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## Mental Disorders and Subsequent Educational Attainment in a US National Sample

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### Abstract

As part of a larger investigation of the adverse effects of mental disorders on role functioning, we examined the associations of early-onset mental disorders with subsequent educational attainment in a large nationally representative survey of the US adult population. Diagnoses and age of onset for each of 17 DSM-IV disorders were assessed through retrospective self-report with the fully-structured WHO Composite International Diagnostic Instrument (CIDI). Survival analysis was used to examine the associations between early-onset DSM-IV/CIDI disorders and subsequent termination of schooling with controls for socio-demographic characteristics and childhood adversities (i.e. childhood traumatic events, childhood neglect, parental mental illness, family disruption, and low parental educational attainment). Mental disorders were found to be significantly associated with termination of schooling prior to completion of each of four educational milestones (primary school graduation, high school graduation, college entry, college graduation), with odds ratios in the range of 1.3 to 7.0. The proportion of school terminations attributable to mental disorders was largest for high school graduation (10.2%) but also meaningful for primary school graduation (3.8%), college entry (4.4%) and college graduation (2.6%). These results add to a growing body of evidence documenting a wide variety of adverse life course effects of mental disorders.

### Keywords

Epidemiology; Mental Disorders; Educational Attainment

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One way that early-onset mental disorders may have adverse effects on adult role functioning is through educational attainment (Freudenberg & Ruglis, 2007). Effects of mental disorders on early termination of schooling could lead to lifelong decrements in economic and social functioning as well as in the poor health known to be associated with low socio-economic status (Cutler & Lleras-Muney, 2006; Freudenberg et al., 2007; Fronstin, Greenberg, & Robins, 2005; Huurre, Aro, Rahkonen, & Komulainen, 2006; Koivusilta, Rimpela, Rimpela, & Vikat, 2001). As part of a larger investigation of the adverse effects of mental disorders (Merikangas et al., 2007), this study examines associations between early-onset mental disorders and subsequent termination of schooling in a large nationally representative survey of the US adult population. Our aim is to identify the specific disorders associated with termination of

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schooling at each stage of education in order to estimate the societal burden of these disorders and inform interventions to reduce that burden.

The first study to examine the educational consequences of mental disorders in a national sample found associations of child-adolescent mood, anxiety, substance use and conduct disorders with termination of schooling prior to each of three educational milestones: high school graduation, college entry among high school graduates, and completion of 4 years of college among college entrants (Kessler, Foster, Saunders, & Stang, 1995). A subsequent study attempted to quantify the societal burden of mental disorders in decreased educational attainment (Vander Stoep, Weiss, Kuo, Cheney, & Cohen, 2003). That study estimated that as many as 46% of high school dropouts might be attributable to the negative effects of prior mental disorders.

Evidence from several longitudinal studies suggests that associations with school termination may vary across mental disorders. In particular, studies that examined the association of depression and anxiety disorders with subsequent school termination found either that the association does not exist when viewed prospectively (Johnson, Cohen, Dohrenwend, Link, & Brook, 1999) or that, where it exists, it is attributable entirely (Fergusson & Woodward, 2002; Miech, Caspi, Moffitt, Wright, & Silva, 1999) or in large part (McLeod & Kaiser, 2004; Woodward & Fergusson, 2001) to childhood adversities that precede the onset of disorders and are likely to have independent effects on educational attainment. On the other hand, studies examining impulse-control and substance use disorders have found associations with subsequent school termination that remain significant after accounting for childhood adversities. These effects have been found for conduct disorder (Miech et al., 1999), attention deficit disorder (Miech et al., 1999), overall externalizing behaviors (McLeod et al., 2004), overall disruptive disorders (Johnson et al., 1999), and substance use disorders (Johnson et al., 1999). However, no study has examined associations with school termination for a wide range of specific DSM disorders across the full range of educational milestones from primary school through college graduation.

Using data from the National Comorbidity Survey Replication (NCS-R; Kessler & Merikangas, 2004), the current study examines the associations between 17 child-adolescent onset DSM-IV psychiatric disorders and the subsequent termination of schooling prior to completion of four educational milestones--primary school graduation (8<sup>th</sup> grade), high school graduation, college entry, and college graduation --with statistical controls for pre-existing childhood adversities. We estimate the proportion of school terminations attributable to mental disorders taking into account potential confounding by childhood adversities.

## Methods

As described in more detail elsewhere (Kessler et al., 2004b; Kessler et al., 2005a), the NCS-R is a nationally-representative, multi-stage clustered area probability sample of English-speaking respondents ages 18 and older in the non-institutionalized civilian population of the 48 coterminous states. Fieldwork was carried out by the professional survey interview field staff of the Institute for Social Research at the University of Michigan between February, 2001 and April, 2003. A total of 9,282 face-to-face interviews were completed. All respondents were administered a Part I diagnostic interview of core diagnoses. A sub-sample of 5692 Part I respondents, consisting of all those who met lifetime criteria for a core disorder plus a probability sub-sample of other respondents, were also administered a Part II interview that assessed correlates and disorders of secondary focus. The response rate was 70.9%. Interviewers explained the study and obtained verbal informed consent prior to beginning all interviews. The NCS-R recruitment, consent, and field procedures were approved by the Human Subjects Committees of both Harvard Medical School and the University of Michigan.

## Measures

**Psychiatric Diagnoses**—DSM-IV diagnoses were made using the World Health Organization's (WHO) World Mental Health (WMH) Survey Initiative version of the Composite International Diagnostic Interview (CIDI) (Kessler & Ustun, 2004c), a fully structured lay-administered diagnostic interview that generates diagnoses according to the definitions and criteria of both the ICD-10 (WHO, 1991) and DSM-IV (APA, 1994) diagnostic systems. DSM-IV criteria are used in the current report. The disorders considered in this report include mood disorders (major depressive disorder, dysthymia, and bipolar disorder I or II studied together for increased statistical power), anxiety disorders (generalized anxiety disorder, specific phobia, social phobia, panic disorder, separation anxiety disorder, and post-traumatic stress disorder), substance disorders (alcohol and drug abuse and dependence), and impulse control disorders (intermittent explosive disorder, conduct disorder, oppositional defiant disorder, and attention-deficit disorder). Lifetime prevalence and age of onset were assessed separately for each disorder.<sup>44</sup> All diagnoses are considered with organic exclusions and without diagnostic hierarchy rules. As described elsewhere, (Kessler et al., 2004a) a blinded clinical reappraisal study using the Structured Clinical Interview for DSM-IV (SCID) (First, Spitzer, Gibbon, & Williams, 2002) as the validation standard showed generally good concordance between DSM-IV diagnoses based on the WMH-CIDI and the clinical diagnoses for anxiety, mood, and substance disorders. The WMH-CIDI diagnoses of impulse-control disorders have not been validated, as the SCID does not assess these disorders.

**Educational Attainment**—Respondents were asked how many years of education they completed. Using these responses and assuming an orderly academic progression we examined the predictors of educational attainment in categories that included completion of primary school, high school among those who completed primary school, college entry among high school graduates, and college graduation among college entrants.

**Childhood Adversities**—Based on the finding in previous studies that childhood adversities explain some of the associations between early-onset mental disorders and subsequent educational attainment, we included controls in the analysis for five childhood adversities: childhood traumatic events, childhood neglect, parental mental illness, family disruption, and low parental educational attainment. Childhood traumatic events were assessed using questions about whether the respondent was physically abused by a caregiver, raped or sexually assaulted, or experienced a life threatening illness or injury. Childhood neglect was assessed with a five-item scale comprised of questions about neglect and maltreatment by adult caregivers during childhood (Courtney, Piliavin, Grogan-Kaylor, & Nesmith, 1998). Parental mental illness was assessed using the Family History Research Diagnostic Criteria (Andreasen, Endicott, Spitzer, & Winokur, 1977; Kessler, Davis, & Kendler, 1997). Family disruption was defined as parental death, divorce, or being raised by someone other than biological parents. Parental educational attainment was assessed as the highest level of education attained by either parent.

**Additional Control Variables**—All models also controlled for respondent age, sex, race/ethnicity (Hispanic, Non-Hispanic Black, Non-Hispanic White, Non-Hispanic Other).

## Statistical Analysis

Discrete-time survival analysis with person-years as the unit of analysis was used to estimate the relationship between mental disorders and subsequent educational attainment (Willett & Singer, 1993). Disorders were entered as time-varying predictors using data on age at onset. Separate models were estimated for each of 17 disorders and 4 disorder categories described above. In addition, we estimated models for composite disorders (having exactly one disorder, exactly two disorders, three or more disorders vs. having no disorder). The relationships between psychiatric disorders and subsequent failure to complete each educational milestone

are presented as odds ratios (ORs). Confidence intervals and statistical tests were calculated using the Taylor-series linearization method as implemented in the SUDAAN software package to account for the complex sample design (RTI, 2002). Significance was assessed using two-sided tests at the .05 level.

To estimate the decrease in educational attainment attributable to mental disorders in the population, we estimated logistic regression equations for each of the educational milestones, including as predictors the control variables listed above and binary indicators for the mental disorders found to predict termination prior to that milestone. Based on these equations, we calculated the population attributable risk proportion (PARP) using the difference between predicted probability of completing the milestone with and without psychiatric disorders. We also present a graphic illustration of the range of potential effects of mental disorders on educational attainment by comparing the average survival curve for the population without disorders with the projected survival curves for 30 randomly selected respondents with at least one mental disorder.

## RESULTS

### Patterns and Predictors of educational attainment in the sample

A small minority of the sample (2.8%) terminated schooling prior to completing primary school (Table 1). Of those who completed primary school, 14.3% terminated before completing high school, while 37.6% of those who completed high school did not enter college and 52.4% of those who entered college terminated before completing four-years of college. A small number of respondents ( $n = 57$ ) were still in high school at the time of interview and a similar number ( $n = 49$ ) were still in college.

Person-year models were estimated to examine associations between demographic characteristics and termination of schooling at each educational milestone (Table 2). At each milestone, higher risk of termination is significantly associated with older age, lower levels of parental education and Non-Hispanic Black or Hispanic race-ethnicity. At the primary school level, there is also a significant association between termination of schooling and male sex.

### Early-onset mental disorders and subsequent termination of schooling

Associations between childhood-onset mental disorders and subsequent termination of primary school were detected for 9 of 15 disorders (ORs greater than 1.0) (Table 2, first column). However, the only statistically significant associations with termination of primary school are for oppositional-defiant disorder (OR=3.5) and alcohol abuse (OR=7.0). Having three or more disorders is associated with elevated odds of termination of primary school (OR=1.3), but this association is not statistically significant ( $p=0.559$ ).

Mental disorders are consistently associated with elevated odds of terminating high school before graduation among people who completed primary school. (Table 2, second column) Of the 17 ORs estimated for individual disorders, all but one are greater than 1.0, and 12 are statistically significant. The statistically significant ORs range from 1.3 to 3.5. Compared to having no mental disorder, having exactly one mental disorder is not significantly associated with higher odds of termination of schooling before graduating from high school, but having exactly two disorders (OR=1.4) or three or more disorders (OR=3.5) is associated with significantly higher odds of termination.

Among high school graduates, impulse control and substance use disorders have significant associations with failure to enter college (ORs range from 1.4 to 2.0); mood and anxiety disorders do not, with the exception of bipolar disorder (OR=1.8) (Table 2, third column). High

comorbidity (having three or more disorders) is associated with elevated odds of failure to enter college compared to having no mental disorder (OR=1.4).

Among people who entered college, impulse control and substance use disorders are consistently associated with termination prior to completion of four years of college, with all of the eight ORs greater than 1.0, and four of these reaching statistical significance (range 1.3 to 1.7) (Table 2, fourth column). Anxiety and mood disorders are not significantly associated with termination of college, with two exceptions: panic disorder (OR=1.4) and bipolar disorder (OR=1.4). College students with 3 or more disorders are at elevated risk of termination prior to completing four years of college compared to those with no disorder (OR=1.2), but this association does not reach statistical significance ( $p=.053$ ).

### Population attributable risk

Comparing the expected educational attainment in the absence of any mental disorder with that expected in the presence of mental disorders observed in the sample shows that the proportion of people dropping out of high school would decrease by 10.2% in the absence of mental disorders (Table 3). The estimated decrements in school terminations at other milestones are smaller. The proportion failing to complete primary school would decrease by 3.9%, the proportion failing to enter college would decrease by 4.4% and the proportion failing to complete four years of college would decrease by 2.6%.

Figure 1 illustrates the population impact of mental disorders on educational attainment through a comparison of the average survival probability among respondents without mental disorders and a random sample of 30 respondents who experienced a first onset of a mental disorder prior to the time they completed their schooling. The curves show that the majority of the randomly selected respondents with mental disorders had predicted levels of educational attainment that were substantially lower than those of people without such disorders. As shown in the figure, the probability of completing college is close to 25% among people who had no mental disorders prior to the age of college completion, while it is as low as 1% among people with some multivariate profiles of comorbid mental disorders. It is important to note that these results are adjusted for differences on the basis of socio-demographics and childhood adversities, which means that they represent the predicted effects of mental disorders net of the effects of the control variables.

Associations between mental disorders and termination of schooling may vary across subgroups of the population. We investigated this possibility by examining statistical interactions between demographic characteristics and classes of mental disorders (any anxiety, any mood, any impulse control, and any substance use disorder) in person-year models predicting termination. Due to the small number of terminations of primary school we were only able to test these interactions for the three subsequent educational milestones. Of the 48 interactions tested only 5 were statistically significant at the  $p=.1$  level (results available on request), and none were consistent across models.

## DISCUSSION

With statistical control for a broad range of childhood adversities, we found that mental disorders significantly predict subsequent termination of schooling at each of the four educational milestones we examined: primary school graduation, high school graduation, college entry and college graduation. Our findings are consistent with previous findings with respect to two broad patterns. First, disorders that involve externalizing behavior are more consistently associated with termination of schooling across the four milestones than are disorders that involve internalizing behaviors. Neither major depression nor generalized anxiety disorder were associated with subsequent termination of schooling at any of the



milestones examined, consistent with the findings of several longitudinal studies (Fergusson et al., 2002; Johnson et al., 1999; Miech et al., 1999). Second, the association of mental disorders with termination of schooling is more consistent across disorders with respect to high school than with respect to any of the other milestones examined.

Four additional findings that have not been reported in previous studies should be highlighted. First, we found an association between early-onset mental disorders and termination of primary school, an association not previously investigated. At this early stage, however, the association of mental disorders with termination of schooling is more circumscribed than at later milestones. Specifically, only two disorders—oppositional defiant disorder and alcohol abuse -- predict failure to complete primary school. Neither conduct disorder, which involves a pattern of rule-breaking behavior, nor ADHD, which involves difficulties in performing classroom activities, predicts failure to complete primary school. These results suggest that impulse control disorders do not lead to termination of schooling at this early stage unless the maladaptive pattern of behavior involves persistent and overt opposition to authority.

Second, although there are consistent associations of mental disorders with termination of schooling, there is not a significant association between having exactly one mental disorder and termination at any of the four milestones we examined. This pattern of findings suggests that, even among students with mental disorders, many are not at higher risk of termination than students without any mental disorder. We also found that having three or more disorders is associated with termination of schooling prior to high school graduation and college entry. Consequently, the development of screening methods for identifying students at high risk for termination, who might benefit from clinical interventions, is likely to require comprehensive assessments of multiple disorders.

Third, our results highlight the importance of bipolar disorder for termination of schooling in high school, prior to college entry and before college graduation. This finding suggests the need for developing early identification and intervention methods for this disorder. Though relatively low in prevalence, bipolar disorder is a severe mental disorder (Kessler, Chiu, Demler, Merikangas, & Walters, 2005b; Mitchell, Slade, & Andrews, 2004) that may have a disproportionate influence on the capacity to complete an academic program at the high school and college levels.

Fourth, our findings suggest that the societal burden of mental disorders in lost educational attainment is substantial, though smaller than estimated in the only previous study to estimate this burden (Vander Stoep et al., 2003). Since our study incorporates controls for an extensive array of childhood adversities it is likely that our more conservative estimates reflect a closer approximation to the causal effect of mental disorders.

These results should be interpreted in light of three limitations. First, we examined the associations of each individual mental disorder with termination of schooling without accounting for the co-occurrence of the disorder with other mental disorders. It is well known, however, that early-onset mental disorders tend to co-occur in complex and poorly understood patterns of comorbidity (Kandel et al., 1999). The significant associations that we observed between some individual mental disorders and termination of schooling may be due in part to other disorders that co-occur with the disorder being examined. These estimates identify disorders that are markers of increased risk for adverse educational outcomes. Some of the disorders might be uniquely influential because of their clinical characteristics, whereas others might signify the presence of multiple disorders.

We partially address this limitation by examining associations of composite disorders, i.e. 1, 2, or 3 or more co-occurring disorders, and subsequent educational attainment and through the comparison of average educational attainment among people without mental disorders with

attainment among a randomly selected sample of individuals with disorders in figure 1. The results on the composite categories indicate that the decrements in educational outcomes are greater among persons with multiple disorders than among persons with single disorders. To identify the combinations of disorders with the strongest associations with truncated education large scale longitudinal studies that begin in childhood with frequent assessments are needed.

A second limitation is the cross-sectional nature of the study and consequent reliance on retrospective recall of age of onset of disorders. The survey instrument incorporated a number of techniques shown in experimental studies to minimize errors of recall of past events (Kessler et al., 2004c). Also, as noted above, where our study examined questions that have been examined in longitudinal studies, our results are consistent with those studies. However, inaccuracy in recall of age of onset of mental disorders cannot be ruled out. Inclusion of mental health assessments in longitudinal studies of youth and young adults is needed to confirm these findings and explore potential mechanisms behind these observations.

Third, due to sample size limitations for population subgroups we were not able to rule out the possibility of demographic variation in the association between mental disorders and termination of schooling. Analysis of statistical interactions between demographic characteristics and classes of mental disorders suggests that the observed associations are generally consistent. However, important patterns of variation in these associations might be found in larger studies or in studies focused on particular population groups.

The findings of this analysis suggest that mental disorders begin to have adverse effects with implications throughout the life course as early as primary school for individuals with particular behavioral problems and in adolescence for a larger group of individuals with more complex disorders and comorbid conditions. Support for school-based mental health services (Haynes, 2002) or dropout prevention programs (Prinz, Dumas, Smith, & Laughlin, 2000; Vander Stoep et al., 2005) that target the disorders identified here as potentially having a negative impact on educational attainment may be strategic public health investments because of the wide range of benefits of educational attainment across the adult life course.

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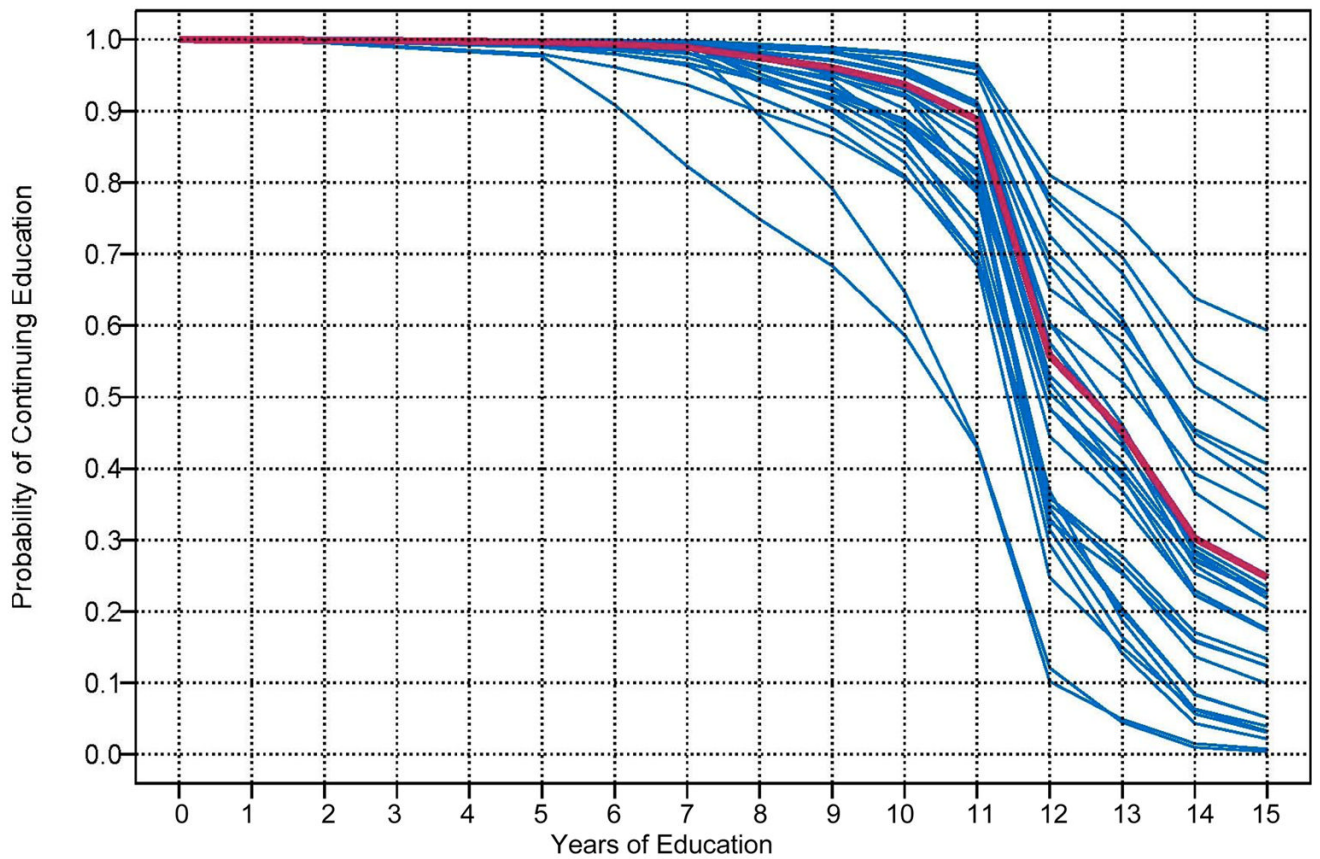
## References

- Andreasen NC, Endicott J, Spitzer RL, Winokur G. The family history method using diagnostic criteria. Reliability and validity. *Arch Gen Psychiatry* 1977;34:1229–35. [PubMed: 911222]
- APA. Diagnostic and Statistical Manual of Mental Disorders. Vol. 4. Washington DC: American Psychiatric Association; 1994.
- Courtney, ME.; Piliavin, I.; Grogan-Kaylor, A.; Nesmith, A. *Foster Youth Transitions to Adulthood: A Longitudinal View of Youth Leaving Care*. Madison, WI: Institute for Research on Poverty; 1998.
- Cutler, D.; Lleras-Muney, A. *National Poverty Center Working Paper Series*. Washington DC: National Poverty Center; 2006. *Education and Health: Evaluating Theories and Evidence*.

- Fergusson DM, Woodward LJ. Mental health, educational, and social role outcomes of adolescents with depression. *Arch Gen Psychiatry* 2002;59:225–31. [PubMed: 11879160]
- First, M.; Spitzer, R.; Gibbon, M.; Williams, J. Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Non-patient Edition (SCID-I/NP). New York: Biometric Research, New York State Psychiatric Institute; 2002.
- Freudenberg N, Ruglis J. Reframing school dropout as a public health issue. *Prev Chronic Dis* 2007;4:A107. [PubMed: 17875251]
- Fronstin P, Greenberg DH, Robins PK. The Labor Market Consequences of Childhood Maladjustment. *Social Science Quarterly* 2005;86s:1170–1195.
- Haynes NM. Addressing students' social and emotional needs: the role of mental health teams in schools. *J Health Soc Policy* 2002;16:109–23. [PubMed: 12809382]
- Huurte T, Aro H, Rahkonen O, Komulainen E. Health, lifestyle, family and school factors in adolescence: predicting adult educational level. *Educational Research* 2006;48:41–53.
- Johnson JG, Cohen P, Dohrenwend BP, Link BG, Brook JS. A longitudinal investigation of social causation and social selection processes involved in the association between socioeconomic status and psychiatric disorders. *J Abnorm Psychol* 1999;108:490–9. [PubMed: 10466273]
- Kandel DB, Johnson JG, Bird HR, Weissman MM, Goodman SH, Lahey BB, Regier DA, Schwab-Stone ME. Psychiatric comorbidity among adolescents with substance use disorders: findings from the MECA Study. *J Am Acad Child Adolesc Psychiatry* 1999;38:693–9. [PubMed: 10361787]
- Kessler RC, Abelson J, Demler O, Escobar JI, Gibbon M, Guyer ME, Howes MJ, Jin R, Vega WA, Walters EE, Wang P, Zaslavsky A, Zheng H. Clinical calibration of DSM-IV diagnoses in the World Mental Health (WMH) version of the World Health Organization (WHO) Composite International Diagnostic Interview (WMHCIDI). *Int J Methods Psychiatr Res* 2004a;13:122–39. [PubMed: 15297907]
- Kessler RC, Berglund P, Chiu WT, Demler O, Heeringa S, Hiripi E, Jin R, Pennell BE, Walters EE, Zaslavsky A, Zheng H. The US National Comorbidity Survey Replication (NCS-R): design and field procedures. *Int J Methods Psychiatr Res* 2004b;13:69–92. [PubMed: 15297905]
- Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005a;62:593–602. [PubMed: 15939837]
- Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005b;62:617–27. [PubMed: 15939839]
- Kessler RC, Davis CG, Kendler KS. Childhood adversity and adult psychiatric disorder in the US National Comorbidity Survey. *Psychol Med* 1997;27:1101–19. [PubMed: 9300515]
- Kessler RC, Foster CL, Saunders WB, Stang PE. Social consequences of psychiatric disorders, I: Educational attainment. *Am J Psychiatry* 1995;152:1026–32. [PubMed: 7793438]
- Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res* 2004c;13:93–121. [PubMed: 15297906]
- Koivusilta LK, Rimpela AH, Rimpela M, Vikat A. Health behavior-based selection into educational tracks starts in early adolescence. *Health Education Research* 2001;16:201–214. [PubMed: 11345662]
- McLeod JD, Kaiser K. Childhood Emotional and Behavioral Problems and Educational Attainment. *American Sociological Review* 2004;69:636–658.
- Merikangas KR, Ames M, Cui L, Stang PE, Ustun TB, Von Korff M, Kessler RC. The Impact of Comorbidity of Mental and Physical Conditions on Role Disability in the US Adult Household Population. *Arch Gen Psychiatry* 2007;64:1180–8. [PubMed: 17909130]
- Miech RA, Caspi A, Moffitt TE, Wright BRE, Silva PA. Low socioeconomic status and mental disorders: A longitudinal study of selection and causation during young adulthood. *American Journal of Sociology* 1999;104:1096–1131.
- Mitchell PB, Slade T, Andrews G. Twelve-month prevalence and disability of DSM-IV bipolar disorder in an Australian general population survey. *Psychol Med* 2004;34:777–85. [PubMed: 15500298]



- Prinz RJ, Dumas JE, Smith EP, Laughlin JE. The EARLY ALLIANCE prevention trial: A dual design to test reduction of risk for conduct problems, substance abuse, and school failure in childhood. *Controlled Clinical Trials* 2000;21:286–302. [PubMed: 10822124]
- RTI. Software for Survey Data Analysis (SUDAAN), Version 8.1. Research Triangle Park, NC: Research Triangle Institute; 2002.
- Vander Stoep A, McCauley E, Thompson KA, Herting JR, Kuo ES, Stewart DG, Anderson CA, Kushner S. Universal emotional health screening at the middle school transition. *Journal of Emotional and Behavioral Disorders* 2005;13:213–223.
- Vander Stoep A, Weiss NS, Kuo ES, Cheney D, Cohen P. What proportion of failure to complete secondary school in the US population is attributable to adolescent psychiatric disorder? *Journal of Behavioral Health Services & Research* 2003;30:119–124. [PubMed: 12633008]
- WHO. International Classification of Diseases (ICD-10). Geneva, Switzerland: World Health Organization; 1991.
- Willett JB, Singer JD. Investigating Onset, Cessation, Relapse and Recovery: Why You Should, and How You Can, Use Discrete-Time Survival Analysis to Examine Event Occurrence. *Journal of Consulting and Clinical Psychology* 1993;61:952–965. [PubMed: 8113496]
- Woodward LJ, Fergusson DM. Life course outcomes of young people with anxiety disorders in adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry* 2001;40:1086–1093. [PubMed: 11556633]



**Figure 1.** Projected educational attainment for 30 randomly selected respondents with at least one mental disorder prior to completing education (—) compared to the average among respondents without a mental disorder (—)\*.  
\*Probabilities estimated in survival models with adjustment for sociodemographic characteristics and childhood adversities.

Prevalence of Termination of Schooling Prior to Completion of Four Educational Milestones

Table 1

Educational Milestone	At Risk		Terminated Prior to Completion		Censored*		Percent Terminated Among Those At Risk		Percent Terminated Among Total Part II Sample	
	N	%	N	%	N	%	%	(se)	%	(se)
Primary School	5,691		105		0		2.8	(0.4)	2.8	(0.4)
High School Graduation	5,586		743		0		14.3	(0.7)	13.9	(0.7)
College Entry	4,843		1,658		57		37.6	(1.0)	31.3	(0.9)
4 years of College	3,128		1,661		49		52.4	(1.2)	26.5	(0.8)

\* Censored observations are respondents who were 18 years old at the time of interview, or were between 19 and 21 years old and still in college.

**Table 2**  
Demographic Predictors of Termination of Schooling at Four Educational Milestones\*

Predictor	Terminated Primary School		Terminated Secondary School		Did Not Enter College		Terminated College	
	Odds	95% CL	Odds	95% CL	Odds	95% CL	Odds	95% CL
<b>Age</b>								
18–34	0.09	(0.03,0.25)	0.78	(0.57,1.07)	0.83	(0.61,1.15)	1.57	(1.14,2.14)
35–9	0.11	(0.05,0.26)	0.43	(0.31,0.60)	0.73	(0.54,1.00)	0.97	(0.71,1.32)
50–64	0.59	(0.27,1.25)	0.48	(0.35,0.65)	0.57	(0.41,0.78)	0.96	(0.70,1.30)
>64	reference		reference		reference		reference	
Chisq <sub>3</sub> (p)	36.78 (<.001)		39.58 (<.001)		15.65 (.001)		32.97 (<.001)	
<b>Parent's Education</b>								
<H.S Grad.	41.53	(9.66,178.48)	7.41	(4.86,11.32)	7.64	(5.63,10.36)	2.92	(2.27,3.75)
H.S. Grad	12.53	(2.76,56.85)	3.35	(2.19,5.11)	5.69	(4.34,7.45)	2.5	(2.04,3.06)
Some college	23.16	(3.71,144.74)	1.84	(1.10,3.09)	1.25	(0.89,1.76)	1.89	(1.51,2.36)
College	reference		reference		reference		reference	
Chisq <sub>3</sub> (p)	35.81 (<.001)		123.47 (<.001)		285.8 (<.001)		98.97 (<.001)	
<b>Race-Ethnicity</b>								
Hispanic	8.13	(3.72,17.76)	2.15	(1.51,3.06)	1.68	(1.23,2.30)	1.28	(0.96,1.71)
Black	3.15	(1.57,6.31)	1.5	(1.13,1.99)	1.35	(1.01,1.82)	1.26	(1.00,1.60)
Other	5.56	(1.26,24.59)	1.01	(0.64,1.61)	0.61	(0.40,0.93)	0.75	(0.52,1.09)
White	reference		reference		reference		reference	
Chisq <sub>3</sub> (p)	29.02 (<.001)		22.53 (<.001)		20.96 (<.001)		9.01 (.029)	
<b>Sex</b>								
Male	2.15	(1.25,3.70)	1.16	(0.94,1.43)	0.93	(0.78,1.11)	0.87	(0.75,1.02)
Female	reference		reference		reference		reference	
Chisq <sub>1</sub> (p)	7.61 (.006)		1.9 (.168)		0.58 (.447)		2.93 (.087)	

\* Odds ratios estimated in person-year models containing all demographic variables.

**Table 3**  
 Psychiatric Disorders as Predictors of Termination of Schooling Prior to Completion of Four Educational Milestones

	Primary School			High School Graduation			College Entry			4 Years of College		
	OR	(95% CI)	$\chi^2$	(p-value)	OR	(95% CI)	$\chi^2$	(p-value)	OR	(95% CI)	$\chi^2$	(p-value)
<b>Anxiety Disorders</b>												
GAD	2.2	(0.4–11.0)	0.9	(.354)	1.0	(0.6–1.7)	0.0	(.885)	0.9	(0.6–1.4)	0.1	(.763)
Specific phobia	0.9	(0.4–1.8)	0.2	(.673)	1.3	(1.1–1.7)	6.3	(.012)	1.0	(0.8–1.2)	0.1	(.756)
Social phobia	1.1	(0.6–2.2)	0.1	(.753)	1.2	(1.0–1.6)	3.3	(.071)	1.0	(0.8–1.2)	0.1	(.705)
Panic disorder or Agoraphobia	0.5	(0.1–4.1)	0.3	(.561)	1.1	(0.8–1.7)	0.4	(.537)	1.0	(0.7–1.3)	0.1	(.793)
Adult or childhood separation anxiety	0.4	(0.1–2.7)	0.8	(.378)	1.6	(1.2–2.2)	10.8	(.001)	1.4	(1.0–1.9)	3.8	(.052)
Posttraumatic stress disorder	4.4	(0.9–21.8)	3.4	(.067)	1.4	(1.0–2.0)	3.1	(.078)	0.8	(0.6–1.2)	1.2	(.282)
Any anxiety disorder	0.8	(0.4–1.6)	0.3	(.567)	1.3	(1.0–1.5)	5.3	(.022)	1.0	(0.8–1.2)	0.0	(.881)
<b>Mood Disorders</b>												
Major depression	1.2	(0.4–3.8)	0.1	(.756)	1.3	(0.9–1.8)	2.5	(.113)	1.0	(0.7–1.2)	0.1	(.754)
Dysthymia	3.3	(0.8–14.6)	2.6	(.108)	2.0	(1.1–3.6)	5.3	(.021)	0.9	(0.5–1.6)	0.2	(.640)
Bipolar disorder <sup>†</sup>	0.3	(0.0–2.6)	1.1	(.304)	1.8	(1.1–2.9)	6.5	(.011)	1.6	(1.1–2.4)	5.1	(.025)
Any mood disorder	1.6	(0.6–4.2)	1.1	(.304)	1.5	(1.1–1.9)	8.6	(.003)	1.1	(0.9–1.4)	1.0	(.306)
<b>Impulse Disorders</b>												
Intermittent explosive disorder	1.0	(0.4–2.9)	0.0	(.954)	1.5	(1.1–2.1)	7.8	(.005)	1.1	(0.8–1.4)	0.3	(.554)
Conduct disorder	0.7	(0.2–3.5)	0.1	(.713)	2.5	(1.8–3.6)	25.7	( $<.001$ )	1.7	(1.2–2.4)	9.2	(.002)
Oppositional defiant disorder	3.5	(1.3–9.7)	5.7	(.017)	1.9	(1.3–2.7)	11.6	(.001)	1.6	(1.1–2.2)	6.1	(.013)
Attention deficit disorder	1.2	(0.3–4.3)	0.1	(.814)	1.7	(1.2–2.3)	8.3	(.004)	1.6	(1.1–2.2)	7.5	(.006)
Any impulse disorder	1.2	(0.6–2.7)	0.3	(.566)	1.8	(1.4–2.4)	22.1	( $<.001$ )	1.4	(1.1–1.7)	7.5	(.006)
<b>Substance Disorders</b>												
Alcohol abuse	7.0	(1.1–46.0)	4.1	(.042)	2.7	(1.9–3.9)	29.3	( $<.001$ )	1.4	(1.1–1.9)	6.7	(.010)
Alcohol dependence	..*	...	..	...	1.9	(1.0–3.4)	4.1	(.042)	1.3	(0.8–2.0)	0.9	(.337)
Drug abuse	4.1	(0.5–33.8)	1.7	(.189)	3.1	(2.1–4.6)	31.1	( $<.001$ )	1.4	(1.0–1.8)	4.1	(.043)
Drug dependence	..*	...	..	...	3.5	(1.7–6.9)	12.4	( $<.001$ )	2.0	(1.2–3.2)	8.0	(.005)
Any substance	4.4	(0.9–21.6)	3.4	(.066)	2.9	(2.1–4.0)	42.0	( $<.001$ )	1.4	(1.1–1.7)	5.8	(.016)
<b>Composite Disorders</b>												
Exactly 1 disorder	0.9	(0.4–1.8)	0.1	(.738)	1.1	(0.8–1.4)	0.2	(.669)	1.0	(0.9–1.3)	0.2	(.686)
Exactly 2 disorders	1.0	(0.4–2.9)	0.0	(.953)	1.4	(1.0–2.0)	4.9	(.027)	0.9	(0.7–1.2)	0.3	(.578)



	Primary School		$\chi^2$	(p-value)	OR	High School Graduation		$\chi^2$ (p-value)	OR	College Entry		$\chi^2$	(p-value)	OR	4 Years of College	
	OR	(95% CI)				(95% CI)	(95% CI)			(95% CI)	(95% CI)				$\chi^2$ (p-value)	
Three or more disorders	1.3	(0.5-3.4)	0.3	(.559)	2.5	(1.9-3.3)	41.5 (<.001)	1.4	(1.1-1.8)	6.6	(.010)	1.2	(1.0-1.5)	3.8	(.053)	

<sup>†</sup>Zero cell counts made estimation of odds ratios for these disorders impossible.

<sup>‡</sup>Bipolar disorder includes both bipolar 1 and bipolar 2 disorders.

**Table 4**  
 Estimated Proportion of Schooling Termination Attributable to Mental Disorders\*

Educational Milestone	Average Probability of Termination With Disorders	Average Probability of Termination Without Disorders	Sum of Termination Probabilities With Disorders	Sum of Termination Probabilities Without Disorders	Percent Change
Primary School	0.03	0.03	162.76	156.50	3.85%
High School	0.17	0.15	964.06	865.60	10.21%
College Entry	0.49	0.47	2791.44	2667.37	4.44%
4 Years of College	0.76	0.74	4332.56	4221.01	2.57%

\* Probabilities estimated using logistic regression models described in the text.

Interactions between demographic variables and classes of psychiatric disorder in predicting termination of schooling at three educational milestones\*

Appendix Table 1

Class of Disorder Demographic Variable	Terminated Secondary		Did Not Enter College		Terminated College	
	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
<u>Any anxiety</u>						
Age	0.78	0.854	1.01	0.799	5.63	0.131
Parents education	0.7	0.872	0.6	0.898	<b>9.53</b>	<b>0.023</b>
Race	5.18	0.159	2.31	0.511	5.32	0.15
Sex	0.62	0.432	0.33	0.568	0.42	0.519
<u>Any impulse</u>						
Age	3.84	0.28	1.51	0.681	<b>418.68</b>	<b>0</b>
Parents education	1.35	0.718	0.72	0.868	1.36	0.716
Race	4.36	0.226	1.16	0.763	3.83	0.28
Sex	0.02	0.888	1.14	0.285	0.07	0.799
<u>Any mood</u>						
Age	1.48	0.687	4.53	0.209	2.32	0.51
Parents education	4.48	0.214	0.84	0.84	1.39	0.707
Race	0.09	0.994	2.71	0.439	1.32	0.724
Sex	0.65	0.419	0.38	0.54	2.22	0.136
<u>Any substance</u>						
Age	2.04	0.564	5.93	0.115	2.81	0.422
Parents education	<b>6.54</b>	<b>0.088</b>	0.79	0.853	2.59	0.459
Race	1.36	0.715	5.32	0.15	<b>7.91</b>	<b>0.048</b>
Sex	<b>4.89</b>	<b>0.027</b>	0.1	0.747	0.16	0.686

\* Interactions estimated in person-year level models. Significant interactions at the p=.1 level are highlighted in bold.