The Effects of School Choice on Mental Health

Corey A. DeAngelis*
Cato Institute
CDeAngelis@cato.org

Angela Dills
Western Carolina University
akdills@email.wcu.edu

August 24, 2018

*Corresponding author is Corey A. DeAngelis, CDeAngelis@cato.org, (210) 818-6713. Address: 1000 Massachusetts Ave NW, Washington, D.C., 20001. Declarations of interest: none. Funding: A grant from the Center for the Study of Free Enterprise at Western Carolina University partially supported Angela Dills's work on this paper.

Abstract

School choice allows families to choose schools that are more suited to their children. These choices may affect non-academic outcomes, including students' mental health. We empirically examine the relationship between school choice and mental health using two methods. First, we use difference-in-differences to estimate the effects of state voucher and charter school laws on adolescent suicide rates. States adopting broad-based voucher programs and charter schools witness declines in adolescent suicides. Second, we use survey data to estimate the effects of private schooling on adult mental health. Controlling for a post-baseline measure of mental health and a variety of individual characteristics, the estimates suggest that private schooling reduces the number of times individuals are seen for mental health issues.

Keywords: school choice; school vouchers; charter schools; mental health; non-cognitive skills

JEL Classifications: I28, I20

Introduction

Between 2007 and 2015, suicide rates for those aged 15 to 19 years old doubled for females and increased by 30 percent for males (CDC, 2017). Suicide is the second leading cause of death for U.S. residents aged 15 to 34 and the third leading cause of death for those aged 10 to 14 (National Institute of Mental Health, 2017). Roughly half of children aged 13 to 18 have had a mental disorder in their lifetime (National Institute of Mental Health, 2017).

Young people spend a significant fraction of their time at school and engaged with school peers. We consider how schooling options affect mental health. We approach this question in two ways. First, we estimate how school choice programs affect adolescent suicide rates. Using a difference-in-differences estimation, we estimate the effect of voucher and charter school laws on mortality rates by the cause of death of self-inflicted harm for those aged 15 to 19 years old. Second, we use survey data to estimate how enrollment in a private school relates to a measure of adult mental health. We use data from the 1997 cohort of the National Longitudinal Survey of Youth. To address the issue of selection into private schools, we control for student background characteristics including a post-baseline measure of mental health.

Each of these methods possesses advantages and disadvantages. Further, each identifies the relationship between school choice and mental health using a different source of variation and a different measure of mental health. Both methods lead to a similar conclusion: increased school choice improves adolescent mental health.

We provide additional background and the theoretical underpinnings in the next section. In Section III, we outline the method, data, and results using cause of death and legislative dates of school choice programs. In Section IV, we outline the method, data, and results using student-level survey data. Section V discusses and concludes.

Background

Alternatives to traditional public schools may affect mental health via a variety of mechanisms. These mechanisms include competitive pressure and differences in school culture.

Larger private school shares of the educational sphere, charter schools, and voucher programs increase competitive pressures in a geographic area. More school choice tends to improve academic (Shakeel, Anderson, & Wolf, 2016) and non-academic outcomes (DeAngelis, 2017; Wolf, 2007). Because families value the overall health and safety of their children (Holmes Erickson, 2017; Kelly & Scafidi, 2013; Stewart et al., 2009; Stewart et al., 2010), competitive pressures may improve schools in ways that maintain or improve mental health. Private schools may be particularly focused on their students' mental health. Private schools face stronger competitive pressures to entice families to enroll – and re-enroll – their children compared to traditional public schools.

Better school cultures may improve mental health. Private schools, perhaps religious schools especially, may focus more attention on character building than do traditional public schools (Berner, 2017; Glenn, 1989) and benefit youth mental health by providing safer school environments (Dynarski et al., 2018; Howell & Peterson, 2006; Shakeel & DeAngelis, 2018; Waasdorp et al., 2018; Witte et al., 2008; Wolf et al., 2013). Some successful urban charter school programs use a No-Excuses approach with strict behavior codes (Angrist et al., 2013; Cheng et al., 2017). School choice has been found to reduce disciplinary incidents and arrest rates (Cullen et al., 2006; DeAngelis & Wolf, 2016; Deming, 2011; Dills & Hernández-Julián, 2011; Dobbie & Fryer, 2015). Private school students experience less bullying, more respectful behavior, and less fighting (Howell & Peterson, 2006; Shakeel & DeAngelis, 2018; Waasdorp et al., 2018). Bullies and children who are bullied are more likely to use psychopharmacological

medications (Eriksen et al., 2014) and cyberbullying increases the likelihood of suicidal behaviors (Nikolaou, 2017).

Previous research suggests a link between schools and mental health. Watt (2003), using survey data from Add Health, suggests that small schools and private schools reduce students' mental health as measured by higher levels of depression and attempted suicide. A challenge with survey data is addressing the issue of student selection into different types of schools. If students with poorer mental health are more likely to enroll in smaller schools or in private schools, the estimates in Watt (2003) are biased. Mocan and Tekin (2006) address this selection issue with propensity score matching and the same data from Add Health. They find that Catholic school attendance has either no effect or reduces attempted suicide. Hansen and Lang (2011) document lower youth suicides when school is out of session, also linking schools to mental health. Relatedly, Plemmons et al. (2018) find lower teen suicide ideation and attempt rates during the summer and higher rates during the spring and fall.

We approach this question in two ways. First, we consider aggregate effects of introducing school choice on adolescent suicide rates. Second, we consider survey data of self-reported mental health measures and whether a student attends a private school. Both approaches have advantages and disadvantages as described in each section below.

Evidence Using State-Level Suicide Rates

We first consider how school choice affects one measure of adolescent mental health: suicide rates among adolescents. We estimate the effect of states' introducing voucher and charter school programs on adolescent suicides. Roughly 90 percent of people dying by suicide have an underlying mental illness (Cavanagh et al. 2003).

Methods

We estimate a difference-in-differences model for the number of suicides in state *s* at time *t*:

$$Suicides_{st} = \beta_1 VoucherProgram_{st} + \beta_2 VoucherIEP_{st} + \beta_3 CharterLaw_{st} + Z'\gamma + \sigma_s + \tau_t + e_{st}$$

We estimate the above using both ordinary least squares (OLS) and a negative binomial model. The negative binomial model better accounts for the count nature of the data.

The variables of interest indicate the presence of a voucher program or a charter school law in the state in that year. We separately code voucher programs that are specifically for students with an Individualized Education Plan (IEP) and voucher programs that are more broadly available.

The vector Z includes controls for state laws that influence substance use: whether the state has adopted medical marijuana, graduated drivers licensing, a maximum legal blood alcohol content of 0.08, or a zero-tolerance law; the minimum legal drinking age; and the inflation-adjusted tax rate on beer. We also control for the percent of the population who are white, black, and aged 15 to 19; the percent of the state below the poverty line; the unemployment rate; and real per capita personal income. In some specifications, we include state-specific linear trends.

Because state-specific linear trends may be confounded with changing impacts of a legal policy on the outcome variable, we also allow the effect of the school choice laws to change over time. We estimate the following for state *s* in year *t*:

$$Suicides_{st} = \alpha_1 VoucherProgram_{st} + \alpha_2 Years\ since\ Voucher\ Program_{st} + \alpha_3 CharterLaw_{st} + \alpha_4 Years\ since\ Charter\ Law_{st} + Z'\gamma + \sigma_s + \tau_t + e_{st}$$

This specification allows the effect of school choice to decrease or increase over time as families and schools adapt to the new schooling options.

State fixed effects, the variety of control variables, and state-specific linear time trends control for many factors likely to influence both policy adoption and mental health. Identification of the effects of school choice programs, however, assumes parallel trends: that the control states appear similar to the treatment states prior to the treatment. One way to validate this assumption is via an event study. We allow the effect of the school choice programs to differ across time, estimating the following:

$$\text{Suicides}_{st} = \sum_{\tau=-2}^{3plus} \alpha_\tau Voucher_{t-\tau} + \sum_{\tau=-2}^{3plus} \beta_\tau VoucherIEP_{t-\tau} + \sum_{\tau=-2}^{3plus} \delta_\tau Charter_{t-\tau} + Z'\gamma + \sigma_s + \tau_t + e_{st}$$

The omitted category is a law being passed three or more years in the future. If the estimated coefficients for the years prior to a law's adoption are statistically insignificant, this would support the assumption of parallel trends for the treatment and control states. This event study specification also allows the effect of the policy to differ the longer the program is in existence.

Data

The outcome variable is the number of state-level deaths of people aged 15 to 19 years old due to self-inflicted harm from the Center for Disease Control's National Center for Health Statistics. Summary statistics for these data appear in Table 1. We consider three school choice laws: whether the state allows charter schools, whether the state adopts a voucher program for students on an IEP, and whether the state adopts a more widely available voucher plan. Table 2 reports the dates of these laws. We separate out the effects of voucher programs for students with an IEP because they tend to be smaller programs and are programs that affect a potentially more fragile population. The programs included as voucher programs include voucher programs, tax credit scholarships, and education savings accounts.

Results

The results using OLS appear in Table 3. Column (1) presents the difference-in-differences estimates. These results suggest that suicides are lower following the adoption of charter school laws and higher following the adoption of vouchers for students on an IEP. In column (2) we include a set of controls for current state drug and alcohol policies: whether the state has adopted medical marijuana, graduated drivers licensing, a maximum legal blood alcohol content of 0.08, zero tolerance laws; the minimum legal drinking age, and the inflation-adjusted tax rate on beer. The results continue to show declines in suicides after charter schools although the effect of the IEP voucher is no longer statistically significantly different from zero. In column (3), we add demographic controls including the percent of the population who are white, black, and aged 15 to 19. In column (4), we include the economic controls of the percent of the state below the poverty line, the unemployment rate, and the real per capita personal income. The results are similar in columns (2) through (4).

In column (5), we add state-specific linear time trends. The addition of these time trends leads to negative coefficients on all three school choice law variables; the implication is that suicides are lower following the adoption of school choice laws although only the effect of charter schools is statistically significant. Voucher programs, tax credit scholarships, and ESAs assist 468,199 students (EdChoice 2018); charter schools enrolled more than six times as many students, 2.9 million, in 2015 (National Alliance for Public Charter Schools 2015). The larger number of students affected by charter schools suggests more potential for affecting children's outcomes.

Adding time trends may confound the state trend in the outcome variable with a changing effect of the policy over time (Wolfers, 2006). In column (6), we allow the effect of the choice

programs to vary over time. In this specification, suicides decline following the adoption of a school choice law. For charters, the initial decline is accompanied by an ongoing decline in suicides the longer the charter school law is in effect. The coefficients on voucher programs are not statistically different from zero. The specification in column (7) continues to allow the policy effects to change over time and removes the state-specific linear time trends.

Across all specifications, the estimated effect of a charter school law is robust: states adopting charter schools witnessed declines in adolescent suicide rates. The estimated effect of a charter school law translates to about a 10 percent decrease in suicides among 15 to 19 year olds.

Table 4 presents the same set of results using a negative binomial. The results are similar with smaller standard errors. We observe fewer suicides following the adoption of broad-based voucher programs and charter schools. In contrast, suicides are higher after states adopt vouchers specific to students on an IEP. The results are robust to a variety of specifications and control variables.

We then estimate the event study specification. Table 5 presents these estimates. We first look for evidence on parallel trends by examining the coefficients for the years prior to each type of program's adoption. For expansive voucher programs and charter schools, the estimated effects of the laws are statistically insignificant in the years prior to adoption. For IEP-specific vouchers, in the most complete specification in column (5), the coefficients on one year and two years before the law are statistically significant; we interpret the results for these programs with cautiously.

We then turn our attention to the estimated effects of the laws after adoption. These estimates support the prior results. In columns (3) and (4), we find that suicides decline once vouchers have been in place for three years. However, once we control for state-specific linear

trends, in column (5), the estimated effects of voucher programs are statistically insignificant. For charter schools, we consistently find declines in suicides following the adoption of charter schools; in the event study specification, this occurs three or more years post-charter school law.

Evidence from Survey Data

The evidence suggests that increased school choice reduces adolescent suicides, an indication of improved mental health. We buttress this evidence using a different approach, a different source of identification, and different data sources. Using survey data, we consider how private school enrollment affects self-reported mental health. Private schools may improve mental health outcomes by, for example, providing a safer school environment. We estimate how enrollment in private schools as a teenager affects mental health outcomes as an adult.

Methods

We use ordinary least squares (OLS) to estimate the following for student *i* in region *r*:

$$\text{Mental Health Outcome}_{irt+1} = \beta_1 \text{Private}_{irt} + \beta_2 \text{MentalScore}_{irt} + X'\delta + \varepsilon_{it+1} \quad (1)$$

The cross-sectional model is estimated using data from three different years: 1997, 2000, 2011, and 2013. We examine two mental health outcomes measured in 2011 and 2013 when the respondents are adults. The first is the number of times the student self-reports being treated for a mental health issue within the previous twelve months. The second is a variable indicating whether the student reported having a mental disorder.

Private is the independent variable of interest, indicating whether the respondent was enrolled in private school in 1997, as an adolescent.

The vector X includes control for each individual's gender, age, race, citizenship status, mother and father's education (in years), household size as a young adult, whether they currently reside in a metropolitan statistical area, and current census region.

Private school attendance is endogenous to adolescent mental health. Families may choose to send children with different mental health statuses to different types of schools. In addition, private schools may have more leeway as to whether they enroll a child with an existing mental health condition. Further, mental health affects the probability of attending school (Tekin and Markowitz 2008).

To address this endogeneity, we control for a measure of the child's mental health in 2000. If child's mental health influences families' or schools' decisions, this variable controls for existing mental health status near the time of private school enrollment. Indeed, because the mental health measure is scored three years after we observe private school enrollment, some of any potential effect of private schools on mental health is already captured in the explanatory variable. For this model to produce unbiased, causal estimates we assume the match using background characteristics and a measure of the outcome near baseline removed endogeneity at baseline. Researchers have recently discovered that matching models based on geographic location – and a baseline measure of the outcome –successfully replicate experimental estimates (Bifulco, 2012).

Data

We use data from the 1997-98 cohort of the National Longitudinal Survey of Youth (NLSY), provided publicly by the U.S. Bureau of Labor Statistics (2017). The first survey was administered in 1997. The initial set of respondents consisted of two subsamples: (1) a cross-sectional sample of 6,748 respondents representative of people living in the U.S. born between January 1st, 1980 and December 31st, 1984, and (2) the sample of 2,236 respondents designed to oversample members of minority groups in the U.S. (Moore et al., 2000). These 8,984 students ranged in age from 12 to 18 in 1997. This cohort has been surveyed seventeen times. The most

recent survey, conducted in the 2015-16 school year, when all individual survey respondents were over 30 years of age. The sixteenth round of the survey in 2013-14 comprised 7,141 (79 percent) of the initial 8,984 individuals.

The survey asks about respondents' adult mental health, the outcome variable in our analysis, in 2011 and in 2013. In 2011, the 26 to 32-year-old respondents answered "During the past 12 months, how many times did you have an emotional, mental or psychiatric problem and were treated by a mental health professional?" Responses are coded as zero, one, two, three, or four for "four or more" times treated for a mental illness. Two years later, in 2013, the survey asked "Have you ever had an eating disorder, a learning or emotional problem or mental condition that has limited your ability to attend school regularly, do regular school work, or work at a job for pay?" We code responses to this variable into an indicator for having had a mental health condition. Table 6 presents descriptive statistics for the sample. In our sample, three percent of respondents report having a mental illness, significantly fewer than observed in the overall U.S. population. On average, respondents have been treated for a mental illness 0.11 times. This reflects a large portion who were not treated in the past year, 95 percent of respondents, as well as 1.7 percent being treated once in the past year; 0.5 percent twice; 0.3 percent three times, and 2.8 percent four or more times in the previous year.

The variable of interest is private schooling. In the sample, 7 percent of respondents attended private school in 1997.

We control for the child's mental health in 2000, very close to baseline. The survey includes a five question version of the Mental Health Inventory. The five questions are: "How much of the time during the last month have you: (i) been a very nervous person?; (ii) felt calm and peaceful?; (iii) felt downhearted and blue?; (iv) been a happy person?"; and (v) felt so down

in the dumps that nothing could cheer you up?". Respondents choose between (1 point) all of the time, (2 points) most of the time, (3 points) a good bit of the time, (4 points) none of the time. The scored points for questions (ii) and (iv) are reversed so that higher scores on all questions indicate more positive mental health. The score ranges from 5 to 20.

We control for the respondents' gender, parental education levels, age, ethnicity, race, and citizenship. Females are more likely to be treated for mental illness than men (American Psychiatric Association, 2013; Freeman & Freeman, 2013). Parental education levels proxy for parental income, a correlate of mental health (Mathur and Freeman 2002). Whites are more likely to report being treated for mental disorders than are members of minority groups (McGuire & Miranda, 2008).

We control for three characteristics measured as an adult: household size, size of MSA, and Census region. Household size accounts for cohabitation, marriage, and child-bearing; it is more costly to raise children with a mental illness (Laursen & Munk-Olsen, 2010; Power et al., 2013).

Results

Table 7 presents estimates of the association between private schooling and adult mental health. The coefficient on the mental health score in 2000 is in the expected direction. The index scores higher mental health as a higher number. Higher baseline mental health scores are associated with lower likelihoods of reported a mental health disorder and lower frequency of past year mental health treatment as adults.

The estimates suggest that individuals enrolled in private school at baseline had better mental health as adults. Both coefficients are negative, indicating that the individuals attending private school treatment were 2.2 percentage points less likely to have a mental health disorder in

2013 and reported being treated for a mental illness 0.0842 fewer times in the previous twelve months in 2011. Both are statistically significant at the 95 percent level of confidence. These effects translate to a 14 percent of a standard deviation decrease in the propensity to report having a disorder at roughly age 30 and around a 14 percent of a standard deviation reduction in the number of times treated for a mental condition.

Conclusions

States increasingly are expanding the schooling options available to families via charter schools and voucher or voucher-like programs that facilitate attending private schools. We consider how these school choice programs affect the number of adolescent suicides. Further, we use survey data to examine how attending a private school correlates with adult mental health. Both analyses yield a similar conclusion: school choice improves mental health. Both empirical strategies have their advantages and disadvantages. However, the congruence of results strongly supports a causal link between school choice programs and improved mental health. These results add to the literature demonstrating how school choice improves non-cognitive outcomes of students. Further, as public attention focuses on the mental health of adolescents in the United States, the results imply that increased school choice advances the public goal of improving mental health outcomes.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. Arlington, VA: American Psychiatric Publishing.

Angrist, J. D., Pathak, P. A., & Walters, C. R. (2013). Explaining charter school effectiveness. *American Economic Journal: Applied Economics*, *5*(4), 1-27.

Berner, A. R. (2017). *Pluralism and American public education: No one way to school*. NY: Palgrave Macmillan.

Bifulco, R. (2012). Can nonexperimental estimates replicate estimates based on random assignment in evaluations of school choice? A within-study comparison. *Journal of Policy Analysis and Management*, *31*(3), 729-751.

Cavanagh, J.T.O., A.J. Carson, M. Sharpe, and S.M. Lawrie. 2003. Psychological autopsy studies of suicide: a systematic review. *Psychological Medicine* 33(3): 395-405.

CDC. QuickStats: Suicide Rates for Teens Aged 15–19 Years, by Sex — United States, 1975–2015. MMWR Morb Mortal Wkly Rep 2017;66:816. DOI: http://dx.doi.org/10.15585/mmwr.mm6630a6.

Cheng, A., Hitt, C., Kisida, B., & Mills, J. N. (2017). "No excuses" charter schools: A meta-analysis of the experimental evidence on student achievement. *Journal of School Choice*, *11*(2), 209-238.

DeAngelis, C. A. (2017). Do self-interested schooling selections improve society? A review of the evidence. *Journal of School Choice*, *11*(4), 546-558.

DeAngelis, C. A., & Wolf, P. J. (2016). *The school choice voucher: A "get out of jail" card?* EDRE Working Paper 2016-03. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2743541

Deming, D. J. (2011). Better schools, less crime? *Quarterly Journal of Economics*, *126*(4), 2063-2115.

Dills, A. K., & Hernández-Julián, R. (2011). More choice, less crime. *Education Finance and Policy*, *6*(2), 246-266.

Dobbie, W., & Fryer Jr, R. G. (2015). The medium-term impacts of high-achieving charter schools. *Journal of Political Economy*, *123*(5), 985-1037.

Dynarski, M., Rui, N., Webber, A., & Gutmann, B. (2018). *Evaluation of the DC Opportunity Scholarship Program: Impacts two years after students applied*. NCEE 2018-4010. National Center for Education Evaluation and Regional Assistance. Retrieved from https://ies.ed.gov/ncee/pubs/20184010/pdf/20184010.pdf.

Eriksen, T. L. M., Nielsen, H. S., & Simonsen, M. (2014). Bullying in elementary school. *Journal of Human Resources*, *49*(4), 839-871.

Figlio, D., & Ludwig, J. (2012). Sex, drugs, and catholic schools: Private schooling and non-market adolescent behaviors. *German Economic Review*, *13*(4), 385-415.

Freeman, D., & Freeman, J. (2013). *The stressed sex: Uncovering the truth about men, women, and mental health*. Oxford, UK: Oxford University Press.

Frenkel, E., Kugelmass, S., Nathan, M., & Ingraham, L. J. (1995). Locus of control and mental health in adolescence and adulthood. *Schizophrenia Bulletin*, *21*(2), 219.

Glenn, C. L. (1989). *Choice of schools in six nations: France, Netherlands, Belgium, Britain, Canada, West Germany*. Ann Arbor, MI: University of Michigan.

Hansen, Benjamin and Matthew Lang (2011). Back to school blues: Seasonality of youth suicide and the academic calendar. *Economics of Education Review*, 30(5), 850-61.

Holmes Erickson, H. (2017). How do parents choose schools, and what schools do they choose? A literature review of private school choice programs in the United States. *Journal of School Choice*, *11*(4), 491-506.

Howell, W. G., & Peterson, P. E. (2006). *The education gap: Vouchers and urban schools*. Washington, DC: Brookings Institution Press.

Hoxby, C. M. (2000). Does competition among public schools benefit students and taxpayers? *American Economic Review*, *90*(5), 1209-1238.

Jackson, C. K. (2012). *Non-cognitive ability, test scores, and teacher quality: Evidence from 9th grade teachers in North Carolina* (No. w18624). National Bureau of Economic Research.

Jacob, B. A. (2002). Where the boys aren't: Non-cognitive skills, returns to school and the gender gap in higher education. *Economics of Education Review*, *21*(6), 589-598.

Jain, M., & Singh, S. (2015). Locus of control and its relationship with mental health and adjustment among adolescent females. *Journal of Mental Health and Human Behaviour*, *20*(1), 16.

Kautz, T., Heckman, J. J., Diris, R., Ter Weel, B., & Borghans, L. (2014). *Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success* (No. w20749). National Bureau of Economic Research.

Laursen, T. M., & Munk-Olsen, T. (2010). Reproductive patterns in psychotic patients. *Schizophrenia Research*, *121*(1), 234-240.

Lindqvist, E., & Vestman, R. (2011). The labor market returns to cognitive and noncognitive ability: Evidence from the Swedish enlistment. *American Economic Journal: Applied Economics*, *3*(1), 101-28.

McGuire, T. G., & Miranda, J. (2008). New evidence regarding racial and ethnic disparities in mental health: Policy implications. *Health Affairs*, *27*(2), 393-403.

Mathur, Vijay K. and Donald G. Freeman. 2002. A Theoretical Model of Adolescent Suicide and Some Evidence from US Data. *Health Economics* 11(8): 695-708.

Mocan, N. H., & Tekin, E. (2006). Catholic schools and bad behavior: A propensity score matching analysis. *The BE Journal of Economic Analysis & Policy*, *5*(1). National Institute of Mental Health. 2017. Mental Illness. Accessed April 2018 at https://www.nimh.nih.gov/health/statistics/mental-illness.shtml

National Alliance for Public Charter Schools (2015) *A Growing Movement: America's Largest Charter School Communities*, Tenth Annual Edition. Accessed May 2018 at http://www.publiccharters.org/sites/default/files/migrated/wp-content/uploads/2015/11/enrollmentshare_web.pdf

Nikolaou, D. (2017). Does cyberbullying impact youth suicidal behaviors? *Journal of Health Economics*, *56*, 30-46.

Pancer, S. M., Hunsberger, B., Pratt, M. W., & Alisat, S. (2000). Cognitive complexity of expectations and adjustment to university in the first year. *Journal of Adolescent Research*, *15*(1), 38-57.

Plemmons, Gregory, Matthew Hall, Stephanie Doupnik, James Gay, Charlotte Brown, Whitney Browning, Robert Casey, Katherine Freundlich, David P. Johnson, Carrie Lind, Kris Rehm, Susan Thomas, and Derek Williams. 2018. Hospitalization for Suicide Ideation or Attempt: 2008-2015. *Pediatrics*, May.

Power, R. A., Kyaga, S., Uher, R., MacCabe, J. H., Långström, N., Landen, M., ... & Svensson, A. C. (2013). Fecundity of patients with schizophrenia, autism, bipolar disorder, depression, anorexia nervosa, or substance abuse vs their unaffected siblings. *JAMA Psychiatry*, *70*(1), 22-30.

Shakeel, M. D., & DeAngelis, C. A. (2017). Who is more free? A comparison of the decision-making of private and public school principals. *Journal of School Choice, 11*(3), 442-457.

Shakeel, M. D., & DeAngelis, C. A. (2018). Can private schools improve school climate? Evidence from a nationally representative sample. *Journal of School Choice, 12*(3), 426-445.

Stewart, T., Wolf, P., Cornman, S. Q., McKenzie-Thompson, K., & Butcher, J. (2009). *Family reflections on the District of Columbia Opportunity Scholarship Program: Final summary report*. School Choice Demonstration Project.

Stewart, T., Lucas-McLean, J., Jensen, L. I., Fetzko, C., Ho, B., & Segovia, S. (2010). *Family voices on parental school choice in Milwaukee: What can we learn from low-income families?* SCDP Milwaukee Evaluation Report# 19. School Choice Demonstration Project.

Tekin, E., & Markowitz, S. (2008). The relationship between suicidal behavior and productive activities of young adults. *Southern Economic Journal, 75*(2), 300-331.

Thompson, A., Sullivan, S., Lewis, G., Zammit, S., Heron, J., Horwood, J., ... & Harrison, G. (2011). Association between locus of control in childhood and psychotic symptoms in early adolescence: results from a large birth cohort. *Cognitive Neuropsychiatry*, *16*(5), 385-402.

Waasdorp, T. E., Berg, J., Debnam, K. J., Stuart, E. A., & Bradshaw, C. P. (2018). Comparing social, emotional, and behavioral health risks among youth attending public versus parochial schools. *Journal of School Violence*, 17(3), 381-391.

Watt, T. T. (2003). Are small schools and private schools better for adolescents' emotional adjustment? *Sociology of Education*, *76*(4), 344-367.

Witte, J. F., Wolf, P. J., Cowen, J. M., Fleming, D. J., & Lucas-McLean, J. (2008). *MPCP longitudinal educational growth study: Baseline report*. SCDP Milwaukee Evaluation Report# 5. School Choice Demonstration Project. Retrieved from https://eric.ed.gov/?id=ED508635.

Wolfers, J. (2006). Did unilateral divorce laws raise divorce rates? A reconciliation and new results. *American Economic Review, 96*(5), 1802-1820.

Wolf, P. J. (2007). Civics exam: Schools of choice boost civic values. *Education Next, 7*(3), 66.

Wolf, P. J., Kisida, B., Gutmann, B., Puma, M., Eissa, N., & Rizzo, L. (2013). School vouchers and student outcomes: Experimental evidence from Washington, DC. *Journal of Policy Analysis and Management*, *32*(2), 246-270.

Table 1: Summary Statistics for State-Level Data

(N=1658)

Variable	Mean	Std. Dev.	Min	Max
Suicides among 15 to 19 year olds	40.07	33.49	1	221
Voucher/tax credit or deduction/ESA	0.14	0.35	0	1
Voucher for IEP students only	0.05	0.22	0	1
Charter school law	0.42	0.49	0	1
Percent of population in poverty	13.45	3.86	2.9	27.2
Unemployment rate	0.06	0.02	0.02	0.18
Real per capita personal income	31686	8268	16060	62211
Percent of population who are white	0.85	0.10	0.28	0.99
Percent of population who are black	0.11	0.10	0.00	0.71
Percent of population aged 15 to 19	0.08	0.01	0.06	0.10
Medical marijuana law	0.09	0.29	0	1
Graduated drivers' licensing law	0.38	0.49	0	1
Minimum legal drinking age	20.65	0.87	18	21
Legal BAC of 0.08	0.42	0.49	0	1
Zero Tolerance Law	0.54	0.49	0	1
Real state beer tax rate	0.30	0.27	0.02	1.97

Table 2: Timing of School Choice Laws

	Voucher Tax Credit ESA	Voucher for IEP only	Charter School Law		Voucher Tax Credit ESA	Voucher for IEP only	Charter School Law
Alabama	2013		2015				
Alaska			1995	Montana	2015		
Arkansas	2016		1995	Nebraska			
Arizona	1997	2009	1994	Nevada	2015		1997
California			1992	New Hampshire	2013		1995
Colorado			1993	New Jersey			1996
Connecticut			1996	New Mexico			1993
Delaware			1995	New York			1998
DC	2004		1996	North Carolina	2014	2014	1996
Florida	2001	1999	1996	North Dakota			
Georgia	2008	2007	1993	Ohio	2006	2004	1997
Hawaii			1994	Oklahoma	2013	2010	1999
Idaho			1998	Oregon			1999
Iowa	1987		2002	Pennsylvania	2001		1997
Illinois	2000		1996	Rhode Island	2007		1995
Indiana	2010		2001	South Carolina		2014	1996
Kansas	2015		1994	South Dakota	2016		
Kentucky				Tennessee		2016	2002
Louisiana	2008	2011	1995	Texas			1995
Maryland	2016		2003	Utah		2005	1998
Maine	1873		2011	Virginia	2013		1998
Massachusetts			1993	Vermont	1869		
Michigan			1993	Washington			2016
Minnesota	1955		1991	West Virginia			
Mississippi		2012	2010	Wisconsin	2013	2016	1993
Missouri			1998	Wyoming			1995

Table 3: Linear probability model estimates of school choice laws on teen suicides

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Voucher Program	-1.701	-2.328	-3.104	-3.223	-0.598	-0.565	-2.948
	(2.527)	(2.145)	(2.157)	(2.104)	(1.677)	(1.700)	(1.926)
Voucher for IEP	3.152*	2.831	2.738	2.454	-1.343	-1.624	0.22
	(1.763)	(1.779)	(1.960)	(2.047)	(3.218)	(3.259)	(2.326)
Charter Law	-3.907***	-3.934***	-3.154**	-3.297**	-3.756***	-4.080***	-2.682**
	(1.238)	(1.259)	(1.288)	(1.275)	(1.280)	(1.338)	(1.162)
Years since voucher						-0.0374	-0.115*
						(0.387)	(0.059)
Years since IEP voucher						0.549	0.651
						(0.346)	(0.400)
Year since charter						-0.480*	-0.121
						(0.249)	(0.156)
drug/alcohol policies	no	yes	yes	yes	yes	yes	yes
demographics	no	no	yes	yes	yes	yes	yes
economic variables	no	no	no	yes	yes	yes	yes
state-specific linear trends	no	no	no	no	yes	yes	no
year dummies	yes	yes	yes	yes	yes	yes	yes
Observations	1,660	1,660	1,660	1,658	1,658	1,658	1,658
R-squared	0.145	0.169	0.203	0.202	0.347	0.351	0.208
Number of stfips	49	49	49	49	49	49	49

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Negative binomial estimates of school choice laws and teen suicides

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Voucher Program	-0.0244	-0.0311	-0.0627***	-0.0635***	-0.0543**	-0.0346	-0.0455*
	(0.023)	(0.023)	(0.022)	(0.022)	(0.025)	(0.025)	(0.023)
Voucher for IEP	0.0644**	0.0657**	0.0773***	0.0670**	0.0828***	0.0401	0.0421
	(0.027)	(0.027)	(0.026)	(0.027)	(0.032)	(0.035)	(0.032)
Charter Law	-0.0987***	-0.0957***	-0.0785***	-0.0795***	-0.0754***	-0.0546**	-0.0594***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
Years since voucher						-0.00251	-0.00448**
						(0.002)	(0.002)
Years since IEP voucher						0.00768*	0.00767*
						(0.005)	(0.004)
Year since charter						-0.00349	-0.00511**
						(0.002)	(0.002)
drug/alcohol policies	no	yes	yes	yes	yes	yes	yes
demographics	no	no	yes	yes	yes	yes	yes
economic variables	no	no	no	yes	yes	yes	yes
state-specific linear trends	no	no	no	no	yes	yes	no
year dummies	yes	yes	yes	yes	yes	yes	yes
Observations	1,660	1,660	1,660	1,658	1,658	1,658	1,658

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Event study estimates of school choice laws and teen suicides

	(1)	(2)	(3)	(4)	(5)
two years before voucher	-1.939	-2.073	-1.742	-1.84	-1.422
	(1.435)	(1.377)	(1.354)	(1.371)	(1.774)
one year before voucher	-2.066	-1.805	-1.585	-1.736	-1.343
	(2.145)	(2.046)	(2.072)	(2.048)	(2.282)
year of voucher	-2.141	-1.885	-2.167	-2.242	-2.036
	(2.320)	(2.191)	(2.117)	(2.040)	(2.356)
one year after voucher	0.0217	-0.0861	-0.0924	-0.266	1.362
	(2.276)	(2.046)	(2.072)	(2.055)	(2.103)
two years after voucher	-2.043	-2.44	-2.829	-2.836	-0.774
	(2.774)	(2.815)	(2.693)	(2.709)	(3.054)
three or more years after voucher	-2.681	-3.709	-5.039*	-5.081*	-1.932
	(3.486)	(2.903)	(2.898)	(2.826)	(1.981)
two years before charter	1.063	0.885	1.433	1.398	0.652
	(1.383)	(1.331)	(1.277)	(1.317)	(1.267)
one year before charter	2.106	1.934	2.810*	2.749	1.747
	(1.710)	(1.650)	(1.639)	(1.655)	(1.629)
year of charter	0.0583	-0.186	0.217	0.241	-0.873
	(1.071)	(1.043)	(0.870)	(0.927)	(1.013)
one year after charter	-0.754	-1.04	-0.163	-0.148	-1.017
	(1.945)	(1.963)	(1.882)	(1.907)	(1.988)
two years after charter	0.193	-0.0216	0.598	0.598	-0.502
	(1.638)	(1.649)	(1.598)	(1.714)	(1.767)
three or more years after charter	-3.809**	-3.684**	-2.919*	-3.009*	-4.496**
	(1.439)	(1.442)	(1.518)	(1.543)	(1.857)
two years before IEP voucher	-1.77	-1.782	-2.103	-2.153	-4.493*
	(2.525)	(2.372)	(2.195)	(2.204)	(2.489)
one year before IEP voucher	-2.31	-2.299	-2.669	-2.808	-5.369*
	(3.255)	(3.517)	(3.461)	(3.412)	(2.685)
year of IEP voucher	1.903	1.721	1.641	1.448	-1.607
	(2.962)	(2.988)	(2.832)	(2.860)	(3.751)
one year after IEP voucher	-0.761	-1.24	-1.254	-1.382	-4.968
	(2.018)	(1.967)	(2.154)	(2.188)	(3.714)
two years after IEP voucher	2.921	2.462	2.49	2.319	-1.425
	(2.426)	(2.431)	(2.416)	(2.523)	(3.494)
three or more years after IEP voucher	4.848*	4.638*	4.729*	4.401	-2.101
	(2.527)	(2.363)	(2.539)	(2.649)	(4.175)
drug/alcohol policies	no	yes	yes	yes	yes
demographics	no	no	yes	yes	yes
economic variables	no	no	no	yes	yes
state-specific linear trends	no	no	no	no	yes
year dummies	yes	yes	yes	yes	yes
R-squared	0.154	0.178	0.216	0.215	0.358

Notes: There are 1,625 observations. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Summary Statistics for Student-Level Data
(N = 4,353)

Variable	Mean	Std. Dev.	Min	Max
Times Treated (2011)	0.11	0.61	0	4
Have Disorder (2013)	0.03	0.16	0	1
Private School (1997)	0.07	0.25	0	1
Female	0.50	0.50	0	1
Father Education (1997)	13.05	3.04	2	20
Mother Education (1997)	13.12	2.68	1	20
Age (2013)	30.96	1.44	28	34
HH Size (2013)	3.21	1.54	1	13
Hispanic	0.11	0.32	0	1
Mixed Race	0.01	0.10	0	1
White	0.73	0.44	0	1
Cit. Unknown - Outside US	0.02	0.14	0	1
Cit. Unknown	0.06	0.23	0	1
MSA 2 (2013)	0.57	0.50	0	1
MSA 3 (2013)	0.38	0.49	0	1
MSA 4 (2013)	0.00	0.06	0	1
North Census Region (2013)	0.26	0.44	0	1
South Census Region (2013)	0.37	0.48	0	1
West Census Region (2013)	0.21	0.41	0	1

Note: Observations are weighted using panel sampling weights.

Table 7: The Effect of Private Schooling on Mental Health Disorder

	(1)	(2)
	Have Disorder (2013)	Times Treated Last Year (2011)
Private (1997)	-0.022***	-0.084*
	(0.000)	(0.021)
Mental Score (2000)	-0.006***	-0.024***
	(0.000)	(0.000)
R-Squared	0.019	0.022
N	4353	4493

Note: P-values in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Models include controls for respondents' gender, age, mother and father education, race, ethnicity, citizenship, whether the respondent grew up in a single-parent household, indicators for the size of MSA the respondent lives in as an adult, household size as an adult, and indicators for the Census region the respondent lives in as an adult. Observations weighted using panel sampling weights.