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Twelfth-Grade Student Work Intensity Linked to Later Educational Attainment and Substance Use: New Longitudinal Evidence

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Abstract

Long hours of paid employment during high school have been linked to a variety of problem behaviors, but questions remain about whether and to what extent work intensity makes any causal contribution. This study addresses those questions by focusing on how 12th-grade work intensity is associated with substance use and educational attainment in the years following high school. It uses two nationally representative longitudinal data sets from the Monitoring the Future project, spanning a total of three decades. One data set tracks 8th graders for 8 years (modal ages 14–22) and provides extensive controls for possible prior causes; the second larger data set tracks 12th graders for up to 12 years (to modal ages 29–30) and permits assessment of possible short- and longer-term consequences. Findings based on propensity score matching and multivariate regression analyses are highly consistent across the two sets of data. All findings show that more fundamental prior problems, including low academic performance and aspirations, make substantial contributions to substance use and long-term academic attainment (selection effects), but the findings also suggest that high work intensity during high school has long-term costs in terms of college completion and perhaps cigarette use.

Keywords

Student employment; Educational attainment; Smoking; Substance use; Problem behaviors

High school students who work intensively (i.e., more than 20 hours per week) in paid employment during the school year are more likely than average to report a variety of problem behaviors; these include higher rates of delinquency, substance use, and school misconduct, lower grade point averages and educational aspirations, less time spent on homework and in extracurricular activities, and reduced odds of high school graduation. This has been widely researched and discussed (see Mortimer, 2003; Staff, Messersmith, & Schulenberg, 2009; Uggen and Wakefield 2008). Nevertheless, critical questions remain unanswered, particularly concerning the causal relations between work intensity and problem behaviors. Longitudinal data from the nationally representative Monitoring the Future (MTF) project provide additional leverage for addressing such questions.

Cross-sectional findings from the MTF project have already contributed to the literature on developmental and educational correlates of student involvement in paid work during the

high school years (Bachman, 1983; Bachman, Safron, Sy, & Schulenberg, 2003; Bachman & Schulenberg, 1993; Osgood, 1999; Safron, Bachman, & Schulenberg, 2001). The present article utilizes two sets of longitudinal MTF data: one is a panel tracking young people from the 8th grade into young adulthood (modal age 22); the other consists of panel data collected from high school seniors and young adults that includes possible consequences up to ages 29–30.

There has been considerable debate about the extent to which student work intensity is a significant *cause* of various problem behaviors, rather than just a *symptom* of earlier problems. Paid work has the potential to disrupt academic performance and promote problem behaviors that may interfere with longer-term educational attainment and adjustment (Steinberg & Cauffman, 1995). For instance, young workers may have less time to spend on school work and extracurricular activities, especially if they spend long hours on the job (Greenberger & Steinberg, 1986; Marsh & Kleitman, 2005). Intensive workers may also be more likely to come to school unprepared for learning because they are less likely to eat breakfast and they get less sleep (Bachman & Schulenberg, 1993). Although most research shows little difference in academic performance between working and nonworking youths (Warren, LePore, & Mare, 2000), other studies have found *intensive* work hours associated with lower academic success in high school (Schoenhals, Tienda, & Schneider, 1998; Lee & Staff, 2007; McNeal, 1997; Warren & Lee, 2003). Adolescents who pursue intensive work hours also obtain fewer years of education than do their nonworking or moderately working peers (Carr, Wright, & Brody, 1996; Mortimer, 2003; Staff & Mortimer, 2007).

Poor academic performance and low commitment to school may also account for the relationship between intensive work and problem behaviors (Greenberger & Steinberg, 1986; Staff & Uggen, 2003; Steinberg & Dornbusch, 1991; Steinberg, Fegley, & Dornbusch, 1993). Furthermore, cross-sectional findings from MTF have shown the inverse relationship between work hours and participation in extracurricular activities (Bachman & Schulenberg, 1993; Osgood, 1999; Safron et al., 2001). Instead, youth who work long hours spend relatively more time going to bars, parties and social events, going on dates, or riding around in cars for fun, all of which are often unstructured, unsupervised activities that can increase the likelihood of substance use and delinquency (Osgood, Wilson, O'Malley, Bachman, & Johnston, 1996). Intensive employment may also enable problem behaviors by providing teenagers with money for cigarettes, alcohol, illicit drugs, and social activities, by exposing them to older workers and more "adult-like" forms of recreation and relaxation (e.g., alcohol and drug use, "smoke breaks"), or by giving them freedom from parental and other adult supervision (Longest & Shanahan, 2007; Osgood, 1999).

In spite of these several plausible mechanisms for causal effects, a growing body of research suggests that the *apparent effects* of student work intensity on school achievement and problem behaviors may really be *spurious correlates* of pre-existing individual differences in academic ability, orientations toward work and school, motivation, self-control, or other unobserved characteristics (Apel et al., 2007, 2008; Paternoster, Bushway, Brame, & Apel, 2003; Rothstein, 2007; Schoenhals et al., 1998; Warren, 2002; Warren et al., 2000). A primary reason why work intensity correlates with academic success (negatively) and problem behaviors (positively) may be that students who develop patterns of little interest and poor performance in school may subsequently, and at least partly as a consequence, choose to invest more of their time in employment (Bachman & Schulenberg, 1993; Mortimer & Johnson, 1998; Schoenhals et al., 1998). Adolescents who place more importance on paid work than school tend to perform poorly in school (Warren, 2002) and have a greater likelihood of substance use and other problem behaviors (Bachman et al., 2003), even when they are not holding a job. Moreover, prior engagement in substance use

and minor deviance may prompt some youth to seek employment in the hopes it will offer fewer constraints on their problem behaviors than do teachers andparents (Bachman & Schulenberg, 1993; Staff & Uggen, 2003). Indeed, the observed associations between long work hours, school disengagement, low academic achievement, and involvement in heavy drinking, substance use, and delinquency in later adolescence may be a symptom of these earlier problem behaviors (Newcomb & Bentler, 1988; Brook & Newcomb, 1995; Donovan & Jessor, 1985). The policy-relevant question remains, however, as to whether high levels of student work intensity make any additional negative contributions to long-term educational attainment and substance use, and therefore should be discouraged.

The Current Study

The broad question addressed in this paper is whether, and if so to what extent, work intensity during high school (particularly during the final year of high school when average levels of work intensity are highest) has lasting developmental and educational consequences not attributable to other prior and more fundamental causes. The evidence summarized above indicates that at least some considerable portion of the observed correlations between student work intensity and problem outcomes does reflect selection effects, so the question really comes down to whether there is any evidence of lasting causal impact(s) of high work intensity. However, we must acknowledge a certain asymmetry when attempting to sort out causation versus selection using observational data: If controlling theoretically-relevant prior and more fundamental variables *fully eliminates* any apparent "effect," then the parsimonious interpretation would be that *only* selection is involved, and one might fairly confidently rule out a causal effect. However, if controls only *reduce somewhat* the apparent "effect," then questions may remain as to whether the controls were adequate, and that in turn leaves some residual uncertainty about whether any causal effect exists.

We can state two alternative hypotheses linking 12th-grade student work intensity to later educational attainment and substance use. Hypothesis 1: The deleterious effects often attributed to high student work intensity are due to selection—i.e., prior differences. This was the working hypothesis with which we began these analyses. We expected that the MTF panel data would provide sufficiently complete measures of those prior differences so as to demonstrate virtually no residual relationships possibly attributable to causal effects of work intensity. Hypothesis 2: Above and beyond any selection effects, high student work intensity does make some causal contribution to substance use and lowered educational attainment. Possible causal pathways for such effects are explored later.

The above hypotheses are not necessarily mutually exclusive. Moreover, it is quite plausible that support for either hypothesis will vary from one outcome to another. Although we began with the expectation that the relations between student work intensity and problem outcomes might be entirely attributable to selection effects, we have taken pains not to "stack the deck" in favor of either hypothesis. Rather, our intention has been to provide new evidence in a balanced fashion.

In spite of our efforts to be broadly representative, we must note that the present analyses cannot generalize directly to all adolescents; rather, our samples are restricted in four important respects. First, we focus primarily on the large majority of young people who remain in school through 12th grade. Second, for reasons discussed further in the next section, we decided to concentrate on work intensity during the 12th grade. Earlier analyses examining MTF cross-sectional samples of students in 8th, 10th, and 12th grades (in 1992–1998) provide some support for this decision; these analyses showed that (a) paid work during the school year was most frequent during the senior year, (b) work intensity showed

consistently negative correlations with college plans and grade point averages (as well as positive correlations with substance use), and (c) the negative relations with college plans and GPA were stronger at the higher grades (Bachman et al., 2003). Third, we deal mostly with intensity of paid work among that subset of 12th graders (the substantial majority) who do hold paid employment. This is because other research has shown that (a) many 12th graders who do not hold paid jobs wish that they did (Bachman et al., 2003), and (b) the zero hours of employment category appears qualitatively different from an "end point" on a scale of paid work intensity (Bachman & Schulenberg, 1993; Foster, 1995). Fourth, like other panel studies, our data suffer from panel attrition; however, we have taken account of that in several ways, including the use of reweighting to adjust for panel attrition in most of our analyses.

Method

Samples and Procedures

We use data from the Monitoring the Future project (MTF), an ongoing study of secondary school students and young adults conducted by the Institute for Social Research at the University of Michigan and described extensively elsewhere (Bachman et al., 2008; Bachman, Johnston, O'Malley, & Schulenberg, 2006; Johnston, O'Malley, Bachman, & Schulenberg, 2008). MTF annually surveys large representative samples of students in public and private schools throughout the 48 contiguous United States. Surveys of 12th-grade classes began in 1975, and mail follow-up surveys have been conducted each year beginning with the class of 1976.[1] Surveys of 8th- and 10th-grade classes began in 1991; follow-up surveys were obtained at two-year intervals from subsets of the 8th graders surveyed in 1991–1993, and these comprise the 8th-grade panel used here. Two distinct types of panel data are thus available and used in this article: (1) *12th-grade panels*— subsamples of all 12th-grade classes surveyed initially in 1976 through 2003, followed on a biennial basis after high school, and (2) *8th-grade panel*— 8th-grade classes surveyed initially in 1991, 1992, and 1993, followed biennially through age 22.

Each type of panel data provides distinct advantages. The set of 12th-grade panels is quite large and spans many high school graduating classes, thus providing considerable precision and a broad range of generalization. Moreover, the 12th-grade panels permit examination of longer-term outcomes, because most include respondents who have reached ages 29–30. The 8th-grade panel is much smaller, especially the numbers of cases reporting high levels of work intensity as high school seniors, so it lacks precision. However, because it includes important data measured in 8th and 10th grades, the 8th-grade panel permits a much wider range of controls for possible prior causes.

Twelfth-grade panels—Three-stage probability sampling procedures (Kish, 1965) were used to select 12th-grade students in approximately 135 public and private high schools each year. Representative subsets from each sample of 12th-grade participants were selected for mail follow-up surveys; those who reported illicit drug use (as 12th graders) were oversampled by a factor of 3 to 1. A random one half of respondents in each subset were sent the first follow-up questionnaire one year after the 12th-grade survey; the rest were surveyed two years after. All further follow-ups were at two-year intervals. The present analyses make use of the second and sixth follow-ups for each available class year. The second follow-up took place when half of the participants were three years beyond high school (modal age 21) and half were four years beyond high school (modal age 22).[2] For

[1]The first survey of 12th-grade students occurred in 1975, but substantial changes were made in the questionnaires after that first year; accordingly, the class of 1976 is the earliest class included in the panel analyses reported here.

analyses involving the second follow-up (modal ages 21–22), we used panel data from the high school classes of 1976 through 2003; the actual (unweighted) number of cases selected for follow-up was 68,224. The sixth follow-up occurred when participants were 11 or 12 years beyond high school (modal ages 29–30); these analyses were based on the high school classes of 1976 through 1995; the actual number of cases selected for follow-up was 48,609. Sample restrictions for many analyses, including a focus on those working one or more hours in paid employment, reduced these numbers of cases.

Eighth-grade panel—This is a panel of respondents initially surveyed as part of the MTF cross-sectional samples of 8th-grade students in 1991, 1992, and 1993 (students scheduled to graduate in the high school classes of 1995–1997). Three-stage probability sampling procedures (Kish, 1965) were used to select students in about 160 public and private schools each year in 1991, 1992, and 1993. From those 8th graders who participated in the initial in-school questionnaire surveys, 2,000 were selected each year for follow-up using a stratified random procedure that overrepresented those most likely to drop out of school. The follow-up surveys were mailed to the target samples at two-year intervals. Present analyses use data from the initial surveys that occurred in 8th grade (modal age 14), as well as follow-up surveys two years later (when most were in 10th grade, modal age 16), two years after that (when most were in 12th grade, modal age 18), and four years after that (modal age 22). Because of our focus on impacts of 12th-grade work intensity while a student (i.e., during the school year), analyses of the 8th-grade panel are further restricted to respondents who were still in school at the time of the second follow-up (that is, had neither dropped out nor graduated). For reasons discussed below, nearly all analyses are restricted to those who reported paid employment during 12th grade.

Weighting, panel attrition, missing data, and significance tests—In propensity matching analyses (described below), unweighted data were used in comparisons; this is because these analyses were intended to compare “treated” with “untreated” cases (somewhat analogous to an experiment) rather than accurately represent total populations or subpopulations. All other analyses used weights that adjust for (a) initial probability of selection, (b) absenteeism at time of initial (base-year) survey, and (c) panel attrition. For each panel, these combined weights were then adjusted (reduced by a constant) to produce final weighted *N*s no larger than the actual numbers of participants. In all regression analyses, adjustments for design effects due to clustering of initial samples in schools are included in calculations of statistical significance.

Adjustment for absenteeism—Weights were set proportionate to rate of absence during the four weeks preceding the survey, so as to compensate for students who missed that initial survey. This adjustment for absenteeism at the base year had the effect of slightly increasing overall prevalence rates for substance use and slightly decreasing average levels of academic performance.

Adjustment for panel attrition—Sample attrition is a potential problem in all panel studies, including Monitoring the Future. When appropriately weighted to account for initial probability of selection and absenteeism at time of base-year survey, retention rates were 66.7% of the 12th-grade panel samples followed 3–4 years later at modal ages 21–22, 56.2% of the 12th-grade panel samples followed 11–12 years later at modal ages 29–30, and 54.6% of the 8th-grade panel followed 8 years later at modal age 22. The adjustments for panel attrition involved an additional set of weights set proportionate to probability for

[2]Although the modal age 22 respondents averaged more years of college completed than the modal age 21 respondents, there were no other substantial differences between the two subsets.

nonparticipation in the follow-up survey, with probability estimated using logistic regression and a subset of the predictors used in the propensity matching analyses (see Table A1). Prior to adjustment, several characteristics of the obtained follow-up samples (based on initial base-year measures) differed modestly from the target samples. The obtained follow-ups had about 5–8% fewer males and non-Whites; and they were slightly higher in two-parent families (4–6%) and grade point average (.12–.20 sd). After the adjustment for panel attrition, the differences for these variables were substantially reduced—in most instances by two thirds or more. The obtained samples also had slightly lower base-year reports of substance use (about .04 to .08 sd); the adjustment for attrition reduced these differences—usually by half or more.[3]

Missing data—Techniques for dealing with missing data range from listwise deletion to multiple imputation of all missing data (i.e., MI). An intermediate approach limits analyses to respondents with nonimputed data on the outcome measure but employs imputation for any missing data on predictor variables (i.e., multiple imputation, then deletion; MID). Similar to an MI approach, MID assumes missing values on the outcome variables are ignorable. Yet, von Hippel (2007) has shown that, under a broad range of circumstances, estimates using the MID procedure are preferable to MI. Nevertheless, at various stages of preliminary analysis we examined each of these methods, before selecting the MID approach as most appropriate.[4] It is worth adding that findings differed relatively little between these analysis approaches. In brief, the listwise deletion approach consistently showed very slightly stronger associations than did the MID approach, whereas the MI approach produced slightly weaker associations than those using MID; significance tests were unaffected by these small differences in coefficient size. Imputations to adjust for missing data employed the SAS procedure PROC MI. We imputed values into five data sets, with all outcome and predictor variables included in the imputation procedure (Rubin, 1996). We combined results from analyses of the five imputed data sets and used PROC MIANALYZE to generate valid statistical inferences.

Measures

Work intensity in 12th grade—The in-school surveys of 12th graders included the question, “On the average over the school year, how many hours per week do you work in a paid or unpaid job?” The response categories were: none, 5 hours or less, 6–10, 11–15, 16–20, 21–25, 26–30, and more than 30 hours. A separate question about average weekly earnings was used to distinguish those who worked, but not for pay. Prior research (e.g., Bachman & Schulenberg, 1993) found that including some unpaid jobs complicated preliminary analyses and blurred potentially important distinctions, so present analyses focus on those who reported working for pay. The measure used in the 8th-grade panel second follow-up (at modal age 18) was also limited to paid work, and recoded to match the response scale used in the 12th-grade in-school surveys (i.e., highest intensity responses were combined to form a single “more than 30 hours” category).

The weighted numbers and percentages of respondents across the different levels of 12th-grade work intensity are shown in Table 1. Three samples are shown: the 8th-grade panel respondents who provided follow-up data at modal age 22, the 12th-grade panel respondents who provided follow-up data at modal ages 21–22, and respondents from the (smaller) set of 12th-grade panels who provided follow-up data at modal ages 29–30. The samples are quite similar in overall distributions of work intensity; roughly 70% of 12th-grade students

[3]Further details are available from the authors on request.

[4]In this application of MID, individuals having imputed data on the particular outcome in question were excluded from analyses of that outcome, without regard to whether any of their other outcome data were imputed.

reported engaging in paid work during the school year. This high degree of similarity, in spite of differences in year of graduation, heightens our confidence in making comparisons across the samples.

Other predictors (controls)—The other predictors (i.e., control variables) used in the multivariate analyses, including means and standard deviations, are shown in Table A1. Table B1 shows bivariate (product-moment correlation) and multivariate (standardized regression) coefficients linking these variables to 12th-grade work intensity. The 8th-grade panel analyses used 8th- and/or 10th-grade measurements of the control variables, and avoided use of 12th-grade measures as controls. Obviously this was not possible for the 12th-grade panel analyses, but in a few instances 12th-grade measures were judged to be reasonable proxies for earlier measures.

Outcome measures—Outcome measures are shown in Table 2, along with their response scales, means, standard deviations, and percentages (the latter based on dichotomous versions used in some analyses). *Educational attainment* was measured using questions about years of schooling completed, and degrees attained. *Substance use* measures include frequency of cigarette use in the past 30 days; frequency of marijuana use, and cocaine use, each reported for the past 12 months; and frequency of heavy drinking (five or more drinks at a time) during the past two weeks. The response scales are approximately logarithmic, with each unit beyond zero roughly double the previous one. These substance use measures have good psychometric properties (Johnston & O'Malley, 1985;O'Malley, Bachman, & Johnston, 1983;Wallace & Bachman, 1993). Usage rates for some substances, most notably cocaine, shifted substantially during the time periods covered by the 12th-grade panels. Moreover, some substance use drops appreciably by ages 29–30. Such trends account for differences in means and percentages across the three panels shown in Table 2 (and later in Table 3). In spite of these differences in rates of substance use, preliminary analyses showed that the *patterns of relations* did not shift importantly across time.

Analysis Strategy

The broad question examined in this article is whether variations in paid work intensity during the final year of high school have any causal impact on substance use and educational attainment 3–4 years later and 11–12 years later. A more specific question involves the size and shape of any causal patterns: for example, might beneficial effects result from a moderate number of hours, but harmful effects occur when hours worked exceed a certain amount? Accordingly, our analysis strategy—employing several different complementary analysis techniques (Morgan & Winship, 2007)—examines whether different dosages of student part-time work might have different consequences, rather than only contrasting high-intensity work with all other alternatives. Our two primary techniques were propensity score analyses and ordinary least squares regression analyses.

We conducted preliminary analyses using multiple classification analysis (MCA), a form of dummy-variable multiple regression analysis (Andrews, Morgan, Sonquist, & Klem, 1973). These preliminary analyses influenced our main analyses in two ways: First, we opted to treat those reporting no paid work as a separate category rather than simply as the zero point on the work intensity continuum, and we omit these nonworkers from nearly all analyses reported here. Second, we opted to treat intensity of paid work as a continuum to the extent possible, rather than focusing on any particular cutoff point (e.g., more than 20 hours) as some maximum above which work intensity might have deleterious effects.

Our first main analytic approach used propensity score matching (Imai & van Dyk, 2004; Rosenbaum & Rubin, 1983), contrasting the educational attainment and substance-using

behaviors of young adults who worked at high levels of intensity during adolescence with otherwise similar individuals who worked fewer hours. For each of the panels, we used propensity score methods to match treated individuals (i.e., intensive workers, or those working more than a certain number of hours a week) and untreated individuals (those working fewer hours) on a set of observed characteristics. More specifically, a propensity score was estimated using the conditional probability of treatment (in our case, intensive work), given a set of variables (listed in Table A1) that potentially confound the associations between intensive work and problem behaviors. Although one can use any parametric or nonparametric estimator of the propensity score, we used a logit model.

The propensity score reduces a potentially long list of confounding covariates to a single dimension, which is then used for matching. Based on an individual's propensity score, a matching algorithm then pairs the treated group with comparable untreated individuals. Thus, matched individuals serve as counterfactuals and unmatched cases are not included in subsequent propensity score matching analyses. This matching procedure is designed to eliminate comparisons between workers who may be systematically very different from each other, thereby producing less biased estimates of the treatment effect when *relevant* differences are captured by the observed covariates (Imai & van Dyk, 2004; Rosenbaum & Rubin, 1983).

To examine dosage effects of work intensity for each of the panels, we carried out the above analysis with three different cut points: (1) propensity for working 31 or more hours per week versus working 1–30 hours (in a paid job during 12th grade); (2) propensity for working 26 or more hours versus 1–25 hours; and (3) propensity for working 21 or more hours versus 1–20 hours. Note that those not working for pay (which includes those not working at all) were excluded from the comparison (i.e., control) groups. All predictors shown in Table A1 were used in the logistic regressions to estimate the nine total propensity scores listed above.

We then used the program PSMATCH2 in Stata 10.0 to perform one-to-one nearest neighbor matching without replacement to pair treated and untreated individuals on their propensities to work intensively at age 18 (Leuven & Sianesi, 2003). We used a common-support match, meaning that intensive workers who did not have a match within one tenth of a standard deviation on the propensity score were not paired with anyone from the nonintensive group. In all of these matching analyses, we found sufficient overlap in the distribution of propensity scores for the treated and untreated groups (results available upon request). For instance, the propensity scores among treated individuals (those working over 21 hours per week) ranged from .179 to .764, with a mean of .437 and a standard deviation of .104. Among nontreated individuals, propensity scores ranged from .171 to .752, with a mean of .389 and a standard deviation of .105. Only a handful of workers were considered "off-support" and therefore omitted from these propensity score matching analyses.

Our second main analytic approach employed regression analyses (with full imputation for missing predictor data using the MID approach described above), because regression analyses provide additional information regarding possible mediators and are well-suited to showing relations across the full continuum of student work intensity. The findings reported here are based on ordinary least squares regression showing linear relations. As noted in the Results section, we used the preliminary MCA results to be sure that no important nonlinearities were overlooked.

Results

Consistencies in the Correlates (Predictors) of Work Intensity

Relations between work intensity and the background and other control variables are shown in Table B1. Twelfth-grade work intensity was negatively correlated with parental education, GPA, and college plans; and positively correlated with school-related problem behaviors, other problem behaviors, and preferred and actual work intensity measured at 8th and 10th grades. All these relations are consistent with earlier cross-sectional analyses of MTF data (Bachman & Schulenberg, 1993;Bachman et al., 2003). Preliminary analyses also revealed that these (and other) *patterns* of findings were quite similar when comparing earlier and later cohorts (see also Brown, Schulenberg, Bachman, O'Malley, & Johnston, 2001); therefore, for the analyses reported here, we combined data across the full range of available 12th-grade panels. However, because there were changes over time in *levels of* substance use and educational attainment, we included cohort year among the control variables.

There are gender differences on some of the outcome measures (e.g., higher academic performance among females, higher rates of occasional heavy drinking among males); however, extensive preliminary analyses revealed no appreciable gender differences in *patterns of relations* among variables examined here. Accordingly, the analyses reported here combine the data from males and females, but include gender as one of the control measures.

Analyses Using Propensity Score Matching

As mentioned before, a key advantage of matching on a propensity score is to minimize the observed differences between youth who work intensively and those who do not (Joffe & Rosenbaum, 1999; Rubin & Thomas, 1996). Not surprisingly, in all of the *unmatched* samples, there were statistically significant differences in school performance, aspirations, problem behaviors, and family background characteristics between the treated and control groups. *After matching*, however, bias due to differences in the background measures between intensive and nonintensive workers was reduced substantially. For instance, out of a total of 207 comparisons between intensive and nonintensive workers, 158 (76%) of the covariates were significantly different ($p < .05$; two-tailed tests) prior to matching, whereas only 10 covariates (4.8%) were significantly different after matching. [5]

The results of the propensity matching analyses are summarized in Table 3. Treated groups are compared with control groups, shown before and after matching, using the dichotomous versions of the outcome measures (for ease of interpretation).[6] Overall, the results are consistent among the three panels. The table also reveals fairly similar patterns whether the high-intensity cutoff is set at 31+ hours (vs. controls working 1–30 hours), 26+ hours (vs. controls working 1–25 hours), or 21+ hours (vs. controls working 1–20 hours). At all three cutoffs, higher work intensity during 12th grade is associated with distinctly lower levels of college attainment and higher proportions of daily cigarette smokers. For the other substance use outcomes, differences linked to 12th-grade work intensity are smaller and less consistent.

[5]In the 12th-grade panels, we included age, age squared, and number of siblings as additional variables in the propensity scores to further reduce pre-existing differences between intensive workers and nonintensive workers in the matched samples. In supplemental analyses, we included various polynomial terms and combinations of predictor variables in each propensity score to reduce *all* significant group differences in the covariates. The results of these propensity matching analyses did not differ from those shown in Table 3.

[6]Patterns of findings did not change substantially when we repeated the analyses using continuous versions of our outcome variables.

Educational attainment—The findings for educational attainment show a good deal of similarity between the 8th-grade panel followed up at modal age 22 and the 12th-grade panels followed up at modal ages 21 and 22.[7] Compared with the controls (but prior to matching), fewer than two thirds as many of the 12th-grade high-intensity workers had completed two years of college by ages 21–22. For the 12th-grade panels followed up at modal ages 29–30, the proportionate differences were almost as large—compared with their high-intensity former classmates, nearly half again as many of those who had been lower-intensity workers in 12th grade had completed at least a bachelor degree 11–12 years later. After propensity matching, all of these differences were sharply reduced—by more than half among both sets of 12th-grade panels, and by one third to one half for the 8th-grade panel (depending on which high-intensity threshold is used). All differences, both before and after matching, are statistically significant ($p < .01$; two-tailed tests). The sharp reductions in differences between the treatment and control groups after propensity score matching indicate substantial selection effects, but there also remain fairly large differences in educational attainment potentially attributable to effects of 12th-grade work intensity. In unlisted analyses we used Rosenbaum bounds (Rosenbaum, 2002) to assess whether unobserved differences at baseline between treated (i.e., intensive workers) and nontreated (moderate workers) might be influencing our observed treatment effects of intensive work on educational attainment (Foster, Wiley-Exley, & Bickman, 2009). We found little evidence that the significant treatment effects of intensive work on educational attainment were produced by unobserved factors that predict treatment. For instance, to explain away the observed association between paid work and college attainment in both the 8th- and 12th-grade panels, an unobserved covariate would need to increase the odds of intensive work by more than a factor of 4.

Substance use—The findings for daily cigarette smoking also exhibit a high level of consistency across the three panels. Among those in the high-intensity categories, 30–38% were daily smokers at ages 21–22, compared with 21–26% of the controls (before matching). For those followed to ages 29–30, daily smoking rates were 28–32% versus 19–22% (respectively). For the 12th-grade panels, all of these differences were cut nearly in half after matching, but they still remained statistically significant. For the 8th-grade panel, matching reduced the differences to a lesser degree (nevertheless, given the relatively small numbers of cases involved, some fell short of .05 statistical significance). So here again there is evidence of important selection effects, along with remaining differences suggesting longer-term impacts of 12th-grade work intensity on smoking. In unlisted analyses, we again used Rosenbaum bounds to assess whether the long-term effects of intensive work on smoking were sensitive to hidden bias. For instance, in the 8th-grade panels, an unobserved covariate would need to increase the odds of intensive work by a factor of 1.2 to explain away the long-term effect of intensive work on cigarette smoking. In 12th grade, an unobserved covariate would need to increase the odds of treatment by 30%. Thus, unlike the effects of intensive work on educational attainment, we cannot be fully confident that the long-term “effects” of intensive work on smoking are not due entirely to selection.

Findings for annual marijuana use are much weaker. Among the 12th-grade panel comparisons, five out of six show significantly higher percentages of marijuana users among those who had been high-intensity workers in 12th grade. However, those differences were only 2–3%, and all were reduced to near zero and nonsignificance after propensity matching. The story was much the same for the 8th-grade panel, except that the initial differences did

[7]The proportions completing two years of college or more are slightly lower for the 12th-grade panels; this is partly because half of these respondents were younger (age 21), but also because the 12th-grade panels followed up at modal ages 21–22 included many earlier high school classes with smaller proportions of college entrants.

not reach significance. So here there is evidence of only modest differences, probably attributable entirely to selection.

The findings for annual cocaine use are similar to those for marijuana, except that overall percentages of users are far lower. For the 12th-grade panel, five out of six comparisons showed slightly but significantly higher proportions of users among those who had been higher-intensity workers in 12th grade (differences of 1–3%); however, all were reduced to near zero after matching. The 8th-grade panel comparisons showed some larger differences, but none was significant after controls. So here, as for marijuana use, modest differences seem likely attributable to selection.

Comparisons involving instances of heavy drinking during the previous two weeks showed only small and generally nonsignificant initial differences. After matching, only one of nine comparisons reached the .05 (two-tailed) level of statistical significance (and that was in the opposite direction from the initial difference).

In sum, the propensity score matching findings seem clear and consistent in showing some differences in long-term outcomes (involving educational attainment, and perhaps cigarette use) that are potentially attributable to impacts of 12th-grade work intensity, as well as additional substantial differences (involving all outcome dimensions) attributable to pre-existing factors (selection effects). Moreover, our success in matching treatment and control groups provides some reassurance of the appropriateness of examining potential mediating variables with regression analyses, as reported in the next section.

Analyses Using Ordinary Least Squares Regression

Educational attainment—We conducted preliminary analyses using multiple classification analysis (MCA) so as to examine the patterns of bivariate and multivariate relations between 12th-grade work intensity and each of the outcome variables. Apart from those who reported no paid work at all, the links with all substance use measures were close to linear; specifically, with each increase in work intensity above 1–5 hours, the likelihood and amounts of substance use tended to increase.[8] For educational attainment, on the other hand, the pattern departed from linearity, as can be seen in Figure 1. Specifically, college attainment at ages 21–22 and 29–30 was much the same whether students had worked 1–5, 6–10, or 11–15 hours as 12th graders; however, each increment in work intensity above 15 hours was associated with lower attainment. Therefore, in order to take account of this nonlinearity, the regression analyses involving educational attainment used a recoded (collapsed) version of the work intensity measure that combined the first three categories.[9]

The MCA findings shown in Figure 1 are quite consistent with the propensity matching analyses reported above. After extensive controls for background factors and earlier educational experiences, the differences in educational attainment linked to 12th-grade work intensity were cut nearly in half, but by no means eliminated.

Results from the ordinary least squares regression analyses linking work intensity to later educational attainment are summarized in Table 4. These analyses use the actual number of years of college as the outcome measure, rather than the dichotomies reported in Table 3.[10] In spite of this difference, the broad findings are again quite consistent with the propensity score matching analyses and also quite consistent across the three sets of panel data. The

[8]The 8th-grade panel findings showed a few somewhat random departures from linearity, which we attribute to small sizes of some subgroups.

[9]We also repeated the regression analyses using the full-scale (noncollapsed) version, and found no important differences in findings—only very slightly reduced bivariate and multivariate coefficients. Nevertheless, we considered it appropriate to use the collapsed version of the work intensity measure for analyses of educational attainment, so as not to violate the assumption of linearity.

product-moment correlations (ranging from −.22 to −.27) show clear negative associations between 12th-grade work intensity and years of college completed 3–12 years later. The correlations also show that other factors, such as parents' education level, GPA, and (for the 8th-grade panel only) 10th-grade college plans, are all stronger predictors of later educational attainment. Most important, in the multivariate analyses including these other predictors, the standardized regression coefficients for work intensity are modest (ranging from −.093 to −.105, all significant at $p < .001$) and much lower than the bivariate correlations. This substantial reduction is clear evidence that most of the association between high school work intensity and later educational attainment is due to earlier differences—selection effects. Nevertheless, it also appears that close to one percent of the variance in educational attainment is attributable to 12th-grade work intensity, unique of the other predictors.[11]

The similarity of findings across the three sets of panel data in Table 4 is impressive, especially in light of the appreciable differences between the 8th- and 12th-grade panels in the number and temporal ordering of the control variables. In particular, in the 12th-grade panel analyses we opted to use 12th-grade GPA as a proxy for earlier GPA (because, of course, the earlier measure was not available). This choice can be justified on the grounds that GPA is highly stable; earlier research with the 8th-grade panel data showed correlations of approximately .62 between 10th- and 12th-grade reports of GPA, and also showed that educational attainment at age 22 was correlated about equally with GPA reported in 8th, 10th, and 12th grades (Bachman et al., 2008). The findings in Table 4 provide further confirmation, this time across panels: The predictions to years of college completed are nearly identical whether from 10th-grade GPA (8th-grade panel) or 12th-grade GPA (12th-grade panels). For other predictors that are the same for 8th- and 12th-grade panels, it can also be seen that product-moment correlations are generally quite similar. Finally, the cross-panel similarities in *R*-squared values (shown at the bottom of Table 4), and in the bivariate and multivariate predictions from 12th-grade work intensity, provide further reassurance about our choices of proxy variables for the 12th-grade panels in lieu of the earlier measures available in the 8th-grade panel, at least when predicting educational attainment.

One other comparison of interest in Table 4 is that the product-moment correlations and regression coefficients predicting years of college completed by ages 29–30 are very similar to those for years completed by ages 21–22 (even though a more limited data set—classes of 1976–1995—was available for the longer-term follow-ups). So to the extent that high levels of work intensity by the end of high school impair educational attainment in the first few years after high school, it appears that those effects remain essentially unchanged through age 30.

Substance use—Table 5 presents results from the ordinary least squares analyses linking work intensity to later cigarette use. Here again the regression results are consistent with the results from the propensity score matching analyses, suggesting that a good deal of the linkage, but perhaps not all, reflects selection effects. For the 12th-grade panels, the correlations between 12th-grade work intensity and later smoking were modest (not surprising, given that most respondents did not smoke at all), and after controls for other factors the relationships were cut nearly in half but remained highly significant. For the 8th-grade panel both coefficients were slightly smaller, and the beta was significant at the .05

[10]We used the full-scale versions of outcome variables in the regression analyses in order to avoid any loss of information resulting from dichotomization; however, additional analyses comparing the two versions showed only small reductions in coefficients when dichotomies were used in regressions.

[11]This is suggested by the beta coefficients for work hours shown in Table 4, and confirmed by *R*-squared values approximately .01 lower when additional regression analyses were carried out with work hours excluded as a predictor.

level. A noteworthy finding from the 8th-grade panel shown in Table 5 is that by far the strongest predictor of cigarette use at age 22 was cigarette use reported six years earlier at the end of 10th grade, reflecting the high stability of smoking behavior. It is also worth noting that for all of the panels, GPA (whether measured at grade 10 or 12) was a stronger correlate of later cigarette use than was 12th-grade work intensity.

Following the approach illustrated above, we conducted regression analyses predicting annual marijuana use, annual cocaine use, and instances of heavy drinking during the previous two weeks. Rather than report the full findings parallel to those in Tables 4 and 5, we present in Table 6 just that portion of the regression results showing bivariate and multivariate associations with 12th-grade work intensity (along with the same data for years of college and cigarette use, taken from Tables 4 and 5, included for comparison purposes). The bivariate correlations involving marijuana use, cocaine use, and instances of heavy drinking are all very small (highest = .08, others < .04), and the multivariate beta coefficients are even smaller and all except one are nonsignificant. These findings, like the propensity score matching analyses summarized in Table 3, suggest little or no impact of 12th-grade work intensity on illicit drug use or heavy drinking measured three or more years later.

Additional regressions exploring possible mediating factors—One plausible causal model for the effects of 12th-grade work intensity on later cigarette use is that the effects are indirect via 12th-grade cigarette use. To check this possibility we repeated the regression analysis shown in Table 5, with 12th-grade cigarette use included as an additional predictor. The results are highly consistent with an indirect effect interpretation. Specifically, beta coefficients for 12th-grade work intensity dropped to near zero (ranging from .007 to .018), indicating no appreciable direct impact of work intensity. So it appears that if 12th-grade work intensity has an impact on later smoking, it is indirect via 12th-grade smoking.

We carried out further regression analyses adding 12th-grade measures of other substance use, but found that the resulting beta coefficients were not appreciably different from those shown in Table 6. We also included college plans/expectations at the end of 12th grade as a predictor of later years of college completed. Although this is a strong predictor of educational attainment, its inclusion in the regression analyses yielded beta coefficients for 12th-grade work intensity only slightly lower than those shown in Table 6 that did not control for 12th-grade educational plans. This suggests that the primary way in which 12th-grade work intensity influences later educational attainment is not through diminished expectations (or other prior or more fundamental causes), and suggests instead that it may be through diminished incentives and opportunities for higher education that accumulate with continued long hours.

Discussion

The present findings are consistent with earlier research, cited at the outset, showing that working long hours in a paid job during high school is *correlated* with many negative outcomes. But the question we set out to address goes beyond correlations to ask: Does high work intensity—specifically, work intensity among high school seniors during the school year—make any important *causal* contribution to lasting problem behaviors—specifically, limited educational attainment or substance use in young adulthood? Or is high work intensity merely a *symptom* of other more fundamental problems? In other words, do the relationships reflect anything more than selection effects?

Our findings provide considerable support for the selection effects hypothesis. Analyses of the 8th-grade MTF panel data showed substantial reductions after controls, often to statistical nonsignificance. Nevertheless, some key relationships in the 8th-grade panel were not reduced entirely to zero, nor did they appear to be random. Instead, high work intensity was linked to later cigarette use and to lower rates of postsecondary education, compared to those youth who worked moderate hours.

When we turned to the much more extensive MTF 12th-grade panel data, we found again that portions of relationships remained after our efforts to control for selection effects. In short, the evidence suggesting some genuine impacts of work intensity kept stubbornly reappearing, in much the same patterns—across samples and time, and across different analysis approaches. It thus appears that work intensity may be more than just a symptom of a problem behavior syndrome—it may make some causal contributions of its own. But these possible causal contributions differ from one outcome to another.

Problems to Which Work Intensity May Contribute

What are the longer-term outcomes to which 12th-grade work intensity may be contributing? The most important appears to be educational attainment. By three to four years after high school, those who had worked moderately in 12th grade showed the highest average years of college completed, but years of post–high school education declined with each additional increment in 12th-grade work intensity. These differences in attainment are not trivial; Figure 1 indicates that those who as seniors had worked 1–15 hours were nearly twice as likely to have completed at least two years of college as those who had worked 31 or more hours. Controls for likely prior causes reduced these differences roughly in half (Figure 1, see also Table 4). Still, important differences in educational attainment remained, even after extensive efforts to control for other factors. Moreover, we found that the links between 12th-grade work intensity and educational attainment remained just about as strong by the time respondents had reached ages 29–30. Of course, educational attainment amounts to more than the measures of years of schooling and degrees obtained that were available for use in the present study. So it is possible, for example, that high work intensity during high school has further negative impacts on such factors as the quality of the postsecondary institutions attended.

Another longer term consequence of work intensity may be cigarette use. For those who worked intensively in 12th grade, smoking rates remained higher through ages 29–30. Although the coefficients showing these relations (see Table 5) are quite modest, it should be noted that relatively few 12th-grade students work at very high intensities, and relatively few are smokers (thus limiting the size of possible relations). As can be seen in Table 3, even after extensive matching, rates of daily smoking are consistently higher (by five percentage points or more) among intensive workers.

How much work is too much? The National Research Council (1998), based on the work of a number of authors, suggested that working more than 20 hours per week while a high school student constitutes “intensive” employment and should be discouraged. The findings presented here suggest that insofar as later educational attainment is concerned, any amount of student work above 20 hours per week may exact some costs and might better be avoided. Certainly the present research suggests that the conventional recommendation of a 20-hour cutoff is not too low.

Potential Explanations

The potential explanation for the possible longer-term effects of teenage work intensity on cigarette use seems especially straightforward: Smoking is the most stable of substance-

using behaviors among youth (Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997), reflecting the highly addictive nature of nicotine. If the smoking habit is established by the end of high school, most individuals find it very difficult to break. So if work intensity makes any causal contribution to smoking during high school (e.g., through increased time away from parental and other adult supervision, contact with older individuals, funds to purchase cigarettes, and work breaks that permit smoking), it also contributes (indirectly, but nonetheless importantly) to smoking in the years after high school.

As for the use of other substances, such use among the vast majority of high school students is far less frequent compared with the cigarette use of regular smokers, and far less likely to have progressed to the point of dependency. So the hypothesis just offered for long-term impacts on cigarette use would be much less applicable to other forms of substance use. Moreover, it is well established that when young people are experiencing the living arrangements associated with college attendance (such as leaving parental homes, but delaying marriage and parenthood), they are increasingly likely to engage in alcohol use, occasional heavy drinking, and illicit drug use (Bachman et al., 1997, 2002; see Chassin, Hussong, & Beltran, 2009 for a recent review). Given such potential complications and cross-currents, we did not hypothesize specific causal pathways for long-term impacts on other substance use, nor were we surprised that the present analyses found little or no evidence of lasting effects of high school work intensity on marijuana, alcohol, and cocaine usage rates several years later.

Regarding educational attainment, high work intensity near the end of high school likely interferes with academic performance by hindering desirable behaviors such as doing homework and participating in extracurricular activities (Marsh & Kleitman, 2005; Safron et al., 2001; Steinberg & Cauffman, 1995), above and beyond any causal connection between *earlier* poor school performance and the desire to work long hours. Poorer performance near the end of high school, in turn, reduces the likelihood of college entrance and successful performance in college. In contrast, moderate work intensity is associated with balanced patterns of paid work, schoolwork, and extracurricular activities, thereby increasing the likelihood of both college matriculation and completion (Mortimer, 2003; Shanahan & Flaherty, 2001; Staff & Mortimer, 2007).

Strengths and Limitations

The MTF data used here are well suited to the questions at hand, allowing us to uncover relationships that are robust, spanning cohorts, gender, and data set characteristics. Further, the use of national data mitigates concerns that findings might be limited to specific regions or demographic groups. The key feature of MTF for present purposes is longitudinal follow-up data, allowing us to consider questions about the long-term impacts of paid work on outcomes as distant as 11–12 years beyond high school.

There are, nevertheless, some notable limitations. First, given that our sampling frame for the data reported here is restricted to 12th graders, we excluded approximately 15–20% of the population who do not graduate from high school. To the extent that high work intensity in earlier grades contributes to dropping out of high school (Apel et al., 2008; Lee & Staff, 2007), or to lowered expectations for further education (Marsh & Kleitman, 2005), then the present findings could underestimate total impacts of work intensity *throughout high school* on academic attainment. Table 4 shows that 10th-grade work intensity is *correlated* with later academic attainment; however, the beta coefficient near zero indicates that it makes no additional contribution to predicting attainment above and beyond that linked to 12th-grade work intensity.[12] In any case, whatever their limitations, the present findings suggest lasting impacts of 12th-grade work intensity on educational attainment 11–12 years beyond high

school. With respect to substance use, it is also possible that we underestimated any lasting effects of work intensity by looking only at high school seniors; however, this seems unlikely given that other research suggests that high intensity work throughout high school has little short-term effect on substance use and delinquency (Paternoster et al., 2003).

A second restriction in our sampling frame is the focus on variations in work intensity among the subset of 12th graders who held paid employment. As shown in Figure 1, those students who had no paid employment are not accurately described as one point further down on the scale of employment intensity; rather, the present and other analyses show that they are qualitatively different in a number of respects. Most notably, other research has shown that most of the nonemployed high school seniors wish to have employment; indeed, these wishes for something different set them apart from those holding paid employment, because the latter usually prefer a level of work intensity equal or close to what they actually experience (Bachman et al., 2003). It thus appears to us that research that simply treats zero hours of work as the bottom point on a continuum of high school work intensity runs a considerable risk of reaching mistaken conclusions, particularly because a strong desire for paid work, and especially intensive work, is associated with poor school performance and problem behaviors even among nonworkers (Staff, Schulenberg, & Bachman, 2008;Warren, 2002). Instead, we chose in the present reporting to focus on variations in work intensity among those employed, leaving further examination of variations in work intensity preferences among nonemployed youth for other analyses.

A third limitation is common to all studies that rely on observational data rather than experimentation; although we took account of many relevant variables, including demographics, family background, measures of educational success and commitment, prior work intensity in the 8th and 10th grades, and school-related problem behaviors, we may have missed some stable pre-existing characteristics related to 12th-grade work intensity and later educational attainment and substance use. Our use of propensity scores adjusted only for the covariates that went into estimation of the propensity scores, so we cannot entirely rule out spuriousness resulting from unobserved characteristics. Fixed-effects models (both with and without instrumental variables) should be used in future work as a further effort to disentangle spurious versus causal effects of work intensity on achievement and socioeconomic attainment (Apel et al., 2008; Foster, 1995; Rothstein, 2007).

Finally, as with all longitudinal studies, the follow-up data suffer from attrition. We used weighting to compensate for attrition in all regression analyses, but not in the propensity score matching analyses; the similarity of findings across these two approaches, plus similar findings from a variety of preliminary analyses using various approaches to deal with missing data, leave us confident that the findings reported here accurately represent overall patterns of relations among variables. Any remaining inaccuracy is likely to be that we slightly underestimate sizes of relationships, given that those who use substances and do poorly in school are underrepresented in the retained samples.

Directions for Future Research

Our focus in this article has been on the all-important matter of *quantity* of work during high school. Future research would do well to examine the *quality* of work experience and other

[12]Of course, the findings in Table 4 are limited to those who remained in school through 12th grade and who reported one or more hours of paid work. In particular, those who dropped out after 10th grade (when the very large majority of dropping out occurs) were not included. To consider further the issue of 10th-grade work intensity as related to educational attainment, we examined the full range of 10th-grade work intensity as a predictor of educational attainment, including dropping out as part of the continuum of educational attainment. We included those not employed, and nonlinear as well as linear relations. The pattern of findings was similar to that for 12th-grade work intensity; however, given the smaller variance in 10th-grade work intensity, the *R*-squared value was less than half as large.

characteristics of work (e.g., job stress, work–school conflict, work–family conflict, learning opportunities, ages of supervisor and coworkers) over and above work intensity; as well as the extent to which paid work might benefit some youth more than others, particularly youth from more disadvantaged backgrounds, who often face a more limited and competitive youth labor market, and are probably more likely to need to work more hours for educational and personal expenses or to help support their families (Entwisle, Alexander, & Olson, 2000; Lee & Staff, 2007). Future research should also examine the positive and negative effects of early work experiences on delinquency, psychosocial development, and other educational outcomes (such as academic engagement, school effort, and educational expectations).

Concluding Comments

Are long hours of paid work during high school an important cause of problem behaviors, or are they merely a symptom of prior more fundamental problems? Consistent with Hypothesis 1, the present research, along with a great deal of earlier research, strongly suggests that selection is the primary factor underlying most of the correlations between high work intensity during school and problem behaviors, including some longer-lasting outcomes. Earlier research (Bachman et al., 2003) has shown that the desire to work long hours generally precedes actual high-intensity employment among high school students, and both are often preceded by poor school performance and a variety of earlier-emerging problem behaviors. All that is evidence of selection effects, and the present analyses provide further evidence in the form of substantial reductions in relationships once selection factors are controlled.

But the present research also suggests that even after extensive statistical controls for the earlier causes just mentioned, something more than selection effects is involved. Consistent with Hypothesis 2, high work intensity while in high school may have some costs that extend far beyond high school. The most notable cost is reduced likelihood of college education—with life-long consequences. A second possible cost is heightened risk of cigarette addiction—with potentially life-shortening consequences.

Appendix

Table A1

Descriptive Statistics: Three Panels of Students Working for Pay While Enrolled in Twelfth Grade[a]

	8th-Grade Panel[b]		12th-Grade Panels			
Graduating Classes	**1995–1997**		**1976–2003**		**1976–1995**	
Outcome Data Collected	**1999–2001**		**1979–2007**		**1987–2007**	
	Mean	**S. Dev.**	**Mean**	**S. Dev.**	**Mean**	**S. Dev.**
Hours of paid work grade 12 (1–31+ hours)[c]	5.19	1.78	4.10	1.78	4.08	1.79
African Americans	10%		9%		7%	
Hispanics	7%		6%		5%	
Other races	16%		6%		5%	
Whites	67%		78%		82%	
Small metropolitan statistical area	48%		47%		47%	
Large metropolitan statistical area	27%		26%		26%	
Non-metropolitan statistical area	24%		27%		28%	
Number of parents in the home	1.77	0.48				

	8th-Grade Panel[b]		12th-Grade Panels			
Graduating Classes	**1995–1997**		**1976–2003**		**1976–1995**	
Outcome Data Collected	**1999–2001**		**1979–2007**		**1987–2007**	
	Mean	**S. Dev.**	**Mean**	**S. Dev.**	**Mean**	**S. Dev.**
Intact family			75%		77%	
Parents' education level (index)	6.88	2.35	6.38	2.35	6.24	2.33
Mother employed			78%		75%	
Males	53%		48%		48%	
Cohort year			14.80	7.87	10.83	5.67
Cohort year squared			280.91	237.90	149.46	124.40
GPA grade 8	6.11	2.12				
GPA grade 10	5.89	2.01				
GPA grade 12			5.92	1.96	5.81	1.93
College plans grade 8	3.46	0.78				
College plans grade 10	3.37	0.79				
Self-rating of school ability vs. peers			4.85	1.13	4.85	1.12
Self-rating of intelligence vs. peers			4.94	1.13	4.94	1.11
College prep (vs. other educational programs)			51%		50%	
Truancy (index)			17.43	10.94	17.20	10.62
Days cut school grade 8	1.31	0.95				
Days cut school grade 10	1.39	0.97				
Number of times skip classes grade 8	1.23	0.74				
Number of times skip classes grade 10	1.40	0.83				
Ever held back prior to grade 10	1.17	0.41				
Ever suspended/expelled prior to grade 10	1.29	0.61				
Number of times sent to the office grade 8	1.66	1.04				
Number of times sent to the office grade 10	1.48	0.81				
Evenings out grade 8	3.17	1.58				
Evenings out grade 10	3.33	1.40				
Smoking grade 10	1.42	0.94				
30-day alcohol use grade 10	1.51	0.92				
Annual marijuana use grade 10	1.31	0.80				
Annual cocaine use grade 10	1.54	1.33				
Heavy drinking grade 10	1.03	0.23				
Hours of work grade 8	1.83	1.29				
Hours of work grade 10	2.81	2.31				
Preferred hours of work grade 10	5.75	2.41				

For the 8th-grade panels, the number of weighted cases who worked for pay while enrolled in 12th grade, and who participated in the follow-up at modal age 22, is 1186.

For those respondents in the 12th-grade panels who worked for pay while enrolled in 12th grade, and who participated in the 2nd follow-up when they were ages 21/22, the weighted number of cases is 22641.

For those respondents in the 12th-grade panels who worked for pay while enrolled in 12th grade, and who participated in the sixth follow-up when they were ages 29/30, the weighted number of cases is 12703.

[a]Weighted to adjust for initial probability of selection, absenteeism during the base-year data collection, and panel attrition.

[b] Data shown only for those who were in school in 1995–1997. Dropouts and those who completed the surveys after graduation are excluded.

[c] Scale values range from 1 (1–5 hours) to 7 (31+ hours). Level 4 equals 16–20 hours per week.

Appendix

Table B1

OLS Regressions Predicting Hours of Paid, Part-Time Work While Enrolled in 12th Grade: Product-Moment Correlations and Standardized Regression Coefficients in Three Panels Restricted to Those Working 1 or More Hours for Pay

	8th-Grade Panel		12th-Grade Panels			
Graduating Classes	**1995–1997**		**1976–2003**		**1976–1995**	
Outcome Data Collected	**1999–2001**		**1979–2007**		**1987–2007**	
	r	**beta**	**r**	**beta**	**r**	**beta**
African Americans[a]	.048	.023	.003	−.023	−.025	−.048
Hispanics[a]	.055	.028	.032	−.015	.014	−.028
Other races[a]	.031	.010	.002	−.010	−.002	−.020
Large metropolitan statistical area[a]	−.065	−.072	−.017	−.019	−.010	−.011
Non-metropolitan statistical area[a]	.026	−.033	−.017	−.040 *	−.019	−.044
Number of parents in the home	−.073	−.026				
Intact family			−.068	−.040 *	−.055	−.039
Parents' education level (index)	−.172	−.104 ***	−.137	−.108 ***	−.115	−.088 ***
Mother employed			.036	.031	.036	.033
Males	−.110	−.079	.057	.034 *	.056	.037
Cohort year			−.003	−.008	−.019	.008
Cohort year squared			−.001	.025 **	−.019	−.010
GPA grade 8	−.159	−.038				
GPA grade 10	−.154	−.015				
GPA grade 12			−.137	−.050 ***	−.124	−.035 ***
College plans grade 8	−.122	.011				
College plans grade 10	−.148	−.048				
Self-rating of school ability vs. peers			−.110	−.022	−.107	−.021
Self-rating of intelligence vs. peers			−.068	.027 **	−.076	.012
College prep (vs. other educational programs)			−.165	−.107 ***	−.167	−.118 ***
Truancy (index)			.120	.090 ***	.117	.088 ***
Days cut school grade 8	.117	.068				
Days cut school grade 10	.114	.031				
Number of times skip classes grade 8	.048	−.044				
Number of times skip classes grade 10	.076	.001				
Ever held back prior to grade 10	.148	.044				
Ever suspended/expelled prior to grade 10	.163	.066				
Number of times sent to the office grade 8	.107	−.051				
Number of times sent to the office grade 10	.110	−.010				
Evenings out grade 8	.100	.059				
Evenings out grade 10	.052	−.002				

	8th-Grade Panel		12th-Grade Panels			
Graduating Classes	**1995–1997**		**1976–2003**		**1976–1995**	
Outcome Data Collected	**1999–2001**		**1979–2007**		**1987–2007**	
	r	**beta**	**r**	**beta**	**r**	**beta**
Smoking grade 10	.107	.039				
30-day alcohol use grade 10	.099	.023				
Annual marijuana use grade 10	.109	.041				
Annual cocaine use grade 10	.062	−.024				
Heavy drinking grade 10	.038	−.001				
Hours of work grade 8	.054	.038				
Hours of work grade 10	.144	.088 ***				
Preferred hours of work grade 10	.165	.067 **				
Adjusted R^2		.107		.057		.053
wtd. N^b		1186		22641		12703

[a] Whites and small MSAs are the excluded categories in the regressions. In product-moment correlations, comparisons are versus all others.

[b] Cases restricted to those who participated in the relevant follow-up survey, and are weighted to adjust for initial probability of selection, absenteeism during the base-year data collection, and panel attrition.

* $p < .05$

** $p < .01$

*** $p < .001$

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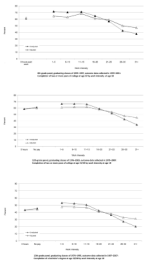

Figure 1.
Educational Attainment by Age-18 Work Intensity in Three Panels

Table 1

Numbers of Weighted Cases by Level of Work Intensity at Age 18[a]

	8th-Grade Panel[b]		12th-Grade Panels			
Graduating Classes	**1995–1997**		**1976–2003**		**1976–1995**	
Outcome Data Collected	**1999–2001**		**1979–2007**		**1987–2007**	
	Wtd. *N*	**%**	**Wtd. *N***	**%**	**Wtd. *N***	**%**
Working (not for pay)			2215	6.9%	1317	7.4%
0 hours	571	32.5%	7128	22.3%	3900	21.8%
1–5 hours	87	4.9%	2072	6.5%	1187	6.6%
6–10 hours	147	8.4%	2761	8.6%	1558	8.7%
11–15 hours	190	10.8%	3388	10.6%	1938	10.8%
16–20 hours	258	14.6%	5129	16.0%	2851	15.9%
21–25 hours	195	11.1%	3973	12.4%	2234	12.5%
26–30 hours	150	8.5%	2525	7.9%	1376	7.7%
31+ hours	160	9.1%	2793	8.7%	1558	8.7%
Total	1758	100.0%	31984	100.0%	17920	100.0%

[a]Cases are restricted to those who participated in the relevant follow-up survey, and are weighted to adjust for initial probability of selection, absenteeism during the base-year data collection, and panel attrition.

[b]Data shown only for those who were in school in 1995–1997; dropouts and those who completed the surveys after graduation are excluded.

Table 2

Means, Standard Deviations, and Prevalences for Later Educational Attainment and Substance Use: Three Panels of Students Working for Pay While Enrolled in Twelfth Grade[a]

	8th-Grade Panel[b]	12th-Grade Panels	
Graduating Classes	**1995–1997**	**1976–2003**	**1976–1995**
Outcome Data Collected	**1999–2001**	**1979–2007**	**1987–2007**
Modal Age	**22**	**21/22**	**29/30**
Years of Schooling [c]			
Mean	3.94	3.65	4.42
Standard deviation	1.54	1.38	1.92
% completing 2 or more years of college	59.3%	53.9%	61.8%
wtd. *N*	1181	20450	11460
Degree Attained			
% completing a bachelor's degree or more			38.2%
30-Day Cigarette Use [d]			
Mean	1.91	1.94	1.83
Standard deviation	1.45	1.51	1.55
% daily smoking	25.4%	25.7%	21.9%
wtd. *N*	1180	20101	11336
Annual Marijuana Use [e]			
Mean	2.12	2.27	1.72
Standard deviation	1.98	2.07	1.69
% any annual use	33.7%	36.5%	20.9%
wtd. *N*	1173	20149	11363
Annual Cocaine Use [e]			
Mean	1.16	1.30	1.16
Standard deviation	0.71	0.99	0.74
% any annual use	6.8%	12.0%	6.7%
wtd. *N*	1176	20243	11362
Heavy Drinking in the Last Two Weeks [f]			
Mean	1.96	1.97	1.60
Standard deviation	1.30	1.33	1.09
% any heavy drinking in the last two weeks	43.8%	43.4%	29.8%
wtd. *N*	1153	19905	11290

[a] Weighted to adjust for initial probability of selection, absenteeism during the base-year data collection, and panel attrition.

[b] Data shown only for those who were in school in 1995–1997. Dropouts and those who completed the surveys after graduation are excluded.

[c] 1=11th grade, 2=12th grade, 3=1 yr. college, 4=2 yrs. college, 5=3 yrs. college, 6=4 yrs. college, 7=5+ yrs. college

[d] 1=Not at all, 2=Less than one cigarette per day, 3=One to five cigarettes per day, 4=About one-half pack per day, 5=About one pack per day, 6=About one and one-half packs per day, 7=Two packs or more per day

[e] 1=0 occasions, 2=1–2 occasions, 3=3–5 occasions, 4=6–9 occasions, 5=10–19 occasions, 6=20–39 occasions, 7=40 or more

[f] 1=None, 2=Once, 3=Twice, 4=Three to five times, 5=Six to nine times, 6=Ten or more times

Table 3

Propensity Score Matching Analyses[a] Showing Effects of Three Levels of Work Intensity on Educational Attainment[b] and Substance Use from Three Panels of Students Working for Pay While Enrolled in Twelfth Grade

	8th-Grade Panel			12th-Grade Panels					
	Effects at Age 22			Effects at Ages 21/22			Effects at Ages 29/30		
	Controls Before Matching	Controls After Matching	Treated	Controls Before Matching	Controls After Matching	Treated	Controls Before Matching	Controls After Matching	Treated
Working 31 or More Hours per Week									
% 2+ years college/bachelor's degree[b]	66.7% ***	53.7% **	39.2%	59.9% ***	44.8% ***	35.5%	44.6% ***	30.1% ***	20.7%
% any daily smoking	23.4% ***	25.1% *	38.1%	26.1% ***	31.0% ***	36.7%	21.9% ***	27.2% ***	32.4%
% any annual marijuana	33.9%	32.7%	43.3%	41.3%	44.4% ***	42.4%	22.0% **	25.4% ***	24.6%
% any annual cocaine	5.6% *	5.6%	12.4%	15.8% ***	19.0%	19.0%	7.7%	9.8%	8.7%
% any heavy drinking in last 2 weeks	43.2%	44.0%	49.5%	45.9%	48.4%	46.7%	29.2%	33.5% *	31.2%
N	749	102	102	26158	3488	3488	15349	2091	2091
Working 26 or More Hours per Week									
% 2+ years college/bachelor's degree[b]	69.7% ***	60.9% ***	43.1%	62.2% ***	49.1% ***	39.7%	46.9% ***	33.6% ***	24.2%
% any daily smoking	22.9% **	24.8%	32.0%	25.2% ***	29.3% ***	34.6%	20.9% ***	25.3% ***	30.6%
% any annual marijuana	34.3%	36.4%	36.0%	40.9% **	43.3%	43.1%	21.8% **	24.7%	24.3%
% any annual cocaine	5.6%	4.7%	9.1%	15.5% ***	17.9%	18.6%	7.6% *	9.4%	8.7%
% any heavy drinking in last 2 weeks	44.1%	46.7%	43.7%	45.9%	47.5%	46.5%	28.7% ***	32.0%	31.9%
N	646	205	205	22860	6787	6787	13433	4008	4008
Working 21 or More Hours per Week									
% 2+ years college/bachelor's degree[b]	73.6% ***	66.5% ***	48.8%	64.8% ***	53.3% ***	45.6%	49.6% ***	37.6% ***	30.1%
% any daily smoking	21.3% **	23.4%	30.3%	23.6% ***	27.5% ***	32.8%	19.5% ***	23.4% ***	28.5%
% any annual marijuana	33.7%	35.4%	36.4%	40.4% ***	42.5%	42.9%	21.1% ***	23.4%	24.2%
% any annual cocaine	5.3%	4.9%	8.2%	15.0% ***	17.0% *	18.0%	7.3% **	8.8%	8.6%
% any heavy drinking in last 2 weeks	44.4%	47.0%	43.6%	45.6%	46.7%	46.6%	28.5% ***	30.9%	30.9%
N	504	345	345	17630	12009	12009	10370	7047	7047

[a] Matching utilized a one-on-one nearest neighbor approach with calipers set at 10% of a standard deviation from the propensity score.

[b] Percent completing two or more years of college for the 8th-grade panel and the 12th-grade panel, ages 21/22; percent completing a bachelor's degree or more for the 12th-grade panel, ages 29/30.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4

OLS Regressions Predicting Years of Schooling: Product-Moment Correlations and Standardized Regression Coefficients in Three Panels

	8th-Grade Panel		12th-Grade Panels			
	Age 22		Ages 21/22		Ages 29/30	
	r	beta	r	beta	r	beta
1 or more hours of paid work, grade 12 (collapsed coding)	−.265	−.105 ***	−.227	−.097 ***	−.222	−.093 ***
African Americans (vs. Whites)[a]	−.152	−.077	−.051	.010	−.041	.009
Hispanics (vs. Whites)[a]	−.130	−.080	−.039	.020	−.039	.027
Other races (vs. Whites)[a]	−.058	−.017	.003	.006	−.008	.008
Large metropolitan statistical area (vs. small MSAs)[a]	.106	.103	.094	.046 **	.112	.054 *
Non-metropolitan statistical area (vs. small MSAs)[a]	−.100	−.008	−.110	−.037 *	−.137	−.038
Number of parents in the home	.167	.040				
Intact family (vs. nonintact family)			.118	.052 ***	.090	.033
Parents' education level (index)	.389	.156 ***	.356	.186 ***	.403	.221 ***
Mother employed (vs. no job outside the home)			−.018	−.017	−.028	−.016
Males (vs. females)	−.074	.002	−.064	−.003	−.029	.020
Cohort year			.180	.132 ***	.163	.167 ***
Cohort year squared			.173	−.043 ***	.154	−.089 ***
GPA grade 8	.439	.137 ***				
GPA grade 10	.461	.192 ***				
GPA grade 12			.412	.206 ***	.408	.189 ***
College plans grade 8	.320	.024				
College plans grade 10	.428	.209 ***				
Self-rating of school ability vs. peers			.355	.041 ***	.389	.029
Self-rating of intelligence vs. peers			.292	.015	.356	.060 ***
College prep (vs. other educational programs)			.462	.270 ***	.514	.305 ***
Truancy (index)			−.129	−.031 ***	−.108	−.009 ***
Days cut school grade 8	−.094	.031				

	8th-Grade Panel		12th-Grade Panels			
	Age 22		Ages 21/22		Ages 29/30	
	r	beta	r	beta	r	beta
Days cut school grade 10	−.196	−.073				
Number of times skip classes grade 8	−.054	.061				
Number of times skip classes grade 10	−.139	−.016				
Ever held back prior to grade 10	−.308	−.071				
Ever suspended/expelled prior to grade 10	−.303	−.095				
Number of times sent to the office grade 8	−.182	.019				
Number of times sent to the office grade 10	−.183	.038				
Evenings out grade 8	−.070	−.006				
Evenings out grade 10	−.060	−.041				
Smoking grade 10	−.145	−.050				
30-day alcohol use grade 10	−.092	.017				
Heavy drinking grade 10	−.097	.023				
Annual marijuana use grade 10	−.045	.064				
Annual cocaine use grade 10	−.069	−.029				
Hours of work grade 8	−.024	.004				
Hours of work grade 10	−.117	−.002				
Preferred hours of work grade 10	−.190	−.021				
Adjusted R^2		0.433		.351		.403
Adjusted R^2 (using MI approach)[b]		0.426		.335		.379
wtd. *N*[c]		1181		20450		11460

[a] Whites and small MSAs are the excluded categories in the regressions. In product-moment correlations, comparisons are versus all others.

[b] All other calculations in this table use the MID approach (see text).

[c] Cases are weighted to adjust for initial probability of selection, absenteeism during the base-year data collection, and panel attrition.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 5

OLS Regressions Predicting 30-Day Cigarette Use: Product-Moment Correlations and Standardized Regression Coefficients in Three Panels

	8th-Grade Panel		12th-Grade Panels			
	Age 22		Ages 21/22		Ages 29/30	
	r	beta	r	beta	r	beta
1 or more hours of paid work, grade 12	.088	.049 *	.115	.065 ***	.113	.061 ***
African Americans (vs. Whites)[a]	−.106	−.123	−.082	−.111 ***	−.047	−.065
Hispanics (vs. Whites)[a]	−.096	−.127	−.073	−.100 **	−.059	−.076
Other races (vs. Whites)[a]	−.014	−.045	−.003	−.022	.015	.001
Large metropolitan statistical area (vs. small MSAs)[a]	−.008	−.030	−.012	.009	−.011	.009
Non-metropolitan statistical area (vs. small MSAs)[a]	−.023	−.037	.039	.029	.050	.036
Number of parents in the home	−.022	−.013				
Intact family (vs. nonintact family)			−.030	−.020	−.043	−.030
Parents' education level (index)	−.022	−.016	−.055	−.010 *	−.093	−.045 ***
Mother employed (vs. no job outside the home)			.014	.020	.011	.011
Males (vs. females)	.011	−.012	.040	−.007	.061	.019
Cohort year			−.079	−.181 ***	−.094	−.204 ***
Cohort year squared			−.069	.148 ***	−.084	.151 ***
GPA grade 8	−.120	.000				
GPA grade 10	−.172	−.074 **				
GPA grade 12			−.199	−.149 ***	−.198	−.131 ***
College plans grade 8	−.080	−.006				
College plans grade 10	−.117	−.024				
Self-rating of school ability vs. peers			−.130	−.011	−.138	−.006
Self-rating of intelligence vs. peers			−.092	.017	−.106	.005
College prep (vs. other educational programs)			−.144	−.064 ***	−.155	−.062 *
Truancy (index)			.173	.124 ***	.162	.109 ***
Days cut school grade 8	.005	−.074				
Days cut school grade 10	.076	.004				

	8th-Grade Panel		12th-Grade Panels			
	Age 22		Ages 21/22		Ages 29/30	
	r	beta	r	beta	r	beta
Number of times skip classes grade 8	.030	.016				
Number of times skip classes grade 10	.062	−.051				
Ever held back prior to grade 10	.031	−.039				
Ever suspended/expelled prior to grade 10	.167	.095				
Number of times sent to the office grade 8	.090	−.034				
Number of times sent to the office grade 10	.191	.065				
Evenings out grade 8	.069	.041				
Evenings out grade 10	.080	−.020				
Smoking grade 10	.391	.365 ***				
30-day alcohol use grade 10	.144	.008				
Heavy drinking grade 10	.118	−.065				
Annual marijuana use grade 10	.203	−.011				
Annual cocaine use grade 10	.075	.034				
Hours of work grade 8	.045	.001				
Hours of work grade 10	.037	−.008				
Preferred hours of work grade 10	.077	.044				
Adjusted R^2		.206		.091		.083
Adjusted R^2 (using MI approach)[b]		.197		.090		.084
wtd. N[c]		1180		20101		11336

[a] Whites and small MSAs are the excluded categories in the regressions. In product-moment correlations, comparisons are versus all others.

[b] All other calculations in this table use the MID approach (see text).

[c] Cases are weighted to adjust for initial probability of selection, absenteeism during the base-year data collection, and panel attrition.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 6

Bivariate Correlations and OLS Standardized Regression Coefficients Linking Grade 12 Work Intensity[a] among Students Working for Pay with Substance Use and Educational Attainment in Three Panels[b]

	8th-Grade Panel		12th-Grade Panels			
		Age 22		Ages 21/22		Ages 29/30
	r	beta	r	beta	r	beta
Years of schooling	−.265	−.105 ***	−.227	−.097 ***	−.222	−.093 ***
30-day cigarette smoking	.088	.049 *	.115	.065 ***	.113	.061 ***
Annual marijuana use	.028	.006	.032	.000	.032	.000
Annual cocaine use	.080	.069 ***	.035	.005	.034	.007
Heavy drinking in the last two weeks	−.003	−.017	.014	−.007	.032	−.005

[a] In analyses involving years of schooling, 1–15 hours on the work intensity scale were collapsed in order to preserve linearity; see text for futher details.

[b] Weighted numbers of cases are shown in Table 2.

* $p < .05$

** $p < .01$

*** $p < .001$