that peers' mental health does not have an effect on socialization outcomes like number of close friends and frequency of meeting friends on the full sample. However, among a subsample of women, the estimated effect of peers' mental health on the frequency of meeting with friends is substantial, with a one standard deviation increase in peers' mental health decreases the frequency of meeting friends by 0.2 standard deviations. Moreover, I find that peers' mental health have no significant effect on alcohol consumption in wave 4—when the sample is 24 to 32 year olds—but it has a significant effect on drug and marijuana consumption. A one standard deviation increase in peers' mental health is associated with a 0.2 standard deviations increase in the frequency of drug consumption. A one standard deviation increase in peers' mental health is associated with a 1.74 standard deviations increase in the frequency of drug consumption in wave 3. A one standard deviation increase in peers' mental health is associated with a 0.34 and 1.01 standard deviations increase in the frequency of marijuana consumption in waves 1 and 3 respectively.

5 CONCLUSION

This paper contributes to the literature by investigating the peer effects on adolescent mental health and its subsequent impact on academic achievement, physical health, and behavioral issues. The findings demonstrate that there is a significant and negative peer effects in mental health among adolescents. Specifically, a one standard deviation increase in the mental health score of peers leads to a 0.76 standard deviation increase in the mental health of the individual. Moreover, peers' mental health significantly affects academic outcomes, with a one standard deviation increase in peers' mental health resulting in a 0.33 decrease in GPA and an increased likelihood of missing school for health reasons by 15 percentage points. Additionally, peers' mental health influences behavioral issues, such as smoking and intoxication, with a one standard deviation increase in peers' mental health associated with a 40 and 30 percentage point increase, respectively.

Furthermore, this study sheds light on the importance of addressing mental health issues among adolescents. Mental health problems have significant consequences for academic achievement, health, and long-term labor market outcomes. As peers play a crucial role in influencing mental health, targeting treatment and interventions to improve mental health in schools could have positive effects on reducing mental health prevalence and improving overall well-being in the long run. These findings have important policy implications, emphasizing the significance of early interventions to improve mental health among adolescents and thereby positively impacting their future outcomes in multiple areas of life.

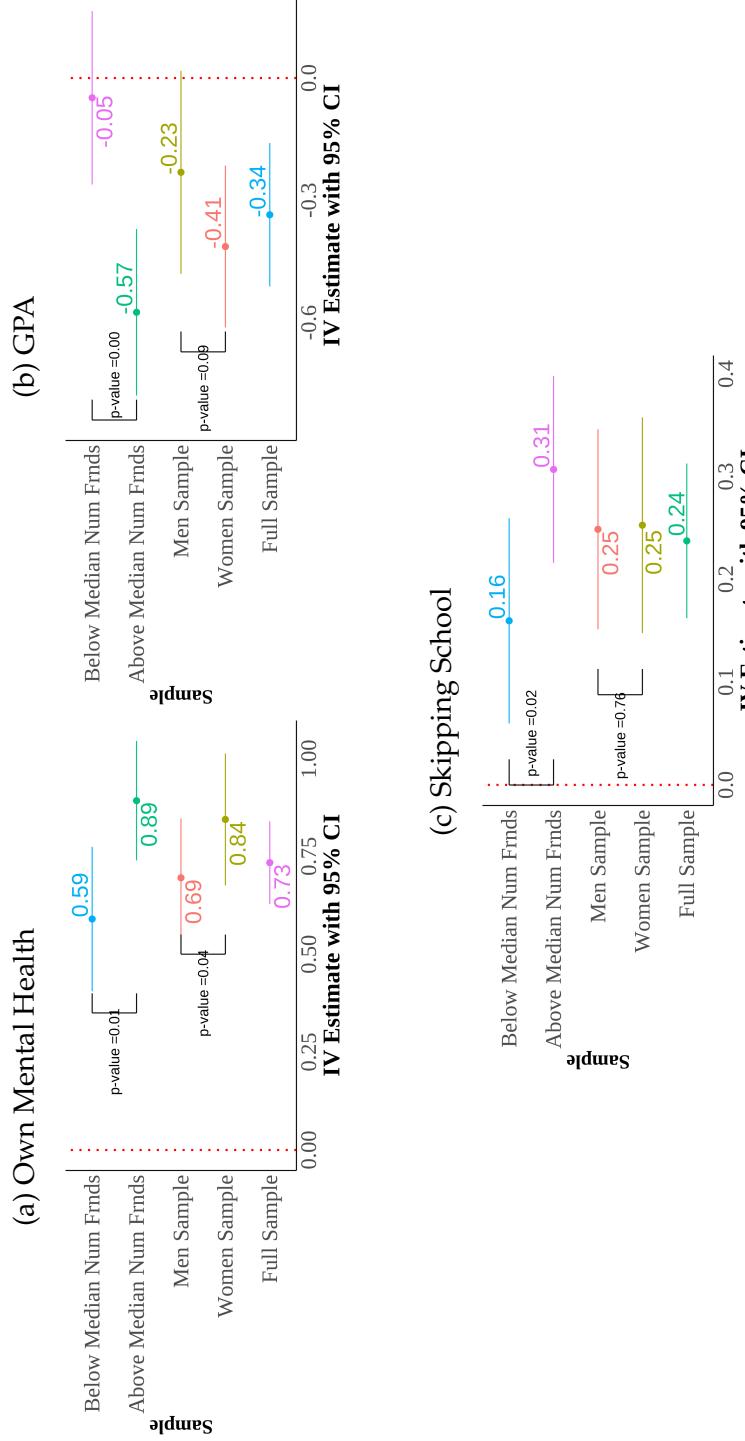
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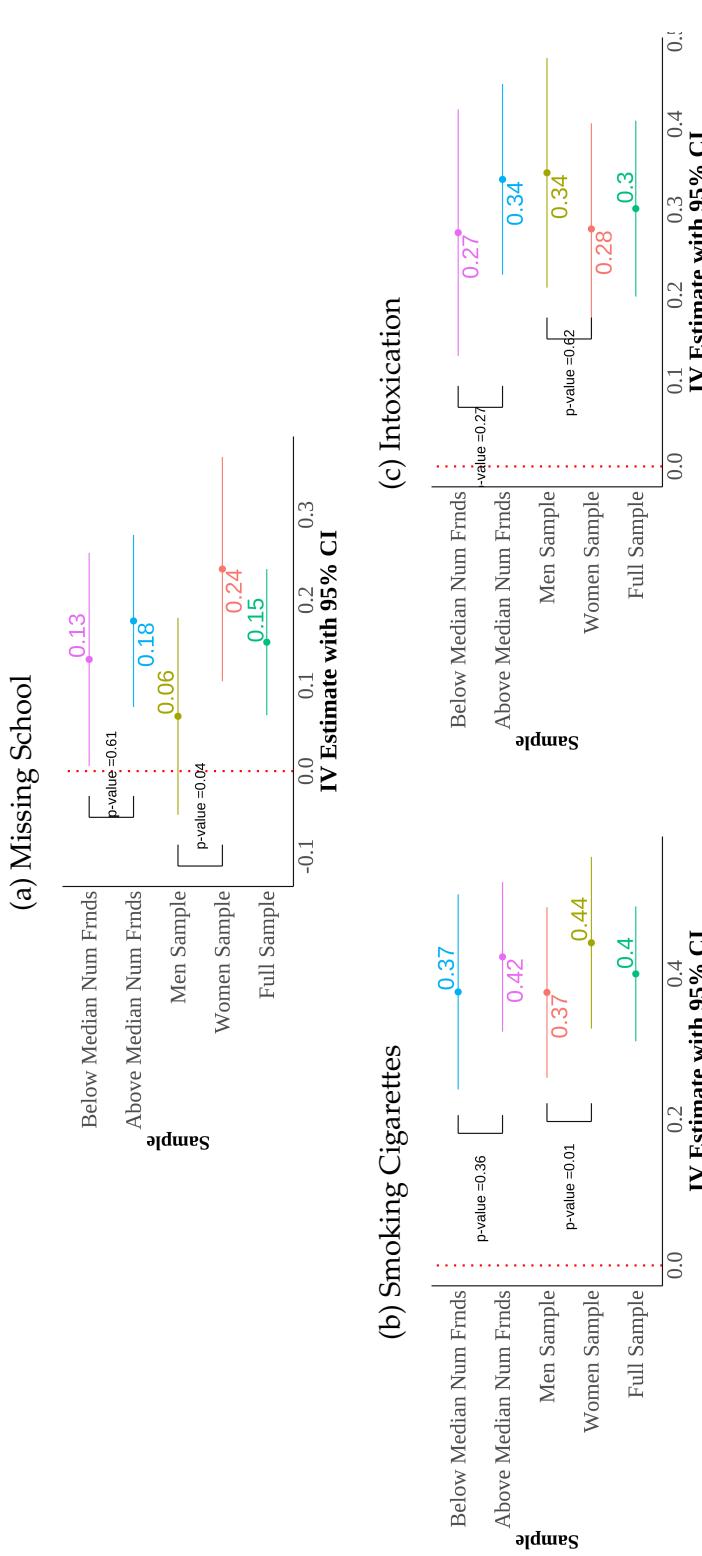
A FIGURES

Figure 1: Spill Over Effect of Peers' Mental Health on Own Mental Health, Academic and Behavioral Outcomes



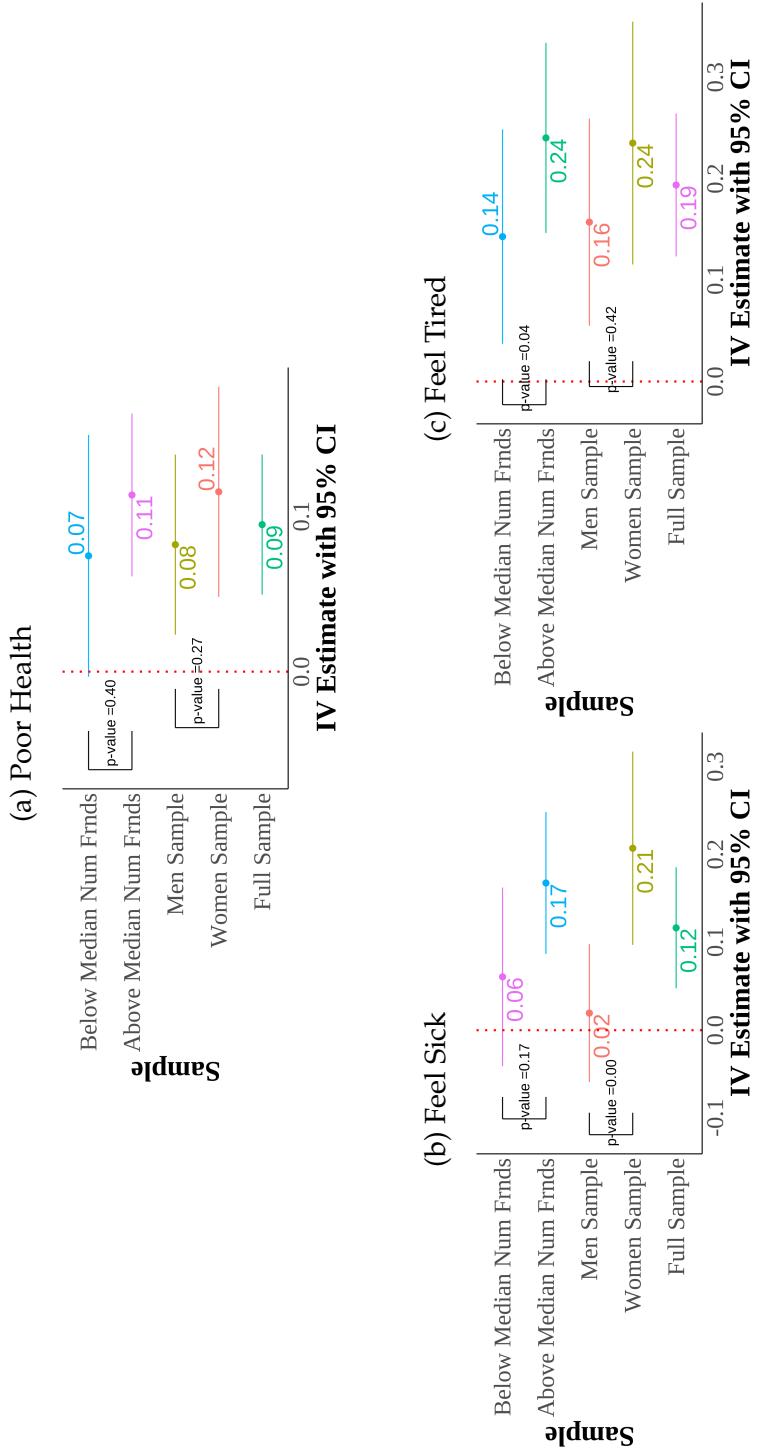
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on mental health, academic, and behavioral outcomes. Additionally, separate IV estimations of equation (1) are provided for different subsamples. In panel (A), the IV estimation is presented for own mental health. Panel (B) shows the IV estimation for GPA. Panel (C) displays the IV estimation for skipping school without an excuse. The control variables in the analysis include sex, race, age, parental education, parental occupation, and number of friends. Standard errors are clustered at the school level. The data source is the Add Health in-school survey.

Figure 2: Spill Over Effect of Peers' Mental Health on Own Mental Health, Academic and Behavioral Outcomes



This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on mental health, academic, and behavioral outcomes. Additionally, separate IV estimations of equation (1) are provided for different subsamples. In panel (A), the IV estimation pertains to missing school for health reasons. Panel (B) demonstrates the IV estimation for smoking, while Panel (C) covers intoxication. The control variables in the analysis include sex, race, age, parental education, parental employment, parental occupation, and number of friends. Standard errors are clustered at the school level. The data source is the Add Health in-school survey.

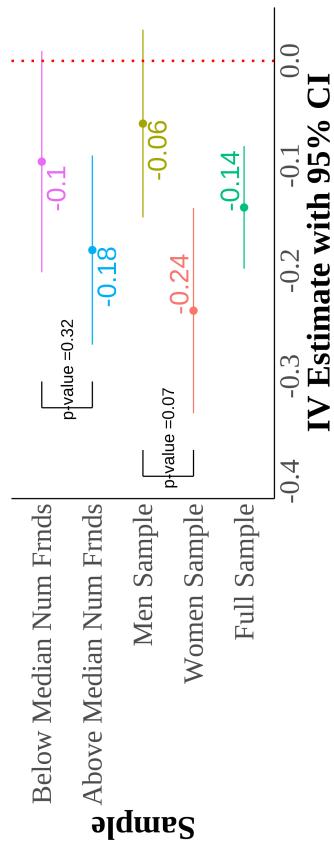
Figure 3: Spill Over Effect of Peers' Mental Health on Health Outcomes



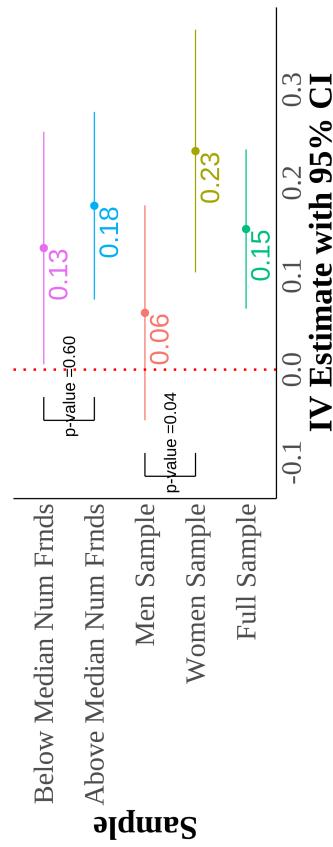
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects focusing on health outcomes. Moreover, I have conducted separate IV estimations for different subsamples. In panel (A), the IV estimation is presented for the effect of equation (1) on self-reported poor health. Panel (B) provides the IV estimation for the impact of equation (1) on feeling sick. In panel (C), the IV estimation pertains to the effect of equation (1) on feeling tired. The control variables used in the analysis include sex, race, age, parental education, parental employment, parental occupation, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 4: Spill Over Effect of Peers' Mental Health on Health Outcomes

(a) Therapy

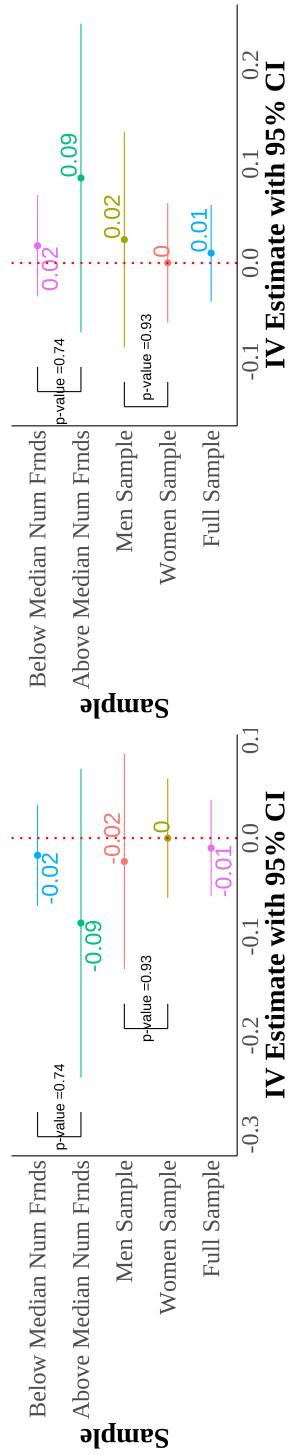


(b) Miss School due to Health

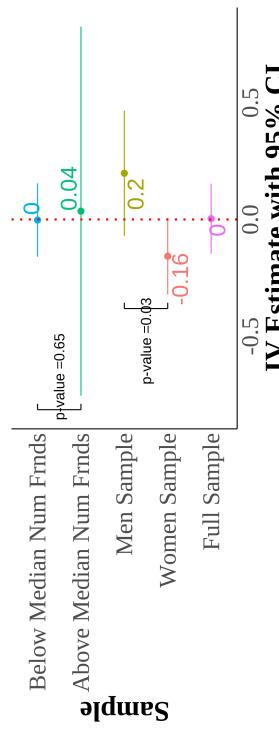


This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects focusing on health outcomes. Moreover, I have conducted separate IV estimations for different subsamples. Panel (A) shows the IV estimation for the influence of equation (1) on attending therapy. Finally, in panel (B), the IV estimation is presented for the relationship of equation (1) with missing school due to health reasons. The control variables used in the analysis include sex, race, age, parental education, parental employment, parental occupation, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 5: Spill Over Effect of Peers' Mental Health on Schooling
(a) High School



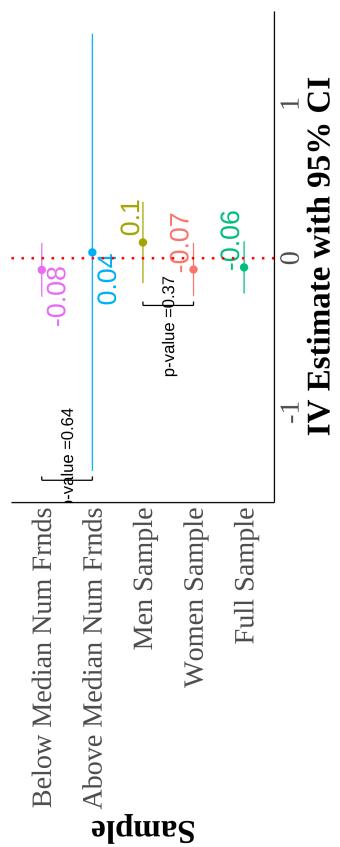
(c) Finish College



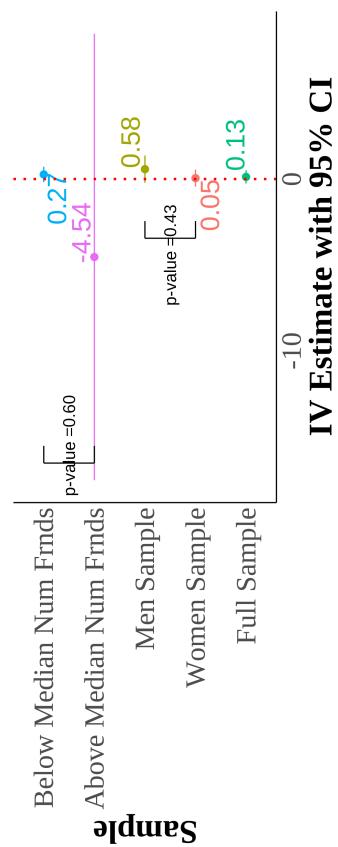
This graph presents the 2SLS estimation of the regression (equation 1) with school fixed effects on schooling and marriage. I also estimate the regression separately for different subsamples. The dependent variable times married is normalized with a mean of zero and standard deviation of one. In panel (A), the IV estimation is presented for finishing high school. In panel (B), the IV estimation is presented for dropping out of high school. In panel (C), the IV estimation is presented for finishing college. The control variables include sex, race, age, educational attainment, parental employment, parental health, and number of friends. Standard errors are clustered on the school level. Data source is the Add Health in-home survey. The dependent variables in panels A to D are constructed from wave 5, while times married is from wave 4.

Figure 6: Spill Over Effect of Peers' Mental Health on Marriage

(a) Marital Status

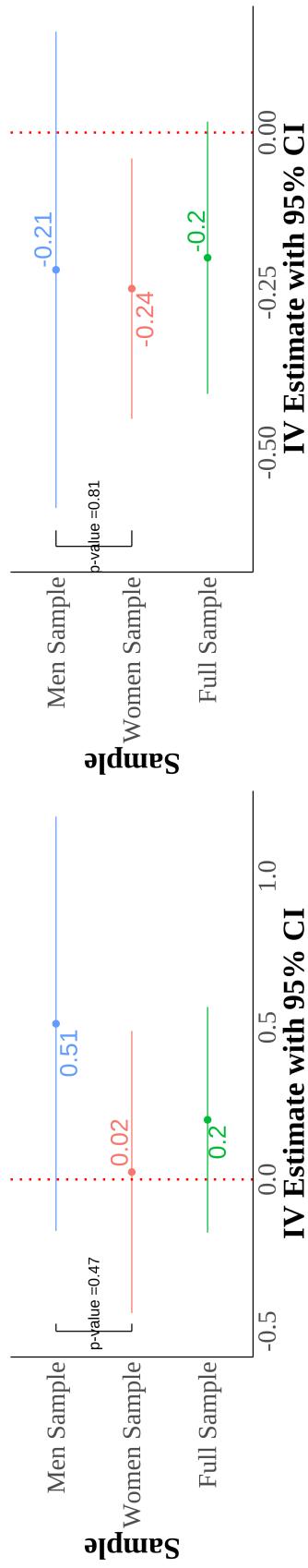


(b) Times Married



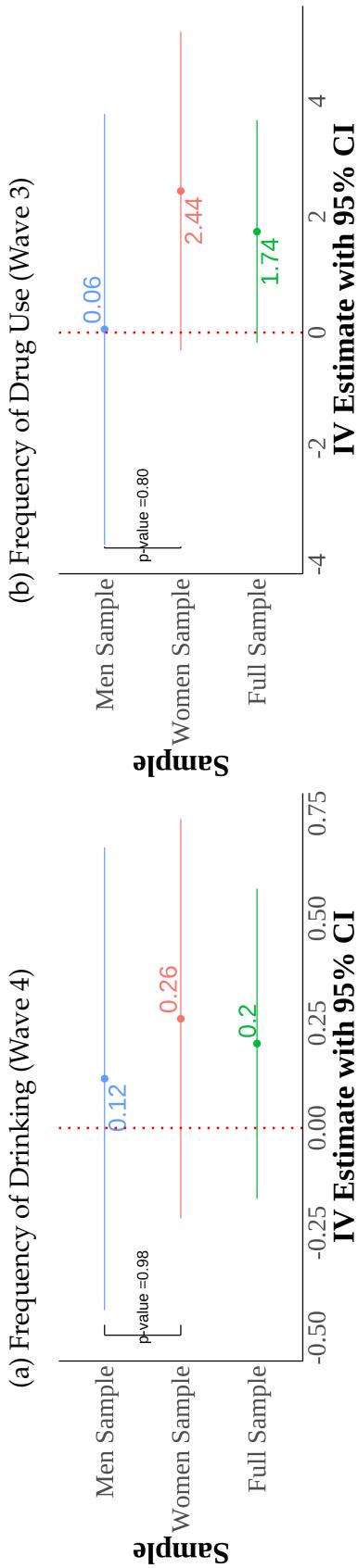
This graph presents the 2SLS estimation of the regression (equation 1) with school fixed effects on schooling and marriage. I also estimate the regression separately for different subsamples. The dependent variable times married is normalized with a mean of zero and standard deviation of one. In panel (A), the IV estimation is presented for being married in wave 5. In panel (E), the IV estimation is presented for times married. The control variables include sex, race, age, educational attainment, parental employment, parental education, and number of friends. Standard errors are clustered on the school level. Data source is the Add Health in-home survey. The dependent variables in panels A to D are constructed from wave 5, while times married is from wave 4.

Figure 7: Spill Over Effect of Peers' Mental Health on Socialization
 (a) Number of Close Friends (b) Freq. Hang Out w/ Frnds



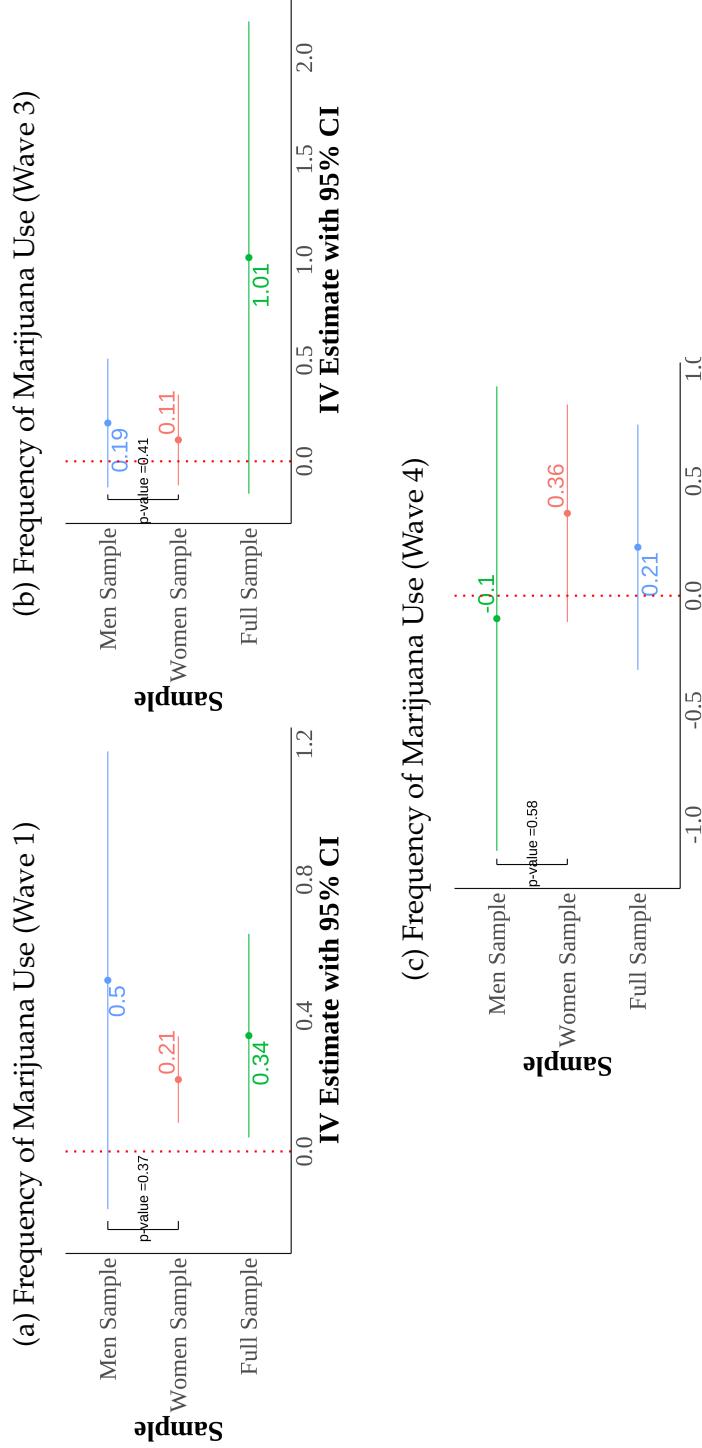
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects, examining socialization, alcohol, and drug consumption. Separate IV estimations are performed for different subsamples. All dependent variables are normalized to have a mean of zero and a standard deviation of one. In panel (A), the IV estimation is presented for the number of close friends in wave 4. Panel (B) shows the IV estimation is presented for the frequency a person hangs out with their friends in wave 5. For the analysis using in-home survey waves 1 to 3, control variables include sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis using in-home survey waves 4 and 5, control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 8: Spill Over Effect of Peers' Mental Health on Alcohol Consumption



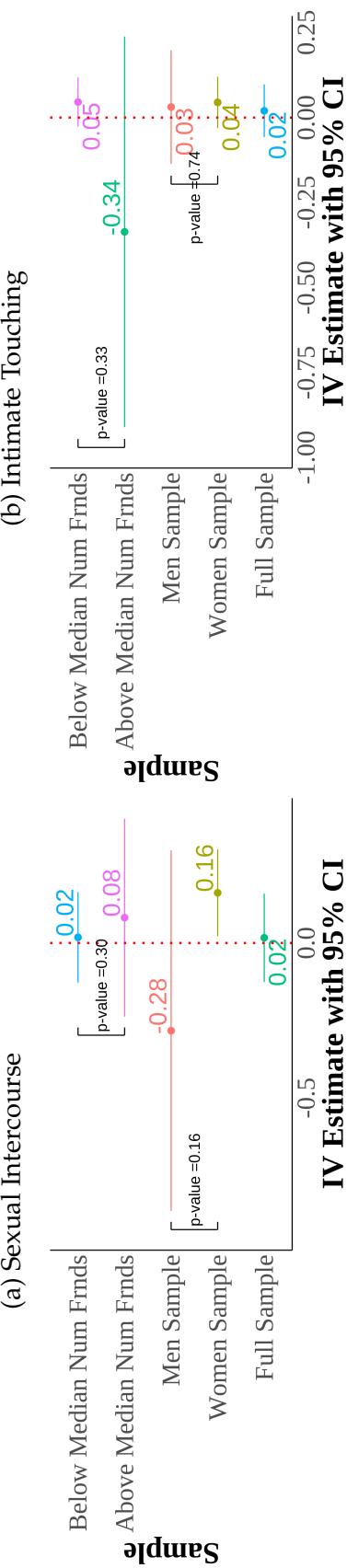
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects, examining socialization, alcohol, and drug consumption. Separate IV estimations are performed for different subsamples. All dependent variables are normalized to have a mean of zero and a standard deviation of one. Panel (A) the IV estimation is presented for the frequency of alcohol use in wave 4. In panel (B), the IV estimation is presented for the frequency of drug use in wave 3. For the analysis using in-home survey waves 1 to 3, control variables include sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis using in-home survey waves 4 and 5, control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 9: Spill Over Effect of Peers' Mental Health on Drug Consumption



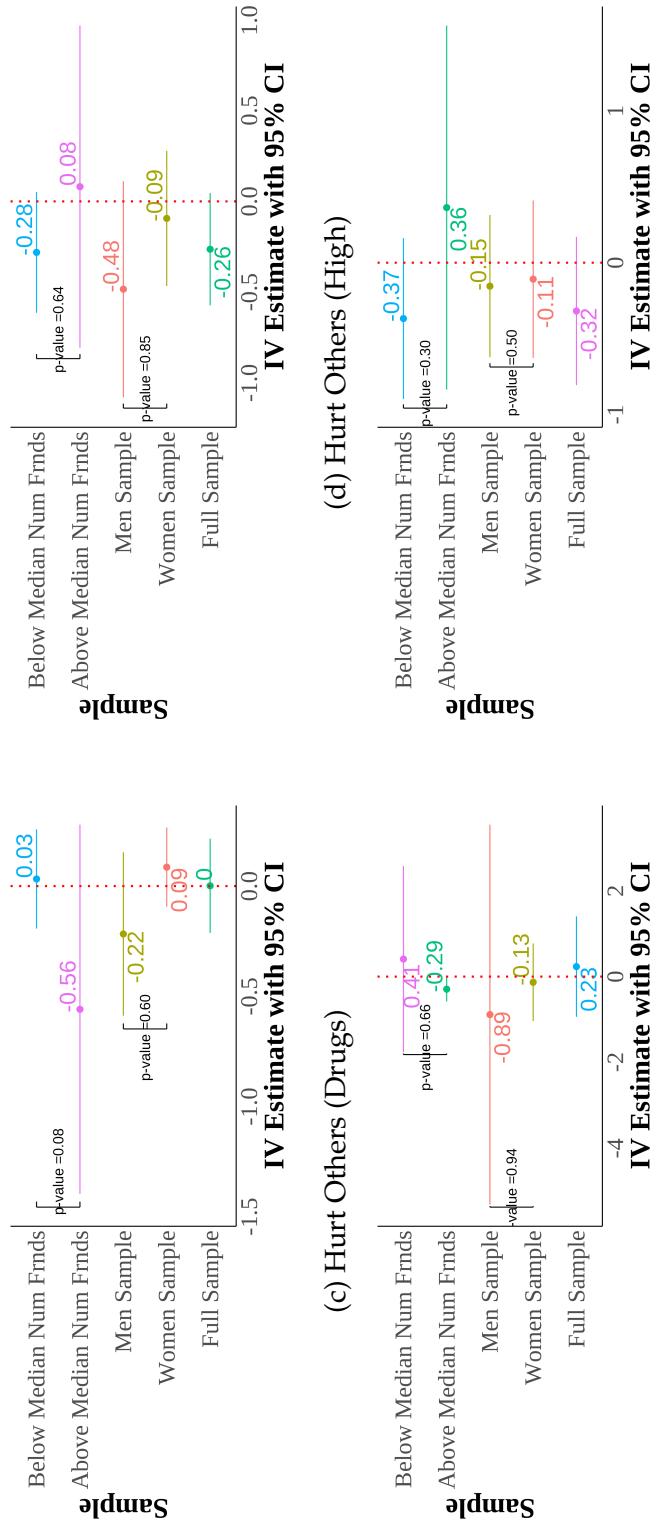
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects, examining socialization, alcohol, and drug consumption. Separate IV estimations are performed for different subsamples. All dependent variables are normalized to have a mean of zero and a standard deviation of one. Panels (A), (B), and (C) present the IV estimation is presented for the frequency of marijuana use during the last 30 days in waves 1, 3, and 4, respectively. For the analysis using in-home survey waves 1 to 3, control variables include sex, race, age, parental education, parental health, and number of friends. For the analysis using in-home survey waves 4 and 5, control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 10: Spill Over Effect of Peers' Mental Health on Sexual Behavior



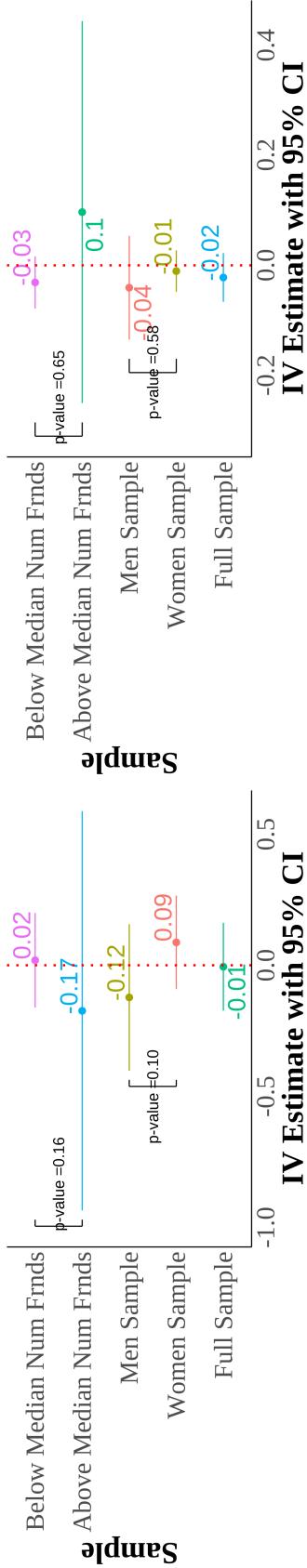
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on sexual, sexually risky, and criminal behavior. Separate IV estimations are conducted for different subsamples. Panel (A) provides the IV estimation is presented for having sex (wave 1). Panel (B) shows the IV estimation is presented for intimate touching (wave 1). For the analysis using in-home survey waves 1 to 3, control variables include sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis using in-home survey waves 4 and 5, control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 11: Spill Over Effect of Peers' Mental Health on Criminal Behavior
(a) Ever Arrested



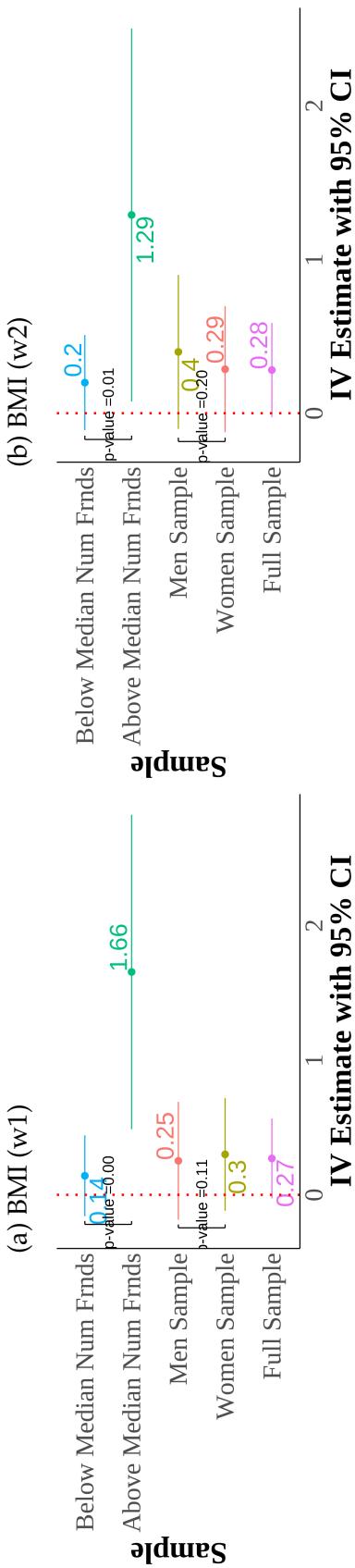
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on sexual, sexually risky, and criminal behavior. Separate IV estimations are conducted for different subsamples. Panel (A) presents the IV estimation is presented for if they have ever been arrested (wave 4). Panels (B), (C), and (D) provide the IV estimation is presented for if they ever hurt others while drunk, high, or under the influence of drugs—including unprotected sex (wave 4). For the analysis using in-home survey waves 1 to 3, control variables include sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis using in-home survey waves 4 and 5, control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 12: Spill Over Effect of Peers' Mental Health on Sexually Risky Behavior
 (a) Multiple Partners
 (b) Paid for Sex



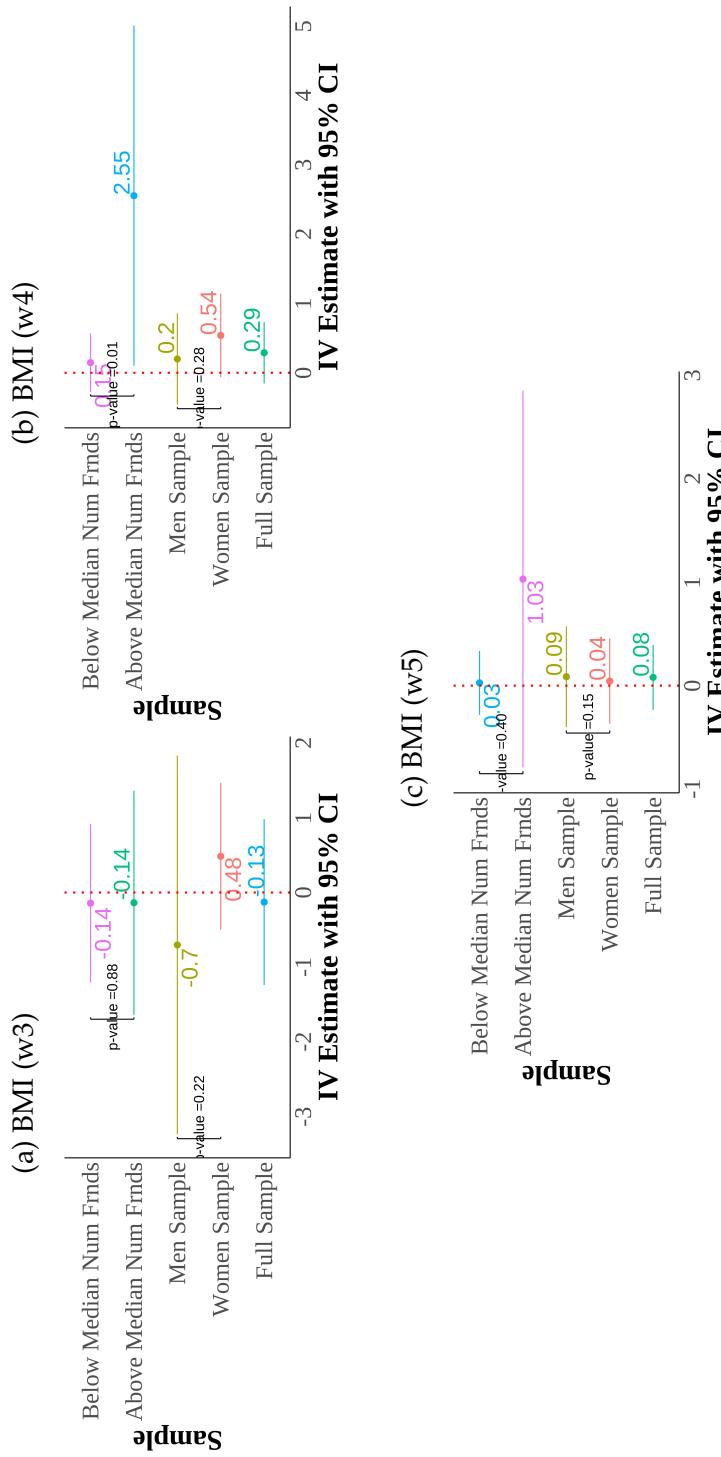
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on sexual, sexually risky, and criminal behavior. Separate IV estimations are conducted for different subsamples. Panel (A) shows the IV estimation is presented for having multiple sexual partners (wave 4). Panel (B) presents the IV estimation is presented for if they ever paid for sex (wave 4). For the analysis using in-home survey waves 1 to 3, control variables include sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis using in-home survey waves 4 and 5, control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered at the school level. The data source for this study is the Add Health in-school survey.

Figure 13: Spill Over Effect of Peers' Mental Health on BMI During Adolescents



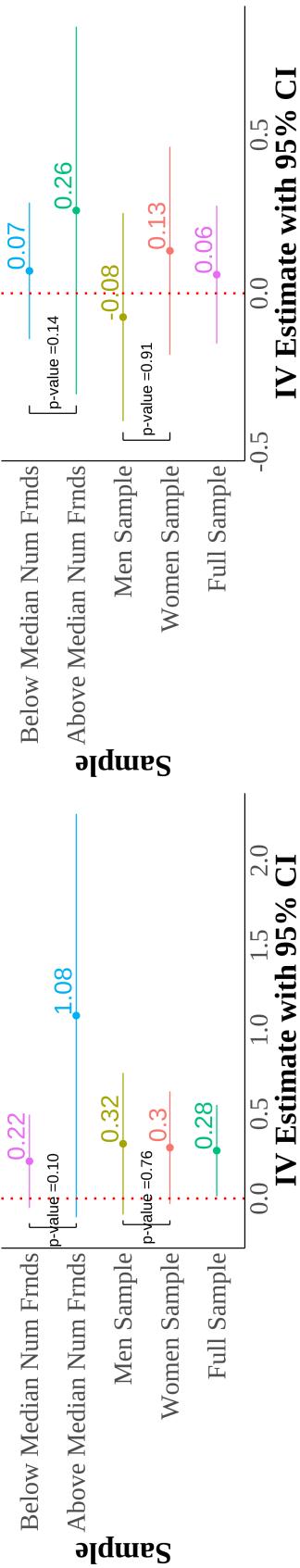
This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on BMI. I also estimate the regression separately for different subsamples. All the dependent variables are standardized with a mean of zero and a standard deviation of one. In panel (A), the IV estimation is presented for BMI in wave 1. In panel (B), the IV estimation is presented for BMI in wave 2. For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered on the school level. Data source is the Add Health in-school survey.

Figure 14: Spill Over Effect of Peers' Mental Health on BMI During Adulthood

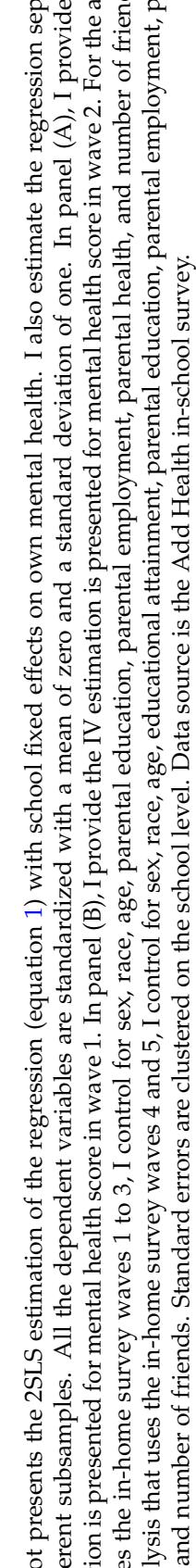


This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on BMI. I also estimate the regression separately for different subsamples. All the dependent variables are standardized with a mean of zero and a standard deviation of one. In panel (A), the IV estimation is presented for BMI in wave 3. In panel (B), the IV estimation is presented for BMI in wave 4. In panel (C), the IV estimation is presented for BMI in wave 5. For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered on the school level. Data source is the Add Health in-school survey.

Figure 15: Spill Over Effect of Mental Health on Own Mental Health During Adolescents
(a) Own Mental Health (w1)

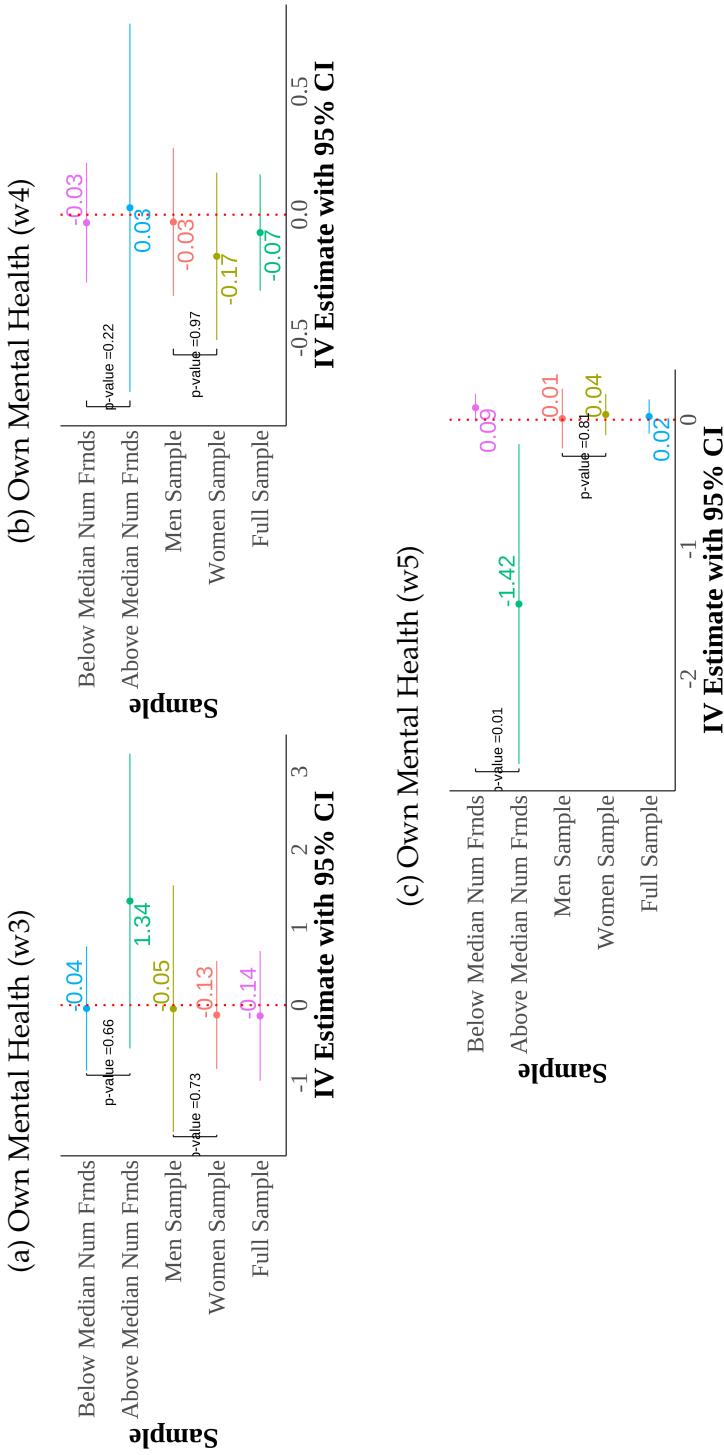


(b) Own Mental Health (w2)



This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on own mental health. I also estimate the regression separately for different subsamples. All the dependent variables are standardized with a mean of zero and a standard deviation of one. In panel (A), I provide the IV estimation is presented for mental health score in wave 1. In panel (B), I provide the IV estimation is presented for mental health score in wave 2. For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered on the school level. Data source is the Add Health in-school survey.

Figure 16: Spill Over Effect of Mental Health on Own Mental Health During Adulthood



This plot presents the 2SLS estimation of the regression (equation 1) with school fixed effects on own mental health. I also estimate the regression separately for different subsamples. All the dependent variables are standardized with a mean of zero and a standard deviation of one. In panel (A), I provide the IV estimation is presented for mental health score in wave 3. In panel (B), I provide the IV estimation is presented for mental health score in wave 4. In panel (C), I provide the IV estimation is presented for mental health score in wave 5. For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends. Standard errors are clustered on the school level. Data source is the Add Health in-school survey.

B TABLES

Table 1: Summary Statistics of In-School Survey

	Mean	Std.Dev.	Range
GPA	2.86	0.79	[1, 4]
Female	0.50	0.50	[0, 1]
White	0.61	0.49	[0, 1]
Black	0.19	0.39	[0, 1]
Asian	0.07	0.25	[0, 1]
Native	0.05	0.23	[0, 1]
Other	0.10	0.30	[0, 1]
Age	15.00	1.71	[10, 19]
Number of Friends	6.53	3.64	[0, 10]
Raw Depression Score	4.66	2.44	[0, 15]
Raw Depression Score: Friends	4.74	1.51	[0, 15]
Raw Depression Score: Friends-of-friends	4.74	1.07	[0, 13.4]
Skip School	0.30	0.46	[0, 1]
Miss School	0.45	0.50	[0, 1]
Smoke	0.36	0.48	[0, 1]
Get Drunk	0.31	0.46	[0, 1]
Poor Health	0.07	0.26	[0, 1]
Never See a Therapist	0.63	0.48	[0, 1]
Feel Sick	0.30	0.46	[0, 1]
Feel Health	0.55	0.50	[0, 1]
Miss School for Health Reasons	0.45	0.50	[0, 1]
Married (w5)	0.41	0.49	[0, 1]
Freq. Drink Alcohol	1.69	1.84	[0, 6]
Freq. High on Drugs	0.04	0.35	[0, 4]
Freq. Weed (w1)	1.92	17.44	[0, 900]
Freq. Weed (w3)	0.69	10.05	[0, 999]
Freq. Weed (w4)	0.46	1.41	[0, 6]
Freq. Hang Out w/ Frnds	2.96	2.69	[0, 7]
Hurt Others b/c Drunk Including Unprot. Sex (w4)	0.61	0.49	[0, 1]
Hurt Others b/c High Including Unprot. Sex (w4)	0.24	0.43	[0, 1]
Hurt Others b/c Drugs Including Unprot. Sex (w4)	0.43	0.50	[0, 1]
Paid for Sex (w4)	0.02	0.14	[0, 1]

¹ Data source is the Add Health survey.

Table 2: Mental Health Question

Variable	Question
S60M	How often have you been moody?
S60N	How often have you cried frequently?
S60O	How often have you felt fearful?
S60K	How often was the following true during the past week [or month]? You felt depressed.
S60I	How often have you had a poor appetite?
S46B	Since school started this year, how often have you had trouble paying attention in school?
S62A	Do you agree or disagree with the following statement? You have a lot of energy.
S62N	Do you agree or disagree with the following statement? You feel like you are doing everything just about right.
S62P	Do you agree or disagree with the following statement? You feel loved and wanted.
S62O	Do you agree or disagree with the following statement? You feel socially accepted.
S62H	Do you agree or disagree with the following statement? You have a lot of good qualities.
S62K	Do you agree or disagree with the following statement? You have a lot to be proud of.
S62M	Do you agree or disagree with the following statement? You like yourself just the way you are.
S60J	How often have you had trouble falling asleep or staying asleep?
S60L	How often have you had trouble relaxing?

Table 3: Spill Over Effect of Peers' Mental Health on own mental health

	Mental Health (1) OLS (Reduced Form)	Friends Depression (2) First Stage	Mental Health (3) IV
Friends Depression			0.734*** (0.053)
Friends of Friends Depression	0.187*** (0.017)	0.254*** (0.019)	
Observations	53,725	53,725	53,725
First Stage F-statistic			1,610.83
Social Multiplier			3.75

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects. Column (1) displays the estimation of the reduced form equation using own mental health as the dependent variable. Moving on to column (2), I present the results of the first stage analysis using the average friends' depression as the dependent variable. Finally, column (3) includes the results of the instrumental variable (IV) estimation. The control variables include sex, race, age, parental education, parental employment, parental occupation, and number of friends.

² Standard errors are clustered on the school level.

³ Data source is the Add Health in-school survey.

Table 4: Spill Over Effect of Peers' Mental Health on Own Mental Health, Academic and Behavioral Outcomes

	(1) Mental Health	(2) GPA	(3) Skip School	(4) Miss School	(5) Smoke Cigarettes	(6) Get Drunk
<i>Panel A: Full Sample</i>						
Friends Depression	0.73*** (0.05)	-0.34*** (0.09)	0.24*** (0.04)	0.15*** (0.04)	0.40*** (0.05)	0.30*** (0.05)
Observations	53,725	35,952	51,639	50,650	51,764	51,404
<i>Panel B: Women</i>						
Friends Depression	0.84*** (0.09)	-0.41*** (0.10)	0.25*** (0.05)	0.24*** (0.07)	0.44*** (0.06)	0.28*** (0.06)
Observations	28,703	19,272	27,797	27,339	27,856	27,659
<i>Panel C: Men</i>						
Friends Depression	0.69*** (0.08)	-0.23* (0.13)	0.25*** (0.05)	0.06 (0.06)	0.37*** (0.06)	0.34*** (0.07)
Observations	25,195	16,784	24,003	23,465	24,071	23,906
<i>Panel D: Above median friends</i>						
Friends Depression	0.89*** (0.08)	-0.57*** (0.10)	0.31*** (0.05)	0.18*** (0.05)	0.42*** (0.05)	0.34*** (0.06)
Observations	34,554	23,587	33,465	32,856	33,544	33,305
<i>Panel E: Below median friends</i>						
Friends Depression	0.59*** (0.09)	-0.05 (0.11)	0.16*** (0.05)	0.13** (0.06)	0.37*** (0.07)	0.27*** (0.07)
Observations	19,171	12,365	18,174	17,794	18,220	18,099
First Stage F-statistic	795.89	475.91	676.42	606.7	686.91	675.58
Mean Full Sample	0.00	2.86	0.30	0.45	0.36	0.31
Mean Women Sample	0.26	2.94	0.29	0.48	0.35	0.29
Mean Men Sample	-0.24	2.78	0.32	0.42	0.36	0.33
Mean Friends > Median	0.11	2.91	0.30	0.44	0.38	0.34
Mean Friends \leq Median	-0.11	2.80	0.30	0.46	0.32	0.27
Equality test						
Women - Men	p = 0.04	p = 0.09	p = 0.76	p = 0.04	p = 0.01	p = 0.62
Equality test						
Friends > Median -						
Friends \leq Median	p = 0.01	p = 0.00	p = 0.02	p = 0.61	p = 0.36	p = 0.27

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on mental health, academic, and behavioral outcomes. I also estimate the regression separately for different subsamples. In column (1), I provide the IV estimation for own mental health. In column (2), I provide the IV estimation for GPA. In column (3), I provide the IV estimation for skipping school without an excuse. In column (4), I provide the IV estimation for missing school for health reasons. In column (5), I provide the IV estimation for smoking. In column (6), I provide the IV estimation for intoxication. The control variables include sex, race, age, parental education, parental employment, parental occupation, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-school survey.

Table 5: Spill Over Effect of Peers' Mental Health on Health Outcomes

	(1) Mental Health	(2) Poor Health	(3) Never See Shrink	(4) Feel Really Sick	(5) Feel Tired	(6) Miss School Health or Mental Problems
<i>Panel A: Full Sample</i>						
Friends Depression	0.73*** (0.05)	0.09*** (0.02)	-0.14*** (0.03)	0.12*** (0.03)	0.19*** (0.04)	0.15*** (0.04)
Observations	53,725	52,365	51,752	51,542	51,504	50,644
<i>Panel B: Women</i>						
Friends Depression	0.83*** (0.09)	0.12*** (0.03)	-0.24*** (0.05)	0.21*** (0.06)	0.24*** (0.06)	0.23*** (0.07)
Observations	28,609	28,049	27,753	27,675	27,661	27,251
<i>Panel C: Men</i>						
Friends Depression	0.69*** (0.08)	0.08*** (0.03)	-0.06 (0.05)	0.02 (0.04)	0.16*** (0.05)	0.06 (0.06)
Observations	25,102	24,303	23,987	23,854	23,830	23,381
<i>Panel D: Above median friends</i>						
Friends Depression	0.89*** (0.08)	0.11*** (0.03)	-0.18*** (0.05)	0.17*** (0.04)	0.24*** (0.05)	0.18*** (0.05)
Observations	34,554	33,920	33,603	33,390	33,368	32,853
<i>Panel E: Below median friends</i>						
Friends Depression	0.59*** (0.09)	0.07* (0.04)	-0.10* (0.05)	0.06 (0.05)	0.14*** (0.05)	0.13** (0.06)
Observations	19,171	18,445	18,149	18,152	18,136	17,791
First Stage F-statistic	1,610.83	1,392	1,360.01	1,344.59	1,321.39	1,265.82
Mean Full Sample	0.00	0.07	0.63	0.30	0.55	0.45
Mean Women Sample	0.26	0.08	0.64	0.37	0.58	0.48
Mean Men Sample	-0.24	0.06	0.63	0.22	0.53	0.42
Mean Friends > Median	0.11	0.06	0.64	0.31	0.57	0.44
Mean Friends ≤ Median	-0.11	0.08	0.62	0.28	0.53	0.46
Equality test						
Women - Men	p = 0.04		p = 0.27		p = 0.00	p = 0.42
Equality test						
Friends > Median -						
Friends ≤ Median	p = 0.01		p = 0.40		p = 0.32	p = 0.17

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on mental health and health outcomes. I also estimate the regression separately for different subsamples. In column (1), I provide the IV estimation for Own Mental Health. In column (2), I provide the IV estimation for having poor health. In column (3), I provide the IV estimation for going to therapy. In column (4), I provide the IV estimation for feeling sick. In column (5), I provide the IV estimation for feeling tired. In column (6), I provide the IV estimation for missing school for health reasons. The control variables include sex, race, age, parental education, parental employment, parental occupation, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-school survey.

Table 6: Spill Over Effect of Peers' Mental Health on Schooling and Marriage

	(1) Mental Health (w5)	(2) Finish High School (w5)	(3) High School Dropout (w5)	(4) Finish College (w5)	(5) Marriage (w5)	(6) Times Married (w4)
<i>Panel A: Full Sample</i>						
Friends Depression	0.03 (0.07)	-0.01 (0.02)	0.01 (0.02)	0.00 (0.08)	-0.06 (0.09)	0.13 (0.19)
Observations	4,949	4,943	4,943	4,943	4,943	3,971
<i>Panel B: Women</i>						
Friends Depression	0.03 (0.08)	0.00 (0.03)	0.00 (0.03)	-0.16* (0.08)	-0.07 (0.09)	0.05 (0.25)
Observations	2,852	2,848	2,848	2,848	2,852	1,829
<i>Panel C: Men</i>						
Friends Depression	0.03 (0.12)	-0.02 (0.06)	0.02 (0.06)	0.20 (0.14)	0.10 (0.13)	0.58 (0.40)
Observations	2,097	2,095	2,095	2,095	2,097	1,216
<i>Panel D: Above median friends</i>						
Friends Depression	-1.54** (0.74)	-0.09 (0.08)	0.09 (0.08)	0.04 (0.39)	0.04 (0.69)	-4.54 (6.18)
Observations	690	688	688	688	690	443
<i>Panel E: Below median friends</i>						
Friends Depression	0.10* (0.05)	-0.02 (0.03)	0.02 (0.03)	0.00 (0.08)	-0.08 (0.09)	0.27 (0.23)
Observations	4,259	4,255	4,255	4,255	4,259	2,602
First Stage F-statistic	289.84	289.63	289.63	289.63	285.24	182.93
Mean Full Sample	0.00	0.96	0.04	0.69	0.41	0.54
Mean Women Sample	0.16	0.97	0.03	0.73	0.47	0.58
Mean Men Sample	-0.16	0.95	0.05	0.65	0.36	0.49
Mean Friends > Median	0.02	0.96	0.04	0.70	0.43	0.55
Mean Friends \leq Median	0.00	0.96	0.04	0.70	0.41	0.53
Equality test						
Women - Men	p = 0.64	p = 0.93	p = 0.93	p = 0.03	p = 0.37	p = 0.43
Equality test						
Friends > Median - Friends \leq Median	p = 0.01	p = 0.74	p = 0.74	p = 0.65	p = 0.64	p = 0.60

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on schooling and marriage. I also estimate the regression separately for different subsamples. The dependent variable times married is normalized with a mean of zero and standard deviation of one. In column (1), I provide the IV for own mental health. In column (2), I provide the IV for finishing high school. In column (3), I provide the IV for dropping out of high school. In column (4), I provide the IV for finishing college. In column (5), I provide the IV for being married. In column (6), I provide the IV for times married—normalized to have a mean of zero and standard deviation of one. The control variables include sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-home survey. The dependent variables in columns 1 to 5 are constructed from wave 5, while times married is from wave 4.

Table 7: Spill Over Effect of Peers' Mental Health on Socialization, Alcohol and Drug Consumption

	(1) Num. of Close Friends (w4)	(2) Freq. Hang Out w/ Frnds (w5)	(3) Freq. Drink Alcohol (w4)	(4) Freq. High on Drugs (w3)	(5) Freq. Weed 30 days (w1)	(6) Freq. Weed 30 days (w3)	(7) Freq. Weed 30 days (w4)
<i>Panel A: Full Sample</i>							
Friends Depression	0.20 (0.19)	-0.20* (0.11)	0.20 (0.19)	1.74* (0.96)	0.34** (0.15)	1.01* (0.59)	0.21 (0.27)
Observations	3,905	4,943	3,972	1,391	7,147	1,392	3,905
<i>Panel B: Women</i>							
Friends Depression	0.02 (0.23)	-0.24** (0.10)	0.26 (0.24)	2.44* (1.38)	0.21*** (0.06)	0.11 (0.11)	0.36 (0.24)
Observations	2,211	2,848	2,246	791	3,803	3,803	2,246
<i>Panel C: Men</i>							
Friends Depression	0.51 (0.34)	-0.21 (0.19)	0.12 (0.28)	0.06 (1.86)	0.50 (0.34)	0.19 (0.16)	-0.10 (0.51)
Observations	1,694	2,095	1,726	600	3,344	3,344	1,726
First Stage F-statistic	180.5	285.24	184.64	37.99	376.38	38.63	180.81
Mean Full Sample	3.12	2.96	1.69	0.04	1.92	0.69	0.46
Mean Women Sample	3.05	3.30	1.51	0.03	1.01	0.42	0.34
Mean Men Sample	3.19	2.61	1.87	0.05	2.85	0.97	0.57
Equality test							
Women - Men	p = 0.47	p = 0.81	p = 0.98	p = 0.80	p = 0.37	p = 0.41	p = 0.58

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on socialization, alcohol and drug consumption. I also estimate the regression separately for different subsamples. All the dependent variables are normalized to have a mean of zero and a standard deviation of one. In column (1), I provide the IV estimation for number of close friends (wave 4). In column (2), I provide the IV estimation for the frequency a person hangs out with their friends (wave 5). In column (3), I provide the IV estimation for the frequency of alcohol use (wave 4). In column (4), I provide the IV estimation for the frequency of use drugs (wave 3). In column (5), I provide the IV estimation for the frequency of use marijuana during the last 30 days (wave 1). In column (6), I provide the IV estimation for the frequency of use marijuana during the last 30 days (wave 3). In column (7), I provide the IV estimation for the frequency of use marijuana during the last 30 days (wave 4).

For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-home survey.

Table 8: Spill Over Effect of Peers' Mental Health on Sexual, Sexually Risky, and Criminal Behaviour

	(1) Intercourse (w1)	(2) Intimate Touch (w1)	(3) Ever Arrested (w1)	(4) Drunk Harm incl. Unprot. Sex (w4)	(5) High Harm incl. Unprot. Sex (w4)	(6) Drugs Harm incl. Unprot. Sex (w4)	(7) Multiple Partners (w4)	(8) Paid for Sex (w4)
<i>Panel A: Full Sample</i>								
Friends Depression	0.02 (0.07)	0.02 (0.04)	0.00 (0.11)	-0.26* (0.16)	-0.32 (0.25)	0.23 (0.59)	-0.01 (0.08)	-0.02 (0.02)
Observations	1,890	2,790	3,960	1,777	1,031	400	3,441	3,443
<i>Panel B: Women</i>								
Friends Depression	0.16** (0.07)	0.04 (0.04)	0.09 (0.09)	-0.09 (0.19)	-0.11 (0.26)	-0.13 (0.46)	0.09 (0.09)	-0.01 (0.02)
Observations	1,067	1,537	2,243	877	453	183	1,911	1,914
<i>Panel C: Men</i>								
Friends Depression	-0.28 (0.29)	0.03 (0.08)	-0.22 (0.19)	-0.48 (0.30)	-0.15 (0.24)	-0.89 (2.23)	-0.12 (0.14)	-0.04 (0.05)
Observations	823	1,253	1,717	900	578	217	1,530	1,529
<i>Panel D: Above median friends</i>								
Friends Depression	0.08 (0.15)	-0.34 (0.27)	-0.56 (0.40)	0.08 (0.42)	0.36 (0.55)	-0.29** (0.13)	-0.17 (0.36)	0.10 (0.16)
Observations	297	450	608	261	146	50	533	534
<i>Panel E: Below median friends</i>								
Friends Depression	0.02 (0.07)	0.05 (0.04)	0.03 (0.11)	-0.28* (0.17)	-0.37 (0.27)	0.41 (1.09)	0.02 (0.09)	-0.03 (0.02)
Observations	1,593	2,340	3,352	1,516	885	350	2,908	2,909
First Stage F-statistic	107.56	241.8	183.05	73.11	30.32	3.7	154.86	155.8
Mean Full Sample	0.92	0.97	0.28	0.61	0.24	0.43	0.16	0.02
Mean Women Sample	0.91	0.96	0.17	0.58	0.21	0.43	0.12	0.01
Mean Men Sample	0.92	0.98	0.41	0.63	0.26	0.43	0.20	0.04
Mean Friends > Median	0.92	0.97	0.29	0.61	0.24	0.43	0.16	0.02
Mean Friends ≤ Median	0.92	0.97	0.28	0.60	0.24	0.44	0.16	0.02
Equality test								
Women - Men	p = 0.16	p = 0.73	p = 0.23	p = 0.41	p = 0.69	p = 0.95	p = 0.53	p = 0.27
Equality test								
Friends > Median - Friends ≤ Median	p = 0.30	p = 0.33	p = 0.08	p = 0.64	p = 0.30	p = 0.66	p = 0.16	p = 0.65

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on sexual, sexually risky, and criminal behaviors. I also estimate the regression separately for different subsamples. In column (1), I provide the IV estimation for having sex (wave 1). In column (2), I provide the IV estimation for intimate touching (wave 1). In column (3), I provide the IV estimation for if they have ever been arrested (wave 4). In column (4), I provide the IV estimation for if they ever hurt other while drunk—including unprotected sex (wave 4). In column (5), I provide the IV estimation for if they ever hurt other while high—including unprotected sex (wave 4). In column (6), I provide the IV estimation for if they ever hurt other while under the influence of drugs—including unprotected sex (wave 4). In column (7), I provide the IV estimation for having multiple sexual partners (wave 4). In column (8), I provide the IV estimation for if they ever paid for sex (wave 4).

For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-home survey.

Table 9: Spill Over Effect of Peers' Mental Health of depression on Body Mass Index (BMI)

	(1) BMI (w1)	(2) BMI (w2)	(3) BMI (w3)	(4) BMI (w4)	(5) BMI (w5)
<i>Panel A: Full Sample</i>					
Friends Depression	0.27* (0.15)	0.28* (0.15)	-0.13 (0.56)	0.29 (0.22)	0.08 (0.16)
Observations	6,995	5,244	1,353	3,914	4,893
<i>Panel B: Women</i>					
Friends Depression	0.30 (0.21)	0.29 (0.21)	0.48 (0.49)	0.54* (0.30)	0.04 (0.21)
Observations	3,688	2,783	766	2,202	2,816
<i>Panel C: Men</i>					
Friends Depression	0.25 (0.22)	0.40 (0.25)	-0.70 (1.27)	0.20 (0.33)	0.09 (0.25)
Observations	3,307	2,461	587	1,712	2,077
<i>Panel D: Above median friends</i>					
Friends Depression	1.66*** (0.56)	1.29** (0.58)	-0.14 (0.68)	2.55** (1.16)	1.03 (0.89)
Observations	1,010	779	59	598	682
<i>Panel E: Below median friends</i>					
Friends Depression	0.14 (0.15)	0.20 (0.16)	-0.14 (0.53)	0.15 (0.21)	0.03 (0.16)
Observations	5,985	4,465	1,294	3,316	4,211
First Stage F-statistic	366.39	259.48	37.56	179.96	273.9
Mean Full Sample	22.55	22.94	25.23	28.30	29.71
Mean Women Sample	22.34	22.70	25.13	28.32	29.77
Mean Men Sample	22.76	23.19	25.35	28.27	29.62
Mean Friends > Median	22.58	22.97	25.30	28.31	29.67
Mean Friends \leq Median	22.51	22.89	25.18	28.28	29.77
Equality test					
Women - Men	p = 0.94	p = 0.95	p = 0.14	p = 0.07	p = 0.99
Equality test					
Friends > Median - Friends \leq Median	p = 0.00	p = 0.01	p = 0.88	p = 0.01	p = 0.40

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on BMI. All the dependent variables are standardized with a mean of zero and a standard deviation of one. I also estimate the regression separately for different subsamples. In column (1), I provide the IV estimation for BMI in wave 1. In column (2), I provide the IV estimation for BMI in wave 2. In column (3), I provide the IV estimation for BMI in wave 3. In column (4), I provide the IV estimation for BMI in wave 4. In column (5), I provide the IV estimation for BMI in wave 5.

For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-home survey.

Table 10: Placebo Regressions

	(1) Own Depression	(2) High School Graduate: Mother	(3) High School Graduate: Father	(4) Native Born Mother
Average Depression Index: friends	0.74*** (0.05)	0.02 (0.03)	0.05 (0.03)	0.03 (0.03)
Observations	57,464	42,909	51,247	52,530

* p < 0.1, ** p < 0.05, *** p < 0.01

Note:

I include controls for sex, age, race, parental education, parental work status, parental job, and school fixed effects. Standard errors are clustered on the school level and all specifications include school fixed effects. Data source is the Add Health in-home survey.

Table 11: Spill Over Effect of Peers' Mental Health of depression on Own Mental Health

	(1) Mental Health (w1)	(2) Mental Health (w2)	(3) Mental Health (w3)	(4) Mental Health (w4)	(5) Mental Health (w5)
<i>Panel A: Full Sample</i>					
Friends Depression	0.28** (0.14)	0.06 (0.11)	-0.14 (0.42)	-0.07 (0.12)	0.02 (0.07)
Observations	7,147	5,357	1,391	3,972	4,943
<i>Panel B: Women</i>					
Friends Depression	0.30* (0.17)	0.13 (0.17)	-0.13 (0.35)	-0.17 (0.17)	0.04 (0.08)
Observations	3,803	2,867	791	2,246	2,848
<i>Panel C: Men</i>					
Friends Depression	0.32 (0.21)	-0.08 (0.17)	-0.05 (0.79)	-0.03 (0.15)	0.01 (0.12)
Observations	3,344	2,490	600	1,726	2,095
<i>Panel D: Above median friends</i>					
Friends Depression	1.08* (0.57)	0.26 (0.28)	1.34 (0.86)	0.03 (0.36)	-1.42** (0.60)
Observations	1,019	785	60	610	688
<i>Panel E: Below median friends</i>					
Friends Depression	0.22 (0.14)	0.07 (0.11)	-0.04 (0.40)	-0.03 (0.12)	0.09* (0.05)
Observations	6,128	4,572	1,331	3,362	4,255
First Stage F-statistic	377.65	261.79	37.99	184.64	285.24
Mean Full Sample	0.00	0.00	0.00	0.00	0.00
Mean Women Sample	0.13	0.08	0.05	0.13	0.16
Mean Men Sample	-0.13	-0.08	-0.05	-0.13	-0.16
Mean Friends > Median	0.04	0.02	-0.03	0.02	0.02
Mean Friends ≤ Median	-0.02	-0.03	0.07	-0.01	0.00
Equality test					
Women - Men	p =0.64	p =0.84	p =0.82	p =0.64	p =0.45
Equality test					
Friends > Median - Friends ≤ Median	p =0.10	p =0.14	p =0.66	p =0.22	p =0.01

* p < 0.1, ** p < 0.05, *** p < 0.01

¹ This table presents the 2SLS estimation of the regression (equation 1) with school fixed effects on own mental health score. All the dependent variables are standardized with a mean of zero and a standard deviation of one. I also estimate the regression separately for different subsamples. In column (1), I provide the IV estimation for mental health score in wave 1. In column (2), I provide the IV estimation for mental health score in wave 2. In column (3), I provide the IV estimation for mental health score in wave 3. In column (4), I provide the IV estimation for mental health score in wave 4. In column (5), I provide the IV estimation for mental health score in wave 5.

For the analysis that uses the in-home survey waves 1 to 3, I control for sex, race, age, parental education, parental employment, parental health, and number of friends. For the analysis that uses the in-home survey waves 4 and 5, I control for sex, race, age, educational attainment, parental education, parental employment, parental health, and number of friends.

² Standard errors are clustered on the school level and all specifications include school fixed effects.

³ Data source is the Add Health in-home survey.