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The effects of depressed mood on academic outcomes in adolescents and young adults

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The Effects of Depressed Mood on

Academic Outcomes in Adolescents and Young Adults

by

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Table of Contents

List of Tables

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ABSTRACT

The following dissertation investigates the relationship between depressed mood and academic performance (measured in terms of grade point average) in U.S. middle and high schools.

Utilizing data from AddHealth, the dissertation establishes Ordinary Least Squares, Two-Stage Least Squares (2SLS), and individual and sibling fixed effect regressions that attempt to control for confounding factors, including student motivation, personality characteristics, and parental inputs that are unobserved but may influence both mental health and achievement.

Study findings indicate that students who report feeling depressed do not perform as well academically as non-depressed students. Additionally, the degree of GPA impact increases with the severity of reported depression. Students reporting either depressed feelings "most or all of the time" - or symptoms consistent with major depression suffer GPA reductions of 0.06 to 0.84 grade points. In addition, middle schoolers and certain minority groups are hardest hit by depression, and persistent depression has a negative impact on grades.

Chapter 1

Introduction

1.1 What is Depression?

In the field of mental health, the term depression is generally characterized as a feeling of sadness or unhappiness.   Most individuals experience depressed feelings sometime in life for short periods, often as the result of negative or unhealthy life events. This, however, does not thoroughly define the relevance of depressed mood for human behavior, nor does it convey the potential consequences of depression for other facets of human performance.

Mental health researchers and practitioners have come to recognize that depression exists in many forms, with variations in origin and severity. The American Psychiatric Association (APA), in its Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), identifies depressive behavior in the context of Mood Episodes and Mood Disorders. Mood episodes are in effect individual mood events, and serve as the building blocks for disorder diagnoses. Depending on their frequency and depth, such episodes may reveal a clinical disorder that has far-reaching impacts on an individual's mental health and overall functioning.

The DSM-IV classifies mood disorders in three categories: Depressive Disorders, Bipolar Disorders, and "Other" Mood Disorders. Depressive disorders

include Major Depressive Disorder, Dysthymic Disorder, and Depressive Disorders Not Otherwise Specified. Detailed explanations of these depressive disorders are as follows:

Major Depressive Disorder is a clinical course that is characterized by one or more major depressive episodes, without a history of other mood episodes (e.g. manic or bipolar). The essential feature of the major depressive episode is a period of at least two weeks during which there is either a depressed mood or a loss of interest in nearly all activities. In addition, four of the following additional symptoms must be experienced by the individual: (1) Changes in appetite, weight, sleep, and psychomotor activity; (2) decreased energy; (3) feelings of worthlessness or guilt; (4) difficulty thinking, concentrating, or making decisions; (5) recurrent thoughts of death or suicide; (6) suicide plans or attempts.

Dysthymic Disorder is characterized by at least 2 years of depressed mood for more days than not, accompanied by at least two of the following symptoms: (1) poor appetite or overeating; (2) insomnia or hypersomnia (excessive sleeping); (3) low energy or fatigue; (4) low self-esteem; (5) poor concentration or difficulty making decisions; (6) feelings of hopelessness. For children and adolescents, dysthymic disorder requires only 1 year of depressed mood, or can be triggered by a pattern of long-term (1+ years) irritability.

Depressive Disorder Not Otherwise Specified includes disorders with depressive features that do not meet criteria for the preceding disorders. Major examples include:

- Premenstrual Dysphoric Disorder (e.g. PMS)

2

- Minor Depressive Disorder: Episodes of at least 2 weeks of depressive symptoms but with fewer than the 5 items required for Major Depressive Disorder

- Recurrent Brief Depressive Disorder: Depressive episodes lasting 2 days up to 2 weeks, occurring at least once a month for 12 months

- Postpsychotic Depressive Disorder of Schizophrenia

- Major Depressive Episode superimposed on Delusional Disorder

Other mood disorders that reveal depressive behavior, such as bipolar disorder and mood disorders induced by substance intake or medical conditions, are not classified by the APA as depressive disorders.

1.2 Mental Health Disorders and Human Capital Formation

Throughout much of recorded history, the subject of mental illness was addressed in the context of dealing with individuals who suffered the most extreme symptoms and displayed the greatest difficulties functioning in society. Many subjects studied in early mental health research were institutionalized, either in asylums or prisons. As recently as the early twentieth century, research emphasized gaining an understanding of why the mentally ill were afflicted; little was done to ascertain whether or not their disorders could be treated, or what the individual and societal impacts were from mental illness.

The latter half of the twentieth century saw a change in the approach to the study of mental illness. Evolutionary changes in the evaluation and diagnosis of neuropsychological conditions, along with innovations in technology and

medicine, began to reveal that a greater percentage of the population suffered from mental disorders than previously suspected. These discoveries brought to light the notion that society has many "walking wounded": individuals who suffer from mental disorders, but fight to maintain a functional existence. An increased interest emerged in treating, as opposed to simply identifying, the mentally ill, and efforts were undertaken to assess the impacts of mental illness on society.

During the past two decades, various health economists have estimated the impacts of mental disorders on the formation of human capital. According to human capital theory, individuals invest in themselves through education, training, and health to increase their earnings. Based on the premise that mental health is a component of the overall health input (along with physical health), those suffering from mental disorders may achieve substandard labor market outcomes relative to those who do not, other things being equal.

To provide a better understanding of why issues related to an individual's mental health are important in economics, Grossman's (1972, 1975) theoretical constructs of the demand for health capital and the linkages between health and schooling are summarized. The consumer's intertemporal utility function is

$$U = U(\Phi_t H_t, Z_t), \quad t = 0, 1, \ldots n \qquad (1)$$

where H_t is the stock of health at age t, Φ_t is the service flow per unit stock (so $\Phi_t H_t$, is the total consumption of "health services"), and Z_t is the consumption of another commodity.

Net investment in the stock of health $(H_{t+1} - H_t)$ equals gross investment (I_t) minus depreciation $(\delta_t H_t)$:

$$H_{t+1} - H_t = I_t - \delta_t H_t \qquad (2)$$

Consumers produce gross investment in health and other commodities in the utility function according to a set of household production functions:

$$I_t = I_t (M_t, TH_t; E_t) \qquad (3)$$

$$Z_t = Z_t (X_t, T_t; E_t) \qquad (4)$$

In these functions, M_t and X_t are vectors of goods purchased in the market that contribute to gross investments in health (I_t) and other commodities (Z_t), TH_t and T_t are time inputs, and E_t is the consumer's stock of knowledge or human capital of exclusive of health capital at time t.

The specified equation for E depends on the amount of formal schooling (S) completed and a vector of variables (C) that include the current or "inherited" stock of human capital as well as determinants of the typical quantity of new knowledge produced per year of school attendance.

$$E_i = \theta S_i + \alpha C_i \qquad (5)$$

It is this stock of education that contributes to the efficiency of producing adult health and other commodities.

Grossman's model demonstrates that education is an investment commodity - which can lead to increases in consumption of not only "hard" commodities (money, goods, services), but also health itself.   Health also serves as a human capital input to education, along with schooling (Equation 5). These equations demonstrate that the consumption of health and other commodities is dependent upon education, while also recognizing that health is an input to education. Grossman's work supports the notion that health,

including mental health, impacts educational attainment and is relevant to consumer theory.

Empirical work over the previous 20 years supports the hypothesis that mental health is an input to labor market outcomes. Bartel and Taubman (1986) estimated that the presence of mental illness in workers reduced earnings by double digit percentages for significant periods of their working careers. Ettner, Frank, and Kessler (1997) show that psychiatric disorders reduce employment and earnings among women and men. Currie and Madrian (1999) and Savoca and Rosenheck (2000) conclude that the labor market consequences of mental health problems are large when compared to the consequences of physical health problems. Currie and Stabile (2006) note that many adult mental health conditions arise in childhood, so in addition to their direct effects, mental health disorders may reduce adult earnings and employment by inhibiting earlier accumulation of human capital.

1.3 Study Purpose

The limited body of work in the fields of health and labor economics on the impacts of mental disorders on human capital formation has largely been generalized to include all mental disorders. These include cognitive, psychotic, anxiety, somatoform, substance abuse, dissociative, adjustment, and personality disorders, in addition to mood disorders. In addition, few researchers in the field of health economics have conducted in-depth research on the impacts of mental health disorders as they pertain to academic achievement.

This research effort will examine the experience of adolescents and young adults in the United States who report that they have experienced feelings and moods consistent with depressive disorders.   The World Health Organization (2004) reports that depressive disorders are the leading cause of disability in the United States for persons aged 15 – 44. This dissertation, which attempts to isolate impacts on achievement from depressive disorders *alone*, adds to the existing literature in health economics of the impact on achievement of more generalized mental illness.   It attempts to establish the causal effects that depressed mood has on self-reported GPA in, English, mathematics, history/social studies, and science.

The remainder of the dissertation is structured as follows: Chapter 2 offers an overview of the relevant literature in this field, from the disciplines of sociology, psychology, and labor and health economics. Chapter 3 specifies the data and variables that will be utilized for this study. Chapter 4 explains the research methodology employed to obtain estimates that represent causal effects of depression on GPA.   Chapter 5 presents the estimation results. Chapter 6 concludes with a discussion of study implications, limitations, and suggestions for future research.

Chapter 2

Literature Review

2.1   Early Work Linking Mental Disorders to Human Capital Formation

The literature review begins with an overview of studies that address the broader linkages between mental disorders and human capital accumulation. Most of this work has focused on the association between mental illness and labor market outcomes in adults. Bartel and Taubman (1986) studied 1951-74 employee earnings data from a National Academy of Science-National Research Council twins sample. A Tobit model showed that the presence of mental illness in workers reduces their annual earnings by approximately 12 percent, with a duration of impact lasting as long as 15 years. Ettner, Frank and Kessler (1997) used 1990 and 1992 National Comorbidity Survey data to develop OLS and probit models that found the presence of a mental disorder reduced the probability of gaining employment by approximately 11 percentage points, and reduced the earnings of those employed by 13 to 18 percent. The study was unable to draw conclusions on the severity of the impact relative to differing diagnoses (major depression, schizophrenia, phobias, etc.), because of the imprecise nature of the estimates generated by this stratified modeling.   French and Zarkin (1998) surveyed workers at a large U.S. manufacturing facility and collected information on absenteeism, earnings, health, emotional problems, and

use of illicit substances.   Results from OLS, logistic, and count data models

indicated that employees who report symptoms of emotional and psychological

problems are nearly 3 times as likely to be absent, with earnings of 13 percent

less than workers who do not report these problems.

2.2   Specific Mental Disorders and Labor Market Outcomes

Research at the beginning of this decade began to focus on the impacts of

specific mental disorders on labor market outcomes. Savoca and Rosenheck

(2000) analyzed data from the National Survey of the Vietnam Generation in

order to ascertain the labor market impacts of post-traumatic stress disorder

(PTSD) and major depression on Vietnam-era veterans.   Using OLS & probit

models, they found that veterans with a lifetime diagnosis of PTSD are 8.6

percentage points less likely to be employed than those who did not have the

disorder. Results were similar for major depression. In addition, vets suffering

from major depression earn wages that are 45 percent lower than unafflicted

vets, while PTSD sufferers experience a smaller (16 percent) wage penalty. The

study also concluded that these mental disorders have greater impacts on

employment and wages than chronic physical conditions.   Slade and Salkever

(2001) focused on the employment impacts of schizophrenia, constructing a

multinomial probit model that estimates changes in employment rates for

schizophrenics based on percentage reductions in their symptom levels resulting

from drug therapy. The findings indicate that a 20 percent reduction in patient

symptoms increased the aggregate employment rate by 5.2 percentage points.

2.3 Recent Works on Mental Disorders and Achievement in Young People

Recent efforts by health economists and psychologists focus on the impacts of specific mental disorders on human capital accumulation and academic achievement in children and young adults. Haines, Norris, and Kashy (1996) assessed college students on measures of depression, concentration, and academic performance. Using an OLS model that controls for age, sex, education, and verbal and abstract reasoning skills, they concluded that an inverse relationship exists between GPA and depressive symptoms. Currie and Stabile (2006) examine North American children with symptoms of Attention Deficit Hyperactivity Disorder (ADHD). Using OLS and IV/2SLS modeling techniques, they find that school-aged children with ADHD symptoms have significantly lower scores in math and reading than non-ADHD children, and ADHD children have a greater likelihood of being placed in special education classes. Currie and Stabile also found that the negative impact of ADHD on children's math and reading performance was twice as large as the impact of a chronic physical condition (asthma). Wolfe and Fletcher (2007) studied ADHD impacts on older youth. Using the AddHealth database, Wolfe and Fletcher conducted OLS and fixed-effects modeling for respondents who reported past ADHD symptoms in their childhood. The results indicated that children with ADHD symptoms face long term educational problems, including lower grades, increases in suspension and expulsions, and fewer completed years of schooling.   Few of these results, however, were robust to the inclusion of family fixed effects.   Fredriksen et. al. (2004) studied 1995-1997 longitudinal data on

Illinois middle-school students in an effort to estimate the effects of diminished sleep on grades. This work is relevant to the current analysis, because it evaluates a similar age group and academic performance measure, and implies that insufficient sleep can reduce self esteem and academic performance, and lead to depression. The study concludes that depression is an endogenous variable that is result, but not the cause, of reduced sleep.

Chapter 3

Data

3.1 Data Source

The dissertation analyzes data from Wave I and Wave II of *AddHealth: The National Longitudinal Study of Adolescent Health* (http://www.cpc.unc.edu/projects/addhealth), published by the Carolina Population Center at the University of North Carolina-Chapel Hill. AddHealth commences with an in-school questionnaire administered to a nationally representative sample of students in grades 7 through 12, then follows up with a extensive in-home interviews of students approximately one and two years later[1]. The Wave I in-school questionnaire and corresponding in-home interview were administered during September 1994 – December 1995. The Wave II in-home interview was administered during April – August 1996.

AddHealth examines the forces that may influence adolescents' behavior, particularly - personality traits, families, friendships, romantic relationships, peer groups, schools, neighborhoods, and communities.

The first stage of Wave I was a random sample of US high schools that included an 11th grade and at least 30 students. A feeder school, i.e. a school that sent graduates to the high school, that included a 7th grade, was also

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[1] A third wave of the AddHealth study was conducted six years after the administration of the original in-school questionnaire, but differs significantly in the types of questions asked when compared to the first two waves, and thus is not used here.

recruited from the community.   A total of 90,118 students completed in-school questionnaires. The second stage of Wave I involved an in-home sample of 20,700 adolescents, drawn from a core sample from each surveyed community plus selected special oversamples, eligibility for which was determined by an adolescent's responses on the in-school questionnaire. Adolescents could qualify for more than one sample. In addition, parents were asked to complete a questionnaire about family and relationships.   The breakdown of Wave I in-home interviews by sample is as follows:

- Core Sample: 12,105 adolescents in grades 7–12 during the 1994–1995 school year

- Saturated schools: 2,559 adolescents (in addition to 200 core sample students) from schools in which all students were selected for the in-home sample

- Disabled: 471 adolescents who reported having a limb disability

- Ethnic/Racial Oversamples: (African American, Chinese, Cuban, Puerto Rican)—2,259 adolescents

- Adolescents residing together — 3,139 adolescents

  Full sibling, not twin — 1,251 adolescents

  Half sibling, not twin — 442 adolescents

  Non-related adolescent—415 adolescents

  Twin siblings — 784 adolescents

  The Wave II sample is the same as the Wave I in-home interview sample, with a few exceptions, mainly dealing with the omission of questions on time-

13

invariant information (i.e. race, sex, etc.).   In addition, school administrators were contacted by telephone to update school information. Information about neighborhoods/communities was gathered from a variety of previously published databases.   Approximately 14,700 in-home interviews were administered in Wave II of the survey.

3.2   Creation of the Depression Variables

As specified in Section 1.1, the DSM-IV diagnostic criteria for Major Depressive Disorder indicate that the primary condition of most recognized depressive disorders is a prolonged period (at least two weeks) of a depressed mood or loss of interest in nearly all activities. In addition, at least four of the following criteria must accompany the primary condition to prompt a diagnosis of major depressive disorder:

- Changes in appetite, weight, sleep, and psychomotor activity

- Decreased energy

- Feelings of worthlessness or guilt

- Difficulty thinking, concentrating, or making decisions

- Recurrent thoughts of death or suicide

- Suicide plans or attempts

These additional symptoms must also be prolonged, and they must have recently occurred or worsened.

The nature of the AddHealth data presents challenges in the creation of a fully representative proxy variable for major depression. The self-reported data

on student feelings does not ask specifically about feelings over the two week period prior to the survey. The time context of the survey questions dealing with student feelings is either "past week", "past month", or "past year". In addition, the AddHealth variables that reflect the other symptoms that must be present for a diagnosis of major depression are not perfect matches with the actual major depression diagnosis criteria.

As a result, two different approaches for defining the depression variable are used in the study. The first uses only the *primary* depression conditions as a variable of study.

In the "*feelings*" section of the Add Health in-home questionnaire, students are asked whether "*You felt depressed during the last week/seven days.*" (Wave I, Section 10, Question 6, Variable Name HIFS6; Wave II, Section 10, Question 6, Variable Name H2FS6). The four response alternatives are progressive in intensity: "*never or rarely*", "*sometimes*", "*a lot of the time*", or "*most or all of the time*".

Three binary depression variables were constructed from this single AddHealth question, each representing a greater frequency of depressed mood. The first binary depression variable is coded as a "1" for all responses of "*sometimes*". The second depression variable is coded as "1" for all responses of "*a lot of the time*". The third depression variable is coded with a "1" for all responses of "*most of or all of the time*". In the two in-home questionnaires, previous week depressed mood was reported with a frequency of "*sometimes*" by

29.9 percent of the respondents, "*a lot of the time*" by 7.2 percent of respondents, and "*most or all of the time*" by 2.9 percent of respondents.

The rationale for constructing the depression variables in this manner is two-fold. First, it is of interest to establish whether or not the existence of any sustained depression, regardless of frequency, has an impact on student achievement. If so, then it would also be of interest to assess whether or not achievement is progressively impacted based on the frequency of the depressed mood.

The second approach is an attempt to construct a proxy for major depression diagnosis as closely as possible. Although Section 3.2 notes that AddHealth does not allow for an exact replication of the major depression diagnosis, several major depression symptom variables do exist within the dataset, each having similar reporting characteristics, including a past week time frame and frequency choices of including "*never or rarely*", "*sometimes*", "*a lot of the time*", or "*most of the time or all of the time*". These additional variables and their DSM-IV symptom counterparts include:

- ***You felt depressed (e.g., DSM-IV "depressed mood" symptom).*** (Wave I, Section 10, Question 6, Variable Name HIFS6; Wave II, Section 10, Question 6, Variable Name H2FS6).

- ***You didn't feel like eating, your appetite was poor (e.g., DSM-IV "changes in appetite" symptom).*** (Wave I, Section 10, Question 2, Variable Name HIFS2; Wave II, Section 10, Question 2, Variable Name H2FS2).

16

- ***You had trouble keeping your mind on what you were doing (e.g., DSM-IV "difficulty thinking or concentrating" symptom).*** (Wave I, Section 10, Question 5, Variable Name HIFS5; Wave II, Section 10, Question 2, Variable Name H2FS5).

- ***You felt like you were too tired to do things (e.g., DSM-IV "decreased energy" symptom).*** (Wave I, Section 10, Question 7, Variable Name HIFS7; Wave II, Section 10, Question 7, Variable Name H2FS7).

- ***You thought your life had been a failure (e.g., DSM-IV "feelings of worthlessness or guilt" symptom).*** (Wave I, Section 10, Question 9, Variable Name HIFS9; Wave II, Section 10, Question 9, Variable Name H2FS9).

Using these questions, a major depression binary variable was coded as a "1" for all respondents who answered something other than "never or rarely" for the first depression indicator *and* each of the other four variables listed above. Thus, respondents responding to all five questions with a frequency of at least "some of the time" are categorized as suffering from major depressive disorder. Approximately 6.8 percent of Wave I and II survey were categorized as having major depression, based on these criteria.

3.3 Variables Addressing Persistent Depression

Another consideration in the analysis of depression how impacts grades is whether or not prolonged depression creates additional negative impacts. To address this issue, a third set of depression variables was developed. Because

17

AddHealth obtains student feedback on depressed mood at three separate points in time (the In-school, Wave I, and Wave II surveys) over a two-year period, it is possible to identify whether students report depressed feelings on a persistent basis.

Binary indicators serving as proxy variables for persistent depression include the following:

- *No persistent depression*: Student does not report depressed mood for *any* of the in-school, Wave I, or Wave II surveys.

- *Persistent depression*: Student reports depressed mood for the in-school survey as further documented in Section 3.5, and "some of the time" or more frequently in *either* the Wave I or Wave II surveys.

- *Onset depression*: Student does not report depressed mood for the in-school survey, but does report depression of "some of the time" or more frequently in *either* of the Wave I or Wave II surveys.

- *Remittance depression*: Student reports depressed mood for the in-school survey, but does not report depression of "some of the time" or more frequently for *either* the Wave I or Wave II survey.

3.4 Outcome (Dependent) Academic Performance Variables

The variables presented below are the primary academic performance measures from Wave I and Wave II of AddHealth that serve as dependent variables in the analysis. The question asked was, "*at the most recent grading period, what was your grade in ___ ?*" Choice options are "*A*", "*B*", "*C*", and "*D*

or lower".

- **English or Language Arts?** (Wave I, Section 5, Question 11, Variable Name H1ED11; Wave II, Section 6, Question 7, Variable Name H2ED7)

- **Mathematics?** (Wave I, Section 5, Questions 12, Variable Name H1ED12; Wave II, Section 6, Question 8, Variable Name H2ED8)

- **History or Social Studies?** (Wave I, Section 5, Question 13, Variable Name H1ED13; Wave II, Section 6, Question 9, Variable Name H2ED9)

- **Science?** (Wave I, Section 5, Question 14, Variable Name H1ED14; Wave II, Section 6, Question 10, Variable Name H2ED10)

Student responses were recoded into a numeric grade for each course, based on a 4-point grade system, with "A" = 4, "B" = 3, "C" = 2, and "D or lower" = 1. In addition, an "Overall GPA" variable was constructed by averaging the numeric grade from all subjects, for students who provided a grade response for all four courses.

3.5 Description of Instrumental Variable Candidates

Numerous variables were initially identified as possible instrumental variable (IV) candidates for 2SLS modeling. The majority were ultimately judged as failing to meet the two necessary conditions for serving as instruments; which are that the variable is correlated with depression, and uncorrelated with all unobserved determinants of academic performance. Sections 4.6 and 5.12 provide further descriptions of both these conditions and the variables that ended up being used as instruments; this subsection provides an overview of all

considered variables:

- **How many hours of sleep do you usually get?** (Wave I, Section 3, Question 51, Variable Name H1GH51; Wave II, Section 3, Question 45, Variable Name H2GH45): As previously mentioned, Fredriksen et al. (2004) concludes that insufficient sleep in young people can lead to depression as well as lower self esteem and academic performance. Under the assumption that reduces sleep causes depression rather than vice versa, this variable potentially influences depression without directly affecting GPA. However, it was ultimately rejected for final analysis.

- **Other health variables dealing with ailments/conditions:** In the DSM-IV definitions of depressive disorders outlined in Section 1.1, there is recognition that depression might arise from and/or be associated with other health conditions.   Students were asked a series of questions in the health section of Waves I and II regarding their past year frequency of suffering from various ailments and/or conditions. Seven variables from these questions were tested as possible instruments:

  (1)   Poor appetite

  (2)   Trouble falling or staying asleep

  (3)   Trouble relaxing

  (4)   Moodiness

  (5)   Frequent Crying

  (6)   Fearfulness

  (7)   Feeling very tired for no reason

Frequency response alternatives include "*never*", "*just a few times*", "*about once a week*", "*almost every day*", and "*every day*". For each of these questions, a binary variable was constructed to indicate a reported frequency of "*about once a week*" or higher.   "Moodiness", "fearfulness", and "frequent crying" were ultimately selected as instruments, with each noted in the DSM-IV as associated features of a major depressive episode.

- **Depression variables from in-school survey**: These are binary variables constructed from data provided in the Wave I in-school questionnaire. The variables are similar to the aforementioned depression indicators developed from responses in the in-home surveys, except the questions in the in-school surveys pertain to the past 30 days. The base depression question within the in-school survey, asked of students approximately one year prior to the "past week" depression question in the Wave I in-home survey, is:

  o   ***In the last month, did you feel depressed or blue?*** (In-school questionnaire, variable name S60K).

This question is similar to the analogous question from the in-home surveys, except that the time frame is the previous *month*, not week. Potential responses include "*never*", "*rarely*", "*occasionally*", "*often*", and "*everyday*". Binary variables were created to reflect reporting of depression (1) "*occasionally*", (2) "*often*", and (3) "*everyday*". This is very similar in nature to the primary past week depression binary variables of "*sometimes*", "*a lot of the time*", and "*most of or all of the time*".   In addition, a major depression IV proxy is developed from the in-home survey responses. The

variable is similar in to the aforementioned "major depression" indicator

developed from responses in the in-home surveys.   The primary "symptom"

indicator includes the question just discussed, plus the following questions.

"In the last month, did you _____ ?":

- o   ***Wake up feeling tired?*** (In-school questionnaire, variable name

  S60B).

- o   ***Have trouble eating, or a poor appetite?*** (In-school questionnaire,

  variable name S60I).

- o   ***Have trouble falling asleep or staying asleep?*** (In-school

  questionnaire, variable name S60J).

Affirmative responses ("*occasionally*", "*often*", or "*everyday*") to all three

questions are required to meet the criteria for the major depression binary

IV. These were the in-school survey questions being most similar to the

corresponding earlier-outlined questions from the in-home questionnaires.

These variable created from these questions, however, was ultimately not

used in the final instrumentation procedures.

3.6   Description of Other Variables

Chapter 4 provides a description of how the OLS and IV models that

estimate the relationship between depression and grades are selected.   These

models control for a wide range of potentially confounding variables, including:

- **Sex** (Wave I, Section A, Variable Name BIO_SEX; Wave II, Section A,

  Variable Name BIO_SEX2).   This variable is represented in the models as

a binary indicator for being female.

- **Month of year interview completed** (Wave I, Section A, Variable Name IMONTH; Wave II, Section A, Variable Name IMONTH2). Manifested as a vector of binary month indictors, this variable accounts for seasonal factors that may affect student performance, including the existence of the seasonal affective disorder (SAD) condition.

- **Wave indicator variable:** Because data from both survey waves are utilized in the OLS models, a binary wave indicator is included as a covariate.

- **School indicator variable: T**o test for possible school fixed effects, school indicators (Wave I, Section A, Variable Name SCID; Wave 2, Section A, Variable Name SCID2) are utilized in the modeling process.

- **(Age) What is your birthdate?** (Wave I, Section 1, Question 1, Variable Name H1GI1Y; Wave 2, Section 1, Question 1, Variable Name H2GI1Y). Used in conjunction with information on the date of the survey, this is converted to a vector of age binary variables.

- **(Grade) What grade are you in?** (Wave I, Section 1, Question 20, Variable Name H1GI20; Wave 2, Section 1, Question 9, Variable Name H2GI9). This is converted to a binary variable for each grade level in the survey.

The next two AddHealth variables were converted to a vector of binary variables for race/ethnicity:

- **(Race/Ethnicity) Are you of Hispanic or Latino Origin?** (Wave I, Section 1, Question 6, Variable Name H1GI16; Not asked in Wave II).

- **(Race/Ethnicity) What is your race?** (Wave I, Section 1, Question 6, Variable Name H1GI16; Not asked in Wave II). Choices include White, Black, Native American, Asian/Pacific Islander, and Other.

  A vector of variables is included in the models to control for student ability:

- **Have you ever skipped a grade?** (Wave I, Section 5, Question 3, Variable Name H1ED3; Not asked in Wave II). A binary variable was created to recognize students who have skipped a grade, which often results from a student's high academic ability.

- **AddHealth Picture Vocabulary Test Score:** (Wave I, Section A, Variable Name AH_PVT; Not administered in Wave II). As part of the Wave I in-home questionnaire, AddHealth administered an image-based vocabulary and comprehension exam to survey participants, The variable is the actual score achieved by students, with a maximum score of 124.

- **Reported GPA from in-school survey**: (In-school survey, Questions S10A through S10D).   Students are asked to report their most recent period grades in English/Language Arts, Mathematics, History/Social Studies, and Science, in identical fashion to the grading questions asked during in-home survey waves I and II, previously noted in Section 3.4

  The next three variables deal with attendance patterns and long term academic motivation of the students.

- **(Absenteeism) During this school year, how many times were you absent from school for a full day with an excuse – for example, because you were sick or out of town?** (Wave I, Section 5, Question 1,

Variable Name H1ED1; Wave 2, Section 6, Question 1, Variable Name H2ED1). Choices included "never", "1 or 2 times", "3 to 10 times", "or more than 10 times". A binary variable was developed for each of these response categories.

- **(Absenteeism) During this school year, how many times have you skipped school for a full day without an excuse?** (Wave I, Section 5, Question 2, Variable Name H1ED2; Wave 2, Section 6, Question 2, Variable Name H2ED2). Students reported an open-ended response, their actual estimate of the number of days skipped.

- **(Desire to Attend College) On a scale of 1 to 5, where 1 is low and 5 is high, how much do you want to go to college?** (Wave I, Section 38, Question 1, Variable Name H1EE1; Wave 2, Section 37, Question 1, Variable Name H2EE1).   A vector of binary variables was developed for student responses.

The following three variables control for parental inputs and potential hereditary factors relevant to student achievement.

- **Two-Parent Household:** Constructed from reported data in Section 11 (Household Roster) of Waves I and II, a binary variable was created for children of two parent households.

- **Educational Attainment of Biological Parent:**   In Sections 12 through 15 of Wave I, question number 5 asks about the educational attainment of the biological parent. The parent could be a non-resident biological mother (S.12), resident biological mother (S.14), non-resident biological father

(S.13), or resident biological father (S. 15). The question is "how far in school did your parent go?" The choices include:

- o 8th grade or less

- o Beyond 8th grade but did not graduate high school

- o High school graduate

- o Completed GED

- o Went to business, trade, or vocational school after high school

- o Went to college but did not graduate

- o Graduated from a college or university

- o Post-graduate training

Binary variables were established for each category referenced above.

- **Disabled Biological Parent:**   In Sections 12 through 15 of Wave I, question number 5 asks about the disability status of the biological parent. The parent could again be a non-resident biological mother (S.12), resident biological mother (S.14), non-resident biological father (S.13), or resident biological father (S. 15). The question is "Is/was your parent mentally or physically disabled?"

Chapter 4

Methodology

4.1 Methodology Introduction

The purpose of the dissertation is to investigate whether depressed mood among adolescents and young adults causally influences academic achievement. The modeling techniques employed to study this relationship include the following:

- Ordinary least squares (OLS), addressing omitted variable bias by including additional variables to account for unobserved factors

- Fixed-effects modeling

  o   School fixed effects

  o   Sibling fixed effects

- First Differencing

- Two stage least squares/instrumental variables

4.2 Ordinary Least Squares – Proxy Variable Approach

Consider an OLS linear regression of achievement (A) on depression (D) and a vector of exogenous variables ($\mathbf{X}$).

(1) $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \varepsilon$

"A" represents the dependent variable, achievement, measured in terms of grade point average for the following subjects: English, mathematics, history/social studies, and science.

"D" represents the depression explanatory variable, as previously defined in Section 3.2.

X denotes a vector of exogenous variables (described in Section 3.6) that deal with considerations of student age, sex, grade, ethnicity, time of year, family environment, and parental inputs that could influence achievement or depression.

β_0, β_1, and $\boldsymbol{\beta_2}$ are the parameters to be estimated and ε is the error term. . If unobservable factors exist that are related to both depression and grades, one can not assume that there is no correlation between the error term (ε) and depression (D), which is a necessary condition for OLS to consistently estimate the causal effect of depression on achievement. If the depression indicator and error term are in fact correlated, OLS suffers from omitted variable bias. The proxy variables approach to attempts to address the omitted variable issue within the context of OLS. Unobservable factors like motivation and ability are likely to impact student achievement, and might also be correlated with experiencing depression. In equation (1), these unobservable factors are omitted and therefore subsumed by the error term ε. The result is omitted variable bias.

One method for dealing with omitted variable bias is to directly address it by adding proxies for unobserved factors such as those listed above. To do this, The following OLS model is estimated:

(2) $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

M denotes a vector of three student motivation variables that reflect the prevalence of absenteeism in the student and the student's desire to attend college. It is conceivable that these variables are in some way affected by depressed mood, so their inclusion impart downward bias (towards zero) in the estimated effect of depression on academic achievement, if depression reduces grades partially by decreasing motivation.

P denotes a vector of variables that attempt to control for a student's ability. They would not necessarily be impacted by the presence of current depressed mood because they reflect outcomes that occurred before the current period corresponding to the depression indicator. These variables, identified in Section 3.6, include (1) whether or not the student has ever skipped a grade, (2) the student's score on the AddHealth picture vocabulary test (PVT), and (3) the student's reported grade from the initial in-school survey for each of the major subjects of study (English, Math, Science, and History/Social Studies). Although determined prior to current depression, these variables might be related to past or persistent depression, so they could again impart downward bias in the estimated depression effect. For example, if academic performance was affected by past depression, then students who display persistent depressed mood might also have lower test scores and lower probability of skipping a grade.

The addition of the M and P vectors to the regression equation should alleviate issues related to bias from omitting any variables that affect grades as a

result of a student's ability or motivation to do well in school. It is important to further recognize that while a student suffering from depression may feel less motivated to achieve, depression does not have to exist in order for the student to be academically unmotivated.

4.3 First Differencing

A primary econometric use of panel data is to allow for the presence of time-invariant unobserved effects that are correlated with the explanatory variables. In this study, many unmeasured factors that affect GPA and might be correlated with depression could be constant over time. Some examples include hereditary factors and family status. In a two-period panel, time-invariant unmeasured factors, or unobserved heterogeneity, can be addressed through the process of *first differencing.*   The first difference is the change in the value of a variable from the first period of the panel to the second. This is a natural setup in this case, in which the difference in student responses between Wave I and Wave II, for those who have responded in both survey waves, can be constructed. The equation for a first-differenced model is denoted as

(3) $\Delta A = \Delta\beta_0 + \Delta\beta_1 D + \Delta\mathbf{X}\boldsymbol{\beta_2} + \Delta\mathbf{M}\boldsymbol{\beta_3} + \Delta\mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

Where Δ denotes the change from $t = 1$ to $t = 2$.

In this analysis, the first differencing procedure eliminates unobserved, time invariant factors that may affect student achievement.   First differencing across waves is conducted for the responses of each individual that is surveyed in *both* Wave I and Wave II. The OLS estimator of the effect of the change in

depression on the change in GPA is referred to as the *first-differenced estimator* of depression on GPA.

In a first differenced equation, any measurement that does not change over time (for example, the sex or race of a student) will be "differenced away". Therefore, the results of the FD analysis will estimate the relationship between changes in the dependent variable (grades) and changes in depression status, holding constant other explanatory variables that can vary over time.

4.4 School Fixed Effects

With 144 U.S. middle and high schools included in the AddHealth Wave I and Wave II surveys, an opportunity exists to evaluate effects on academic performance attributable to particular schools. The survey schools could have wide variation in the relative standards of their respective curriculums, in addition to socioeconomic and demographic disparities. School fixed effects estimation was performed to eliminate cross-school heterogeneity by isolating the "within-school" variation. This simply entails adding a binary variable for each survey school (except one), which equals 1 if the student attends the school and zero otherwise, to equation 4.2. The estimates from this regression are purged of bias from school-specific elements that contribute to both academic achievement and depression incidence.

4.5 Sibling Fixed Effects

Section 2.3 of the dissertation noted that Wolfe and Fletcher (2007), found

that the estimated ADHD impacts on achievement were not robust to controls for unobserved sibling effects. This outcome underscores the importance in this study of attempting an analogous method. If siblings with different depression status have correspondingly different academic achievement, this would provide further evidence that any depression effects estimated in the OLD, FD, and school FE models do not merely reflect spurious correlation induced by unobserved factors that simultaneously determine depression and achievement.

AddHealth does not report sibling achievement or mental health, but as detailed earlier, did intentionally survey groups of siblings from the same households. Identifiers within the AddHealth determine which respondents are siblings.

To control for sibling effects a vector of fixed effects, i.e. binary variables that equal 1 if the respondent is a member of a specific sibling group and 0 other wise, is included in the regression equation for each sibling pair responding to Waves I and II. This procedure controls for unobserved family-specific factors that are correlated with both achievement and depression.

4.6   Two Stage Least Squares/Instrumental Variables

Section 4.2 discussed the implementation of a proxy variable approach to address omitted variable bias. The proxy variable approach, however, does not deal with the other two problems that create endogeneity, measurement error and reverse causation. This section discusses a methodology that addresses these issues as well as omitted variable bias, known as the instrumental

variables (IV) approach.

If we consider the scenario in which depression responds to changes in grades, e.g. a student becomes depressed because of receiving poor grades, then shocks to the error term will circulate to depression through the achievement (dependent) variable. This is called the simultaneity, or reverse causation, problem.

The most common solution to the address the aforementioned problems is the two-stage least squares (2SLS)/instrumental variable (IV) approach, which produces consistent estimates even in the presence of endogeneity. The 2SLS/IV approach requires one or more instrumental variables. Wooldridge (2003) explains that appropriate IV's must satisfy two conditions: The instrument must be uncorrelated with the error term ε, and it must be correlated with the suspected endogenous variable; in this case, the depression explanatory variable D. In simpler terms, at least one variable must be identified that is correlated with depression but is otherwise uncorrelated with academic performance.

Sections 3.5 and 3.6 present a series of AddHealth "candidate" variables considered for implementation as instruments. The first candidate variable, *hours of sleep,* might meet the first IV criterion, as Fredriksen et. al. indicates that insufficient sleep leads to depressed mood. That study also finds, however, that insufficient sleep negatively impacts GPA in middle school students, which calls into question whether this variable fully satisfies the second IV criterion, that insufficient sleep is not otherwise related to academic performance.

33

The next series of IV candidates address whether students experienced the following conditions within the last 12 months: *Poor appetite; Trouble falling asleep or staying asleep; Trouble relaxing; Moodiness; Frequent Crying; Fearfulness; Feeling very tired, for no reason.* Each of these health variables has a potentially significant correlation with depressed mood, but not necessarily grades, other than the *sleep* and *tiredness* variables as just discussed.

The final series of IV candidates are the binary variables for depression (including major depression) created from the Wave I in-school survey. These variables, are presumably highly correlated with subsequent depression as reported in the in-home surveys, but have the potential to separately impact achievement if persistent or prolonged depression is relevant.

An argument for possibly considering the parental disability variable noted in Section 3.5 is that conditioning on parental education in the GPA equation may eliminate the potential connection between parental disability and respondent achievement, thus leaving this variable as one that would have a possible correlation with depressed mood in students (IV criterion #1) but not achievement (IV criterion #2).

The 2SLS modeling procedure in this case commences with a "first stage" OLS regression of depression on the instrument(s) as well as all exogenous and explanatory variables. A significant t-statistic on the candidate variable suggests that it may be an effective instrument for use in 2SLS. The fitted values from this regression are obtained for use in the second stage, which is simply an OLS regression of the structural equation in Section 4.1, substituting the depression

variable with the fitted values from the first stage regression. Using more than one instrument necessitates testing for overidentifying restrictions. To test for overidentifying restrictions, the Davidson-Mackinnon (1993) test is performed. This procedure involves obtaining the residuals from 2SLS modeling and performing an auxiliary regression. More specifically:

(1)   Estimate the GPA equation by 2SLS and obtain the residuals.

(2)   Regress the residuals on all exogenous variables, including the instruments, and obtain the R-squared from this regression (call it R^{2*})

(3)   Under the null hypothesis that the overidentifying IV's are uncorrelated with the 2SLS residuals, the test statistic is nR^{2*}, with a χ^2_q distribution, where q is the number of IV's minus the number of endogenous explanatory variables.

If nR^{2*} exceeds the 5 percent critical value in the χ^2_q distribution, we reject the null hypothesis of instrument exogeneity and conclude that at least one of the IV's is separately correlated with achievement.

Two other methodological points are of note. First, although 2SLS estimates are consistent if instrument strength and exogeneity conditions are satisfied, they are inefficient relative to OLS if it turns out that depression is truly exogenous with respect to achievement. Even strong instruments generate larger standard 2SLS errors than those from OLS regressions. As a result, endogeneity testing using the Hausman (1978) method of comparing the statistical significance of the differences between 2SLS and OLS estimates can

be implemented.

Another advantage of 2SLS, as previously mentioned, is that it also addresses the issue of errors in the measurement of the depression variable, which likely exist to some degree because the AddHealth data used are almost entirely self-reported.

To summarize, 2SLS/IV will produce consistent estimates of the causal effect of depression on academic achievement in the presence of endogeneity, if valid instrument variables are used and all remaining classical linear regression model (CLRM) assumptions are met.

4.7   Synopsis of Model Runs

The following presents a sequential outline of all OLS and 2SLS models developed and estimated for this dissertation:

4.7.1   OLS Regression of GPA on Depression and Exogenous Variables, by Progressive Depression Severity

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \varepsilon$

The dependent variable in this equation (A) is grade point average. Five separate equations are necessary to estimate each GPA-depression relationship, including one for English GPA, one for math GPA, and one each for social studies GPA, science GPA, and overall GPA. The independent variables in the equation include the following:

- "Depressed some of the time" binary variable (D)

- "Depressed a lot of the time" binary variable (D)

- "Depressed most or all of the time" binary variable (D)

- Binary variable for each month of survey administration, from January through November (December omitted) (X)

- Binary variables of student age by year, from "under 12" through "age 19" ("age greater than 19" omitted) (X)

- Binary variables of student grade by year, from "grade 7" through "grade 11" ("grade 12" omitted) (X)

- Binary variables of student race, including "white", "Hispanic", "black", "Native American", and "Asian/Pacific Islander" ("other races" category omitted) (X)

- Binary variable for identifying whether or not the student comes from a 2-parent household (X)

- Binary variables for parental disability (X)

- Binary variables for academic achievement of each parent, including the categories "beyond 8th grade-no high school", "vocational school instead of high school", "high school graduate", "GED", "vocational school after high school", "attended college but did not graduate", "college graduate", and "post-graduate training" ("8th grade or lower" education category omitted (X))

The results of this model run are discussed in Section 5.2 of the dissertation, and Table 2.

4.7.2 OLS Regression of GPA on Depression and Exogenous Variables, for Major Depression Only

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta}_2 + \varepsilon$

This equation is identical to the one discussed in Section 4.7.1, with one exception. Instead of including the three progressive states of depression in a single equation ("some of the time", "a lot of the time", "most or all of the time"), only the major depression binary variable is included as a depression variable. It was necessary to separately estimate major depression because of identification overlaps between those meeting major depression criteria and those in the progressive depression severity categories. The results of this model scenario can also be found in Section 5.2 and Table 2.

4.7.3 OLS Regression of GPA on Depression, Exogenous Variables, and Motivation Variables, by Progressive Depression Severity

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta}_2 + \mathbf{M}\boldsymbol{\beta}_3 + \varepsilon$

This model adds the vector of motivation proxy variables to the equation profiled in Section 4.7.1. These variables include:

- Binary variables for number of excused absences in school year, including the categories "1 to 2 times", "3 to 10 times", and "more than 10 times" ("never" response omitted).

- Number of unexcused absences in school year

- Binary variables for desire to go to college, with the categories "very low", "low", "medium", and "high" ("very high" omitted).

All other estimation procedures are identical to that identified in Section 4.7.1. The results of this model run can be found in Section 5.3 of the dissertation, and Table 3.

4.7.4 OLS Regression of GPA on Depression, Exogenous Variables, and Motivation Variables, for Major Depression Only

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \varepsilon$

In identical fashion to that described in Section 4.7.2, this equation replaces the progressive depression variables in 4.7.3 with the major depression variable, to estimate the impacts of major depression on GPA when motivation proxies are added. These results are also located in Section 5.3 and Table 3 of the dissertation.

4.7.5 OLS Regression of GPA on Depression, Exogenous Variables, and Ability Variables, by Progressive Depression Severity

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

This model adds the vector of ability proxy variables to the equation in Section 4.7.1. These variables include:

- Binary variable that acknowledges whether or not the student has ever skipped a grade

- AddHealth Picture Vocabulary Test Score

- Reported GPA from initial in-school survey

Estimation of the model is identical to that described in Section 4.7.1. The results of this model run can be found in Section 5.4 and Table 4 of the dissertation.

39

4.7.6 OLS Regression of GPA on Depression, Exogenous Variables, and Ability Variables, for Major Depression Only

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

Again, the equation replaces the progressive depression variables in

4.7.5 with the major depression binary variable, to estimate the impacts of

major depression on GPA when ability proxies are included. These results

are also seen in Section 5.4 and Table 4.

4.7.7 OLS Regression of GPA on Depression, Exogenous Variables, Motivation Variables, and Ability Variables, by Progressive Depression Severity

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

This equation includes the depression measures and exogenous

variables noted in 4.7.1, in addition to *both* the motivation variables (4.7.3)

and ability variables (4.7.5). This represents the "base" equation of

explanatory variables from which all other analyses are conducted.

Estimation of the model is identical to that described in Section 4.7.1, 4.7.3,

and 4.7.5. The results of this model run can be found in Section 5.5 and

Table 5 of the dissertation.

4.7.8 OLS Regression of GPA on Depression, Exogenous Variables, Motivation Variables, and Ability Variables, for Major Depression Only

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

The major depression binary variable replaces the three progressive

depression variables in 4.7.7, with results also shown in Section 5.5 and

Table 5.

4.7.9 OLS Regression of GPA on Depression, Exogenous Variables, and Ability Variables, by Grade

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$ (for each grade 7 – 12)

The equation and model procedures discussed in sections 4.7.7 and 4.7.8 were used to run OLS analyses by grade level, from grade 7 through grade 12. This exercise allows us to see differentials in depression impacts across grades, and determine whether or students in certain middle or high school grades are suffering greater achievement impacts from depressed mood. This grade-based OLS modeling is done for the progressive depression measures in a single equation, and major depression in a separate equation. The results of this modeling are presented in Section 5.7 and Tables 7 through 14 of the dissertation.

4.7.10 OLS Regression of GPA on Depression, Exogenous Variables, and Ability Variables, by Gender

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \mathbf{P}\boldsymbol{\beta_4} + \varepsilon$ (for males & females)

The equations and models presented in sections 4.7.7 and 4.7.8 were also used to create gender-specific OLS regressions.   This procedure helps to identify if there is a difference in depression effects on grade performance between male and female students. These analyses are again conducted for the progressive depression measures in a single equation, and major depression in a separate equation. Model results are presented in Section 5.8 and Tables 15 - 16 of the dissertation.

4.7.11 OLS Regression of GPA on Depression, Exogenous Variables, and Ability Variables, by Race/Ethnicity

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\beta_2 + \mathbf{M}\beta_3 + \mathbf{P}\beta_4 + \varepsilon$ (by race/ethnicity)

The final series of stratified OLS models were developed to compare depression impacts amongst various ethnic segments. These equations and models continue to be consistent with that presented in sections 4.7.7 and 4.7.8. The race-based models also evaluate progressive depression measures in a single equation, and major depression in a separate equation. Model results are presented in Section 5.9 and Tables 17 through 23 of the dissertation.

4.7.12 OLS Regression of GPA on Depression, Exogenous Variables, and Ability Variables, for Persistent Depression

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\beta_2 + \mathbf{M}\beta_3 + \mathbf{P}\beta_4 + \varepsilon$

For this equation, the binary depression persistence measures discussed in Section 3.3 (*persistent depression, onset depression, remittance depression*) replace the three progressive depression variables of "some of the time", "a lot of the time", and "most or all of the time". No other changes are made to the base OLS equation.   The results of the OLS persistence depression analysis are found in Section 5.10 and Table 24.

4.7.13 OLS Regression – School Fixed Effects

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\beta_2 + \mathbf{M}\beta_3 + \mathbf{P}\beta_4 + \mathbf{S}\beta_5 + \varepsilon$

A school-based fixed effects analysis was conducted In an attempt to determine if any effects on academic performance are attributable to particular schools in the AddHealth survey. The rationale behind this

analysis is based on consideration of the fact that particular schools may have divergent qualities in educational curriculum, as well as location-specific socioeconomic considerations that may impact students' learning capabilities. A vector of binary variables (S) identifying each of the 144 middle and high schools, save one, was added to the base OLS equation noted in Section 4.7.7 for this exercise. Impacts related to progressive states of depression severity, major depression, and depression persistence were modeled. A dummy variable regression is employed, to control for the factors discussed in Section 4.4 of the dissertation. Results of the school FE analysis are presented in Section 5.6 and Table 6 of the dissertation.

4.7.14 OLS Regression – Sibling Fixed Effects

Model: $A = \beta_0 + \beta_1 D + \mathbf{X}\boldsymbol{\beta_2} + \mathbf{M}\boldsymbol{\beta_3} + \mathbf{P}\boldsymbol{\beta_4} + \mathbf{F}\boldsymbol{\beta_6} + \varepsilon$

To control for student achievement considerations that may be influenced by siblings, each full sibling pair in the survey was identified, and a corresponding binary variable was assigned to that pair. OLS regressions for Wave I and Wave II were conducted specifically on this group, with addition of the sibling binary vector (F) to the base OLS equation noted in Section 4.7.7.   Impacts related to progressive states of depression severity and major depression were analyzed. Once again, a dummy variable regression is employed, in order to control for family-specific factors discussed in Section 4.5 of the dissertation. Sibling FE results are presented in Section 5.12 and Tables 26 and 27 of the dissertation.

43

4.7.15 OLS Regression – First Differencing

Model: $\Delta A = \Delta\beta_0 + \Delta\beta_1 D + \Delta\mathbf{X}\boldsymbol{\beta_2} + \Delta\mathbf{M}\boldsymbol{\beta_3} + \Delta\mathbf{P}\boldsymbol{\beta_4} + \varepsilon$

The first differencing analysis is intended to measure changes in survey responses for students who answered questions in both the Wave I and Wave II surveys. For the nearly 15,000 students who responded in both survey waves, the difference in their individual responses between Wave I and II was calculated, and the OLS model from Section 4.7.7 was used on this dataset to see whether or not depression continued to have a practically and statistically significant impact on grades. If the impacts do not remain statistically significant or change in practical significance by a large amount, it may be an indication that time factors (which may include depression persistence) are having an impact on the depression-GPA relationship. Of course, the challenge in dealing with multiple binary variables that represent severity, or "degrees" of depression, can create challenges for effective analysis using a first-differencing methodology. The results of this analysis should demonstrate the strength of the depression-GPA relationship, after unobserved time factors have been accounted for. As standard practice, impacts related to progressive states of depression severity and major depression were evaluated. Results of the first differencing analysis and further discussion of FD limitations are addressed in Section 5.11 and Table 25 of the dissertation.

4.7.16 Instrumental Variables/Two Stage Least Squares (2SLS) Regression

The following criteria was used to evaluate candidate instruments for major depression:

- Plausible argument that instrument is correlated with depression yet does not directly affect academic performance

- Significant t-statistics on candidate variable in first-stage regression

- 2SLS analysis of instrument yields statistically significant robust t-statistic in second-stage regression

- Sign of instrument is the same as the suspected endogenous variable, and the magnitude of the coefficient is reasonably similar (in this case, less than 0.5)

- R-squared of first stage regression is maximized

- If multiple instruments are used, the instruments must pass overidentification tests

Initial testing on the following candidate instruments for major depression noted in Section 3.5 and 4.6 resulted in their rejection for final tests of validity. Failures included statistically insignificant t-statistics on first-stage regressions of the depression instrument at a 5 percent level of significance; or a second stage instrument coefficient with incorrect sign, insignificant t-statistic, or magnitude that exceeded a full grade point (1.0). As a result, they were eliminated from further validity testing.

- Poor appetite

- Hours of sleep

- Trouble falling asleep

- Trouble relaxing

- Feeling tired for no reason

- Parental disability

- Depression variables from initial in-school survey

Instrument candidates that passed initial testing and could be evaluated for further criteria (e.g. overidentification testing) included the following variables:

- Frequent crying within the previous 12 months, for no apparent reason ("crying12")

- Moodiness within the previous 12 months ("moody12")

- Fearfulness within the previous 12 months ("fearful 12")

Section 5.13 and Tables 28 and 29 of the dissertation offer the results of the two-stage least squares modeling and overidentification testing for these candidate instruments.

4.8   Summary of Advantages & Disadvantages of Model Alternatives

Ordinary Least Squares/Proxy Variable Model (4.2): The commonly recognized theoretical advantage of Ordinary Least Squares (OLS) regression analysis, is that has been shown to be the best method of satisfying the Gauss-Markov theorem, where errors have expectation zero and have equal variances.

Under the assumptions of linearity in parameters, random sampling, zero

conditional mean, no perfect collinearity, and unbiasedness, the OLS estimator is

the *best linear unbiased estimator.*   The primary disadvantage of using this

approach is that, even with the inclusion of proxy vectors to control for

unobserved factors which may impact grade performance, omitted variables

within the OLS equation(s) may exist. Omitted variable bias causes OLS

estimators to be biased.

   First Differencing (4.3): The principal benefit from employing first

differencing (FD) in this analysis is that it controls for time-invariant factors

related to student achievement, and allows for the effect of time-related issues

not considered by the OLS model to be considered in the analysis. The principal

disadvantage of using the FD approach for this study primarily deals with the

nature of the data.   Consider the following: The base OLS equation of

progressive depression has three binary variables representing varying, mutually

exclusive degrees (severity) of self-reported depressed mood in students. The

FD analysis, on its own, cannot determine if a change in one depression state

(depressed some of the time, a lot of the time, most or all of the time), is resulting

in an increase or decrease in depressed mood, from one wave to the next. For

example: Consider a student who reports depressed mood of "a lot of the time"

in Wave I. That student reports no depressed mood of "a lot of the time" in Wave

II. Did the student have an increase, or a decrease, in depressed mood from

Wave I to Wave II? The binary variables indicating the other two depression

severity levels (some of the time, most or all of the time), may display this

change, but the FD procedure falls short of being able to explain the direction of this change. Therefore, the results of the FD analysis may not provide relevant information to account for the direction of such a change.

Fixed Effects (School FE {4.4} and Sibling FE {4.5}): The advantage of using fixed effects models is that they can control for individual differences that affect achievement which are unobservable in the base OLS model. In this study, performance differences which may be attributable to individual schools, or differences that arise from family (sibling) factors, are accounted for by the use of FE models. The disadvantage of using these FE estimators varies based on the type of estimator used. In the case of schools, sufficient information does not exist to make a determination as to whether or not educational or demographic standards vary across the 144 surveyed schools, so it is difficult to establish the full meaning of employing a school FE model for this analysis. In the case of sibling FE, there does not exist a comprehensive profile of the social, psychological, and physical background of each student and their corresponding sibling. Therefore, it is difficult to accurately surmise all of the relevant sibling/family factors, if any, that may be attributable to the academic performance of the surveyed student(s).

Two Stage Least Squares/Instrumental Variables (4.6): Two-stage least squares regression is beneficial to employ when there is concern of endogeneity. If we believe that depression may be a result of grade performance (e.g. reverse causation), or if measurement error may exist, then 2SLS can produce consistent estimates in most forms of this endogeneity. Disadvantages of employing 2SLS

arise in finding variables which satisfy the necessary criteria required for an

effective instrument, which are noted in Section 4.6, and discussed in later

sections of the analysis.

Chapter 5

Results

5.1 Summary Statistics for Key Variables

Table 1 presents summary statistics on grade point average, demographic characteristics, family background, motivation, and ability for Wave I and Wave 2 survey respondents.   The statistics are presented by "category" of depressed mood for the student respondents (no depressed mood, depressed some of the time, depressed a lot of the time, depressed most or all of the time, major depression).   The sample of respondents with "major depression" characteristics is estimated at 6.8 percent. This compares with reported 12-month prevalence rates of 8.3 percent for U.S. adolescents, and 10.3 percent in the general U.S. population, as reported by Birmaher, et al. (1996).

Students who reported depressed mood of "some of the time" have GPA's of 0.108 to 0.177 grade points lower than students who report no depressed mood. For students with depressed mood "a lot the time", GPA's were reported to be 0.203 to 0.271 grade points lower than those students with no depressed mood. Students who report depressed mood "most or all of the time" reported averages of 0.345 to 0.462 grade points lower than students reporting no depression. Finally, students identified with "major depression" characteristics reported averages of 0.359 to 0.434 grade points lower than non-depressed students. This shows a progressive impact in GPA decline, depending upon the

severity (frequency) of the reported depressed mood, and the grade impacts

appear to be more significant in social studies and science than English and

math. Depression prevalence also increases with age.

Table 1
Summary Statistics - Depression Impacts on GPA

	CATEGORIES OF DEPRESSION FREQUENCY									
	No Depressed Mood		Some of the Time		A lot of the Time		Most or all of the Time		Major Depression	
	n	avg.	n	avg.	n	avg.	n	avg.	n	avg.
GPA										
English	19,824	2.869	9,690	2.762	2,279	2.666	894	2.525	2,083	2.510
Math	18,719	2.728	9,020	2.576	2,123	2.473	826	2.337	1,932	2.335
Social Studies	17,669	2.938	8,610	2.761	2,026	2.666	805	2.511	1,885	2.505
Science	17,659	2.874	8,436	2.705	1,964	2.603	776	2.412	1,789	2.475
Overall	15,142	2.884	7,185	2.727	1,652	2.638	650	2.452	1,528	2.492
FEMALE	21,316	0.455	10,577	0.562	2,555	0.658	1,035	0.693	2,396	0.654
AGE										
Less than 12	21,316	0.001	10,577	0.000	2,555	0.000	1,035	0.000	2,396	0.000
age12	21,316	0.017	10,577	0.013	2,555	0.011	1,035	0.004	2,396	0.008
age13	21,316	0.092	10,577	0.068	2,555	0.047	1,035	0.040	2,396	0.042
age14	21,316	0.143	10,577	0.114	2,555	0.100	1,035	0.123	2,396	0.096
age15	21,316	0.172	10,577	0.160	2,555	0.164	1,035	0.171	2,396	0.162
age16	21,316	0.196	10,577	0.205	2,555	0.214	1,035	0.208	2,396	0.220
age17	21,316	0.191	10,577	0.217	2,555	0.230	1,035	0.220	2,396	0.218
age18	21,316	0.147	10,577	0.170	2,555	0.177	1,035	0.173	2,396	0.181
age19	21,316	0.035	10,577	0.042	2,555	0.048	1,035	0.052	2,396	0.057
>19	21,316	0.006	10,577	0.010	2,555	0.009	1,035	0.010	2,396	0.015
GRADE										
grade7	21,316	0.089	10,577	0.074	2,555	0.054	1,035	0.043	2,396	0.054
grade8	21,316	0.150	10,577	0.120	2,555	0.106	1,035	0.116	2,396	0.101
grade9	21,316	0.171	10,577	0.155	2,555	0.159	1,035	0.169	2,396	0.158
grade10	21,316	0.185	10,577	0.187	2,555	0.194	1,035	0.192	2,396	0.194
grade11	21,316	0.180	10,577	0.210	2,555	0.217	1,035	0.190	2,396	0.205
grade12	21,316	0.166	10,577	0.183	2,555	0.178	1,035	0.173	2,396	0.174
RACE/ETH.										
Hispanic	21,316	0.164	10,577	0.179	2,555	0.176	1,035	0.186	2,396	0.203
White	21,316	0.623	10,577	0.599	2,555	0.597	1,035	0.601	2,396	0.548
Black	21,316	0.231	10,577	0.234	2,555	0.238	1,035	0.250	2,396	0.234
Native American	21,316	0.033	10,577	0.038	2,555	0.039	1,035	0.046	2,396	0.045
Asian/Pacific Islander	21,316	0.072	10,577	0.085	2,555	0.077	1,035	0.071	2,396	0.106
Other Races	21,316	0.092	10,577	0.099	2,555	0.105	1,035	0.090	2,396	0.125
SKIP GRADE	21,316	0.027	10,577	0.030	2,555	0.031	1,035	0.043	2,396	0.041
AH PVT SCORE	20,259	100.540	10,068	98.601	2,414	97.785	994	96.653	2,273	95.939

Table 1 (continued)
Summary Statistics - Depression Impacts on GPA

	No Depressed Mood		Some of the Time		A lot of the Time		Most or all of the Time		Major Depression	
	n	avg.	n	avg.	n	avg.	n	avg.	n	avg.
EXCUSED ABSENCES										
0	21,316	0.120	10,577	0.095	2,555	0.084	1,035	0.088	2,396	0.084
1 to 2	21,316	0.308	10,577	0.276	2,555	0.238	1,035	0.196	2,396	0.214
3 to 10	21,316	0.422	10,577	0.429	2,555	0.396	1,035	0.386	2,396	0.381
11 or more	21,316	0.106	10,577	0.144	2,555	0.207	1,035	0.231	2,396	0.221
UNEXCUSED ABSENCE	20,377	1.566	9,977	2.355	2,356	3.629	931	5.041	2,153	4.237
DESIRE FOR COLLEGE										
very low	21,316	0.035	10,577	0.044	2,555	0.059	1,035	0.091	2,396	0.069
low	21,316	0.026	10,577	0.035	2,555	0.044	1,035	0.046	2,396	0.062
medium	21,316	0.092	10,577	0.116	2,555	0.150	1,035	0.138	2,396	0.161
high	21,316	0.131	10,577	0.141	2,555	0.137	1,035	0.127	2,396	0.157
very high	21,316	0.695	10,577	0.646	2,555	0.594	1,035	0.581	2,396	0.535
2 PARENT HH	21,316	0.654	10,577	0.602	2,555	0.550	1,035	0.513	2,396	0.528
MOTHER DISABLED	21,316	0.049	10,577	0.058	2,555	0.063	1,035	0.078	2,396	0.067
FATHER DISABLED	21,316	0.065	10,577	0.074	2,555	0.073	1,035	0.092	2,396	0.091
MOTHER'S EDUCATION										
8th grade or less	21,316	0.055	10,577	0.066	2,555	0.062	1,035	0.071	2,396	0.074
9th grade, no hs	21,316	0.101	10,577	0.121	2,555	0.144	1,035	0.139	2,396	0.162
Vocational, no hs	21,316	0.008	10,577	0.008	2,555	0.009	1,035	0.012	2,396	0.009
High school grad	21,316	0.309	10,577	0.305	2,555	0.292	1,035	0.315	2,396	0.291
GED	21,316	0.037	10,577	0.043	2,555	0.046	1,035	0.048	2,396	0.045
Vocational after hs	21,316	0.065	10,577	0.064	2,555	0.071	1,035	0.059	2,396	0.061
Some college, not finish	21,316	0.132	10,577	0.125	2,555	0.126	1,035	0.124	2,396	0.122
4 year college degree	21,316	0.195	10,577	0.180	2,555	0.175	1,035	0.141	2,396	0.162
Post-graduate work	21,316	0.080	10,577	0.070	2,555	0.058	1,035	0.062	2,396	0.053
FATHER'S EDUCATION										
8th grade or less	21,316	0.055	10,577	0.068	2,555	0.069	1,035	0.078	2,396	0.075
9th grade, no hs	21,316	0.089	10,577	0.098	2,555	0.119	1,035	0.114	2,396	0.122
Vocational, no hs	21,316	0.007	10,577	0.008	2,555	0.007	1,035	0.006	2,396	0.010
High school grad	21,316	0.286	10,577	0.297	2,555	0.286	1,035	0.295	2,396	0.288
GED	21,316	0.028	10,577	0.029	2,555	0.028	1,035	0.026	2,396	0.027
Vocational after hs	21,316	0.056	10,577	0.053	2,555	0.051	1,035	0.060	2,396	0.051
Some college, not finish	21,316	0.109	10,577	0.102	2,555	0.104	1,035	0.085	2,396	0.094
4 year college degree	21,316	0.187	10,577	0.166	2,555	0.155	1,035	0.145	2,396	0.142
Post-graduate work	21,316	0.095	10,577	0.085	2,555	0.076	1,035	0.065	2,396	0.061

Females comprise the majority of respondents reporting depressed mood (56.2 percent of "depressed some of the time" respondents, to 69.3 percent of "depressed most or all of the time respondents"). Whether this suggests that females are more likely than males to be depressed during this period of life, to accurately self-report their feelings of depression, is an issue that will be discussed later in the paper.

Regarding ethnicity, whites make up the largest share of survey respondents for all depression categories, including no depressed mood. However, as the severity of depression increases, whites make up a lower overall share of the respondents. The percentage drops from 62.3 percent reporting no depressed mood, to 60 percent reporting depression of most or all of the time, and only 54.8 percent reporting symptoms consistent with major depression. Ethnic groups with larger shares of the "more depressed" respondent base include Hispanics, Asians, and Native Americans. The share of black respondents remained relatively constant across all depression categories.

Other summary statistics observations include the following; respondents who have skipped grades make up a slightly higher share of the more frequently depressed groups than the non-depressed group. Respondents with college-educated parents make up a smaller share of the frequently depressed groups than the non-depressed group. In addition, the more depressed respondent groups have lower standardized test scores, higher rates of absenteeism, lower desire to attend college, and are more likely to live in a single-parent household with a disabled parent. Again, these impacts also appear to be progressive, based on the severity of reported depressed mood.

5.2 OLS Regression of GPA on Depression and Exogenous Variables

Table 2 provides results from the OLS regression of GPA on depression and exogenous variables. We see the expected negative relationship between

depressed mood and GPA, as well as the progressive nature of the impact that more severe depressive states have on grades.

Table 2: Results
OLS Regression of GPA on Depression and Exogenous Variables Only

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables Only										
Depressed Some of the Time	-0.150	-14.700	-0.123	-10.760	-0.135	-10.240	-0.169	-13.160	-0.161	-12.360
Depressed a Lot of the Time	-0.231	-12.530	-0.230	-11.290	-0.223	-9.520	-0.257	-11.250	-0.254	-10.830
Depressed Most or All of the Time	-0.406	-14.300	-0.361	-11.490	-0.350	-9.670	-0.401	-11.480	-0.432	-11.990
Major Depression	-0.305	-16.200	-0.326	-15.600	-0.299	-12.410	-0.338	-14.560	-0.303	-12.560

For students reporting depressed mood of "some of the time", overall GPA falls by 0.15 grade points. Students reporting depressed mood "a lot of the time" have an overall GPA reduction of 0.231 grade points. Depressed feelings "most or all of the time" results in a 0.406 overall grade point reduction. Those with characteristics consistent with major depression suffer a 0.305 grade point decline. When individual subjects are evaluated, results vary somewhat, based on the type of depressive mood reported. In the regression with the categorical depression variable, the largest grade impacts are consistently in social studies and science. GPA is most affected in social studies, with English second. As illustrated in Table 1, all depression coefficients display very high levels of statistical significance.

5.3 OLS Regression of GPA on Depression, Exogenous Variables and Motivation Proxies

Table 3 displays the results when the motivation proxy variables are added to the base OLS model as discussed in sections 3.6 and 4.7.3. Although

depression is only one of many potential reasons for a lesser degree of

motivation, including these motivation proxies in the OLS equation should help to

mitigate omitted variable bias.

Table 3: Results
OLS Regression of GPA on Depression, Exogenous Variables, and Motivation Proxy Vector

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies										
Depressed Some of the Time	-0.112	-11.560	-0.083	-7.480	-0.099	-7.700	-0.127	-10.250	-0.122	-9.570
Depressed a Lot of the Time	-0.145	-8.300	-0.134	-6.760	-0.142	-6.170	-0.158	-7.120	-0.165	-7.220
Depressed Most or All of the Time	-0.272	-10.100	-0.228	-7.490	-0.232	-6.500	-0.262	-7.720	-0.294	-8.370
Major Depression	-0.200	-11.170	-0.216	-10.640	-0.197	-8.290	-0.225	-9.950	-0.190	-8.080

As expected, the inclusion of the motivation proxies reduces the overall

negative impacts of depressed mood on GPA. Coefficient magnitudes generally

fall by about one-third. Students remain more impacted in social studies and

science courses than in math and English when depression is measured

categorically, while those with major depression characteristics see the largest

GPA impacts in social studies and English.   The depression coefficients remain

very highly statistically significant.

5.4   OLS Regression of GPA on Depression, Exogenous Variables and Ability Proxies

For the next OLS model, the ability proxy variables are substituted for the

motivation proxies in the regression equation. This allows for comparative

assessment of the impacts of the ability and motivation vectors on the

GPA/depression relationship.   The ability proxies, noted in Section 4.7.5, attempt

to control for a student's natural intelligence and/or aptitude. Again, inclusion of

these variables is intended to at least partially address the issue of omitted

variable bias.

Table 4: Results
OLS Regression of GPA on Depression, Exogenous Variables, and Ability Proxy Vector

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Ability Proxies										
Depressed Some of the Time	-0.056	-5.160	-0.064	-4.920	-0.063	-4.220	-0.086	-4.700	-0.089	-5.790
Depressed a Lot of the Time	-0.075	-3.640	-0.138	-5.850	-0.113	-4.150	-0.116	-2.870	-0.130	-4.560
Depressed Most or All of the Time	-0.220	-6.800	-0.213	-5.700	-0.238	-5.540	-0.143	-5.840	-0.343	-7.700
Major Depression	-0.128	-5.790	-0.190	-7.620	-0.215	-7.460	-0.137	-4.730	-0.167	-5.470

The results of Table 4 suggest that controlling for student ability generally

has a more substantial mitigating effect on the depression/GPA relationship than

controlling for motivation.   While the relationship between GPA and depression

remains consistently negative and highly significant, the impacts of depression

on grades are typically less than that seen when the motivation proxies are

added, although this varies by depression category and subject. The depressed

"some" and "a lot" of the time coefficients fall by 25-50 percent, except in one

case (English) the latter actually increases slightly. Effects of "most or all of the

time" and major depression are generally less impacted, with the math and

science coefficients either rising or falling only slightly, but decline considerably

for social studies. The net result is that science GPA now experiences the

largest effect for the categorical depression measure, while major depression has

the biggest impact on math.

5.5   OLS Regression of GPA on Depression, Exogenous Variables, Motivation Proxies, and Ability Proxies

This model includes *both* the motivation and ability proxies, in an attempt to maximally control for factors that may influence student grades, in addition to depressed mood. Table 5 presents the results.

Table 5: Results
OLS Regression of GPA on Depression, Exogenous Variables, Motivation Vector, and Ability Vector

	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
Depression Variable	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies										
Depressed Some of the Time	-0.045	-4.290	-0.044	-3.470	-0.046	-3.090	-0.068	-4.580	-0.071	-4.700
Depressed a Lot of the Time	-0.040	-1.990	-0.080	-3.440	-0.066	-2.420	-0.066	-2.430	-0.081	-2.870
Depressed Most or All of the Time	-0.159	-5.000	-0.125	-3.400	-0.166	-3.890	-0.061	-1.430	-0.258	-5.840
Major Depression	-0.087	-4.030	-0.127	-5.160	-0.157	-5.470	-0.081	-2.850	-0.105	-3.470

The impact of depression on grades is further reduced. Students with depressed mood "some of the time" have a 0.045 grade point reduction in overall GPA. Students reporting depressed mood "a lot of the time" are negatively impacted overall by 0.040 grade points. Those with depressed feelings "most or all of the time" have a 0.159 overall grade point reduction. Students in the major depression category suffer a 0.087 grade point drop. The coursework most significantly affected in this model remains largely unchanged from the "ability vector only" model (Table 4). Table 5 indicates that all but one depression coefficient ("depressed most or all of the time" – social studies) remains statistically significant at 5 percent.   It is also conceivable that the inclusion of these motivation and ability variables may be capturing some of the effects of depressed mood on grades; thus the results may be conservative.

5.6   OLS Regression – School Fixed Effects

Section 5.7 will present results for various grades in school, from 7th through

12th grade. Before these results are discussed, the study assesses whether the

results hold within schools or are partially caused by variation across schools in

unobserved factors. Binary indicators for each school were created, and added

to the base OLS model, in an attempt to determine whether controlling for

variation across schools would further mitigate the impacts of depression on

GPA.

Table 6: Results
OLS-School Fixed Effects Analysis

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (School FE)										
Depressed Some of the Time	-0.043	-4.050	-0.041	-3.190	-0.041	-2.750	-0.061	-4.110	-0.064	-4.260
Depressed a Lot of the Time	-0.035	-1.750	-0.072	-3.090	-0.055	-2.050	-0.066	-2.410	-0.076	-2.710
Depressed Most or All of the Time	-0.156	-4.960	-0.121	-3.310	-0.166	-3.920	-0.058	-1.360	-0.241	-5.510
Major Depression	-0.080	-3.740	-0.121	-4.950	-0.139	-4.870	-0.079	-2.770	-0.096	-3.190
Persistence Depression	-0.038	-2.870	-0.025	-1.600	-0.089	-4.850	-0.050	-2.680	-0.065	-3.420
Onset Depression	-0.065	-5.210	-0.064	-4.240	-0.045	-2.560	-0.087	-4.960	-0.093	-5.160
Remittance Depression	-0.021	-1.500	0.019	1.090	-0.064	-3.200	-0.034	-1.740	-0.012	-0.590

Table 6 provides the results of this analysis. In summary, none of the

depression coefficients changed by more than 0.017, and most changed by less

than 0.01 of a grade point from Table 5 when school fixed effects were included.

These small differentials between Tables 5 and 6 suggest that, even within

schools, the depression impacts previously estimated hold. It does not appear

that more depressed students are attending schools that have omitted

characteristics that are correlated with both lower grades and depressed mood

(i.e. more disadvantaged socioeconomic status, poor teaching, discipline problems, etc.).

Table 6 also reports results of the school FE analysis using the persistence depression variables. The results, except for math in which even remittance depression is harmful and has the strongest effect, suggest that grades do not suffer significantly from depression that is not current and that the onset of depression symptoms hurts grades as much or more than persistent depression that has carried over from the baseline survey. These will be further discussed in Section 5.10.

5.7 OLS Regression – Results by Grade

Tables 7 through 14 present the results of OLS regressions that include the motivation and ability proxies, but exclude the school fixed effects, stratified by grade level. These regression equations do not differ structurally from those discussed in Sections 4.7.7 and 5.5, except that they include only respondents in specific grade levels. School fixed effects are omitted because they take up substantial degrees of freedom but were observed in Table 6 to have no tangible impact on the estimates.

The presentation commences with a discussion of depression coefficients for two larger groups, students in middle school (grades 7-8) and high school (grades 9-12), with follow-up discussions for grade-level specific samples. Table 7 profiles results of for respondents in grades 7 and 8.

Table 7: Results
OLS-GPA Impacts by Grade (Grades 7 & 8)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 7-8)										
Depressed Some of the Time	-0.068	-3.230	-0.048	-1.670	-0.066	-2.080	-0.071	-2.320	-0.123	-3.900
Depressed a Lot of the Time	-0.045	-1.010	-0.045	-0.760	-0.102	-1.580	-0.094	-1.490	-0.063	-0.970
Depressed Most or All of the Time	-0.350	-5.360	-0.372	-4.330	-0.440	-4.610	-0.186	-2.010	-0.410	-4.210
Major Depression	-0.162	-3.320	-0.181	-2.930	-0.244	-3.520	-0.061	-0.900	-0.222	-3.130

The main difference between these results, and those for the full sample in Table 5, are for the most severe categories of depression, the "depressed most or all of the time" and "major depression" categories. Overall GPA for middle school students in the "depressed most or all of the time category" is reduced by 0.35 grade points, while students suffering from major depression have a GPA that is 0.162 grade points lower than those reporting no depression. These results show approximately twice the depression effect among middle school students than the overall sample demonstrates. In addition, middle schoolers hardest hit by depression are impacted substantially in the subjects of math and science, where GPA falls from one quarter to one-half of a grade point. Perhaps surprisingly, none of the depression coefficients for "depressed a lot of the time" are statistically significant at 5 percent, whereas for "depressed some of the time", only the coefficient for the English GPA regression is insignificant at 5 percent. Also, compared to the coefficient for "most or all of the time", that for major depression is never much more than half the size, and is as little as one-third the size (and highly insignificant) in the case of social studies.

The results for high school students (grades 9 through 12) are presented in Table 8. The differences in depression impacts on GPA between middle school and high school students can be easily seen by comparing the coefficients with those from Table 7. Depression has a more modest impact on the GPA of high school students.

Table 8: Results
OLS-GPA Impacts by Grade (Grades 9 through 12)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 9-12)										
Depressed Some of the Time	*-0.034*	*-2.810*	*-0.044*	*-3.070*	*-0.040*	*-2.350*	*-0.064*	*-3.790*	*-0.052*	*-3.000*
Depressed a Lot of the Time	*-0.040*	*-1.780*	*-0.088*	*-3.440*	*-0.057*	*-1.900*	*-0.063*	*-2.070*	*-0.083*	*-2.620*
Depressed Most or All of the Time	*-0.083*	*-2.300*	*-0.070*	*-1.710*	*-0.100*	*-2.080*	*-0.008*	*-0.160*	*-0.215*	*-4.310*
Major Depression	*-0.061*	*-2.570*	*-0.074*	*-2.180*	*-0.138*	*-4.340*	*-0.081*	*-2.540*	*-0.074*	*-2.180*

High school students who are the most severely depressed ("most or all of the time", major depression) have grade impacts of roughly one-third the magnitude of middle school students. Students depressed "most or all of the time" see an overall GPA decline of 0.083 grade points, while major depression drops GPA by 0.061 grade points. Math scores suffer the most for those with major depression (-0.138), while those depressed "most or all of the time" are hard hit in science (-0.215). The coefficients for "depressed most or all of the time" are not statistically significant at 5 percent LOS, in the subjects of English and social studies. The remaining "severe depression" coefficients are statistically significant. Interestingly, unlike for middle school students, for high school students major depression hurts GPA more than being depressed most or all of the time in all subjects except science, and has similar impacts on overall GPA.

61

Tables 9 through 13 display OLS models estimated for each grade level.

Table 9: Results
OLS-GPA Impacts by Grade (Grade 7)

	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
Depression Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 7)										
Depressed Some of the Time	-0.038	-1.050	0.023	0.500	-0.052	-0.980	0.035	0.660	-0.108	-2.070
Depressed a lot of the Time	-0.175	-2.180	-0.187	-1.820	-0.262	-2.340	0.015	0.140	-0.102	-0.900
Depressed Most or All of the Time	-0.200	-1.710	-0.256	-1.710	-0.170	-0.980	0.154	0.910	-0.399	-2.320
Major Depression	-0.174	-2.130	-0.197	-1.940	-0.288	-2.480	0.076	0.690	-0.225	-1.920

Table 9 suggests that even moderate levels of depression appear to have sizable negative effects on the GPA of 7th graders, with frequent and major depression having particularly large effects on science GPA.

Table 10: Results
OLS-GPA Impacts by Grade (Grade 8)

	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
Depression Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 8)										
Depressed Some of the Time	-0.083	-3.130	-0.085	-2.330	-0.071	-1.770	-0.116	-3.040	-0.128	-3.230
Depressed a Lot of the Time	0.024	0.440	0.023	0.320	-0.018	-0.230	-0.133	-1.740	-0.046	-0.580
Depressed Most or All of the Time	-0.425	-5.380	-0.429	-4.060	-0.534	-4.630	-0.335	-3.010	-0.437	-3.670
Major Depression	-0.148	-2.390	-0.172	-2.180	-0.213	-2.440	-0.115	-1.340	-0.227	-2.520

Being depressed most or all of the time appears to negatively impact the performance of 8th graders more than any other grade level. Table 10 shows that 8th grade students who are depressed "most or all of the time" see a 0.425 overall GPA reduction. On a subject level, the impacts range from one-third to one-half grade point, with math performance suffering the most (-0.534). Yet, the effect of major depression, though significant, is no larger than for 7th graders, and being depressed "a lot of the time" has little impact, except in the subject of social studies.

Table 11: Results
OLS-GPA Impacts by Grade (Grade 9)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 9)										
Depressed Some of the Time	-0.037	-1.460	-0.004	-0.110	-0.056	-1.540	-0.048	-1.280	-0.053	-1.480
Depressed a Lot of the Time	-0.097	-2.010	-0.124	-2.100	-0.015	-0.230	-0.110	-1.620	-0.123	-1.900
Depressed Most or All of the Time	-0.113	-1.570	-0.178	-1.960	-0.039	-0.400	-0.012	-0.120	-0.209	-2.100
Major Depression	-0.045	-0.910	-0.144	-2.350	-0.106	-1.580	-0.034	-0.490	-0.174	-2.550

High school freshmen depressed at least "a lot of the time" struggle in the areas of science and English, with grade declines in the courses ranging from one-eighth to one-fifth of a grade point. The results in Table 11 also suggest little grade impact in math, social studies or overall.

Table 12: Results
OLS-GPA Impacts by Grade (Grade 10)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 10)										
Depressed Some of the Time	-0.020	-0.880	-0.002	-0.060	-0.019	-0.600	-0.091	-2.600	-0.046	-1.390
Depressed a Lot of the Time	-0.002	-0.050	-0.054	-1.080	0.038	0.680	0.027	0.420	-0.111	-1.870
Depressed Most or All of the Time	-0.024	-0.330	0.059	0.730	-0.036	-0.400	0.033	0.330	-0.207	-2.190
Major Depression	-0.096	-2.140	-0.126	-2.360	-0.136	-2.270	-0.109	-1.650	-0.068	-1.050

The results for sophomores show that depression coefficients are not statistically significant at low to moderate levels of depressed mood. Table 12 also shows that major depression is significant for all grades except social studies, whereas being depressed "most or all of the time" is significant only for science. For those depressed "most or all of the time", science grades drop by one-fifth of a grade point. For students having characteristics of major depression, math and English scores are affected by one-eighth of a grade point.

Table 13: Results
OLS-GPA Impacts by Grade (Grade 11)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 11)										
Depressed Some of the Time	-0.048	-2.150	-0.062	-2.320	-0.042	-1.350	-0.030	-0.980	-0.054	-0.880
Depressed a Lot of the Time	-0.017	-0.410	-0.094	-2.000	-0.053	-0.960	-0.039	-0.720	-0.235	-2.410
Depressed Most or All of the Time	-0.118	-1.710	-0.080	-1.010	-0.221	-2.390	-0.024	-0.270	-0.004	-0.130
Major Depression	-0.045	-1.050	-0.083	-1.690	-0.170	-2.870	-0.030	-0.530	0.010	0.160

In Table 13, OLS regressions suggest that severely depressed mood impacts a junior's math average by roughly two-tenths of a grade point. Beyond that, depression impacts are either practically small, or statistically insignificant.

Table 14: Results
OLS-GPA Impacts by Grade (Grade 12)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Grade 12)										
Depressed Some of the Time	-0.025	-0.870	-0.084	-3.000	-0.044	-1.170	-0.097	-2.880	-0.036	-0.930
Depressed a Lot of the Time	-0.045	-0.830	-0.068	-1.330	-0.245	-3.490	-0.113	-1.810	-0.018	-0.250
Depressed Most or All of the Time	-0.071	-0.870	-0.105	-1.310	-0.084	-0.790	-0.063	-0.670	-0.162	-1.430
Major Depression	-0.063	-1.060	-0.116	-2.130	-0.124	-1.710	-0.157	-2.390	-0.092	-1.220

Table 14 results suggest that high school seniors appear to experience noticeable negative affects from depressed mood in English and social studies, even at lower levels of reported depression. GPA declines in both subjects are roughly one-tenth of a grade point. However, this drop in performance rises only modestly as the severity of depressed mood increases.

5.8   OLS Regression – Results by Gender

Table 15 presents the OLS model results for survey females. The data suggests that depressed mood negatively affects the GPA of females, even at

relatively modest frequency. In addition, with increasing frequency of

depression, females' grade performance slips even further, with "technical"

subjects seeing the greatest decline.

Table 15: Results
OLS-GPA Impacts by Sex (Female)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Female)										
Depressed Some of the Time	-0.056	-4.070	-0.070	-4.160	-0.063	-3.180	-0.084	-4.330	-0.075	-3.750
Depressed a Lot of the Time	-0.058	-2.440	-0.125	-4.530	-0.069	-2.090	-0.072	-2.220	-0.096	-2.870
Depressed Most or All of the Time	-0.200	-5.610	-0.185	-4.310	-0.232	-4.580	-0.107	-2.170	-0.306	-5.970
Major Depression	-0.080	-3.140	-0.134	-4.580	-0.182	-5.240	-0.075	-2.230	-0.087	-2.420

Females who report being depressed "some of the time" see a decline in

overall GPA of 0.056 grade points, with science being the most affected subject

(-0.075). Those reporting depression "a lot of the time" experience a drop in

overall GPA of 0.058 grade points, with English performance being affected the

most (-0.125). Female students with depressed mood "most or all of the time"

suffer a 0.20 overall grade point decline, including setbacks of 0.306 GPA in

science and 0.232 in math. When major depression characteristics are present

in females, their overall GPA declines by 0.08 grade points, with math being the

most heavily affected subject (-0.182). All depression coefficients for females are

statistically significant at 5 percent.

The results for depression frequency among male students in Table 16 tell a

different story. The impacts are considerably smaller in magnitude and are rarely

statistically significant. Coefficients are mixed in their statistical significance.

Table 16: Results
OLS-GPA Impacts by Sex (Male)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Male)										
Depressed Some of the Time	-0.034	-2.050	-0.017	-0.850	-0.029	-1.290	-0.048	-2.100	-0.067	-2.850
Depressed a Lot of the Time	-0.012	-0.330	-0.010	-0.240	-0.081	-1.680	-0.071	-1.450	-0.054	-1.040
Depressed Most or All of the Time	-0.061	-0.940	-0.021	-0.290	-0.021	-0.270	0.030	0.370	-0.174	-2.070
Major Depression	-0.103	-2.630	-0.121	-2.730	-0.115	-2.260	-0.097	-1.870	-0.148	-2.720

Beyond the lowest level of depression, only science course grades show a statistically significant negative impact (-0.174). On the other hand, except for math, the GPA reduction induced by major depression is similar or greater for males than females. Males in the major depression category see an overall GPA decline of 0.103 points, again with science seeing the largest drop (-0.148)

The differences seen in the results of the OLS model runs between males and females generates questions as to whether females' grade performance is truly more impacted by depression, or whether the results reflect differences in self-reporting of depression and grades between the sexes. Nicholson (1984) points out that young males display a greater tendency than females to distort facts related to achievement.

5.9   OLS Regression – Results by Race/Ethnicity

The analysis of depression impacts on grades by race suggests that Caucasian students suffering from depression have similar academic performance issues when compared overall to non-Caucasian students. However, when each racial cohort is assessed individually, ethnic distinctions in the GPA gap become more apparent.

Table 17: Results
OLS-GPA Impacts by Race/Ethnicity (White)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (White)										
Depressed Some of the Time	-0.052	-3.860	-0.052	-3.220	-0.044	-2.350	-0.085	-4.610	-0.074	-3.880
Depressed a Lot of the Time	-0.039	-1.530	-0.097	-3.290	-0.062	-1.780	-0.056	-1.650	-0.103	-2.940
Depressed Most or All of the Time	-0.169	-4.220	-0.172	-3.700	-0.153	-2.870	-0.060	-1.120	-0.260	-4.790
Major Depression	-0.057	-1.950	-0.131	-3.950	-0.131	-3.350	-0.069	-1.820	-0.100	-2.460

Table 17 provides a profile of the OLS regression results for Caucasian students. Grade performance is impacted even at moderate levels of depression. For students that report depressed mood "some of the time", overall GPA falls by 0.052 grade points, with social studies being the most affected subject. Although statistical significance is mixed for coefficients of depressed mood "a lot of the time", those subjects that pass significance testing at 5 percent indicate a 1/10 grade point negative impact (English, science). At more severe levels of depression, the impacts to GPA increase. Overall GPA falls by 0.169 grade points for students reporting depressed mood "most or all of the time", with science grades seeing the largest decline (-0.260). Caucasian students who met the major depression criteria realized declines in English and math GPA of 0.13 grade points, as well as a 1/10 grade point drop in science.

When all other races are evaluated as a single group, GPA impacts from depressed mood do not appear to differ dramatically from Caucasian students. Table 18 shows that non-whites depressed "some of the time" see an overall GPA decline of 0.037 grade points, with social studies and science grades affected similarly at 1/20 of a point. No coefficients are statistically significant for the depression category "a lot of the time".

Table 18: Results
OLS-GPA Impacts by Race/Ethnicity (Non-White)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (All Non-White)										
Depressed Some of the Time	-0.037	-2.390	-0.023	-1.140	-0.046	-2.000	-0.051	-2.180	-0.056	-2.330
Depressed a Lot of the Time	-0.027	-0.910	-0.041	-1.120	-0.041	-0.970	-0.048	-1.100	-0.060	-1.320
Depressed Most or All of the Time	-0.121	-2.580	-0.046	-0.810	-0.159	-2.380	-0.063	-0.930	-0.252	-3.500
Major Depression	-0.094	-3.240	-0.116	-3.320	-0.174	-4.260	-0.060	-1.450	-0.124	-2.810

Non-white students with depression "most or all of the time" experience an
overall negative GPA impact of 0.121 points, with science grades suffering the
most (-0.252). Those who have major depression characteristics see an overall
GPA drop of slightly less than 1/10 of a point, with math performance being most
affected (-0.174).

Tables 19 through 24 display the results for each individual non-Caucasian
race/ethnic group.

Table 19: Results
OLS-GPA Impacts by Race/Ethnicity (Black)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Black)										
Depressed Some of the Time	-0.030	-1.370	-0.036	-1.290	-0.045	-1.450	-0.060	-1.870	-0.061	-1.860
Depressed a Lot of the Time	-0.041	-0.970	-0.067	-1.290	0.000	-0.010	-0.073	-1.210	-0.037	-0.590
Depressed Most or All of the Time	-0.095	-1.420	-0.055	-0.690	-0.139	-1.560	-0.076	-0.810	-0.212	-2.190
Major Depression	-0.159	-3.590	-0.181	-3.480	-0.117	-2.000	-0.121	-1.950	-0.162	-2.540

Table 19 suggests that black students with major depression are impacted
much more substantially than whites, with an overall GPA drop of 0.159 points.
At other levels of reported depression, it is not clear that blacks suffer a greater
GPA impact. Many coefficients are not statistically significant in these other

categories, and most are lower than for the Caucasian segment. This may be

attributable to differentials in self-reporting.

Table 20: Results
OLS-GPA Impacts by Race/Ethnicity (Hispanic)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Hispanic)										
Depressed Some of the Time	-0.044	-1.550	-0.059	-1.810	-0.087	-2.270	-0.052	-1.360	-0.058	-1.430
Depressed a Lot of the Time	-0.060	-1.110	-0.053	-0.890	-0.063	-0.900	-0.071	-1.000	-0.182	-2.410
Depressed Most or All of the Time	-0.104	-1.190	-0.027	-0.290	-0.177	-1.620	0.008	0.070	-0.137	-1.150
Major Depression	-0.048	-0.920	-0.017	-0.300	-0.191	-2.820	-0.056	-0.830	-0.086	-1.170

Table 20 shows that most of the depression coefficients for Hispanic

students are not statistically significant at 5 percent LOS under any depression

frequency scenario. Hispanic students suffering from major depression

characteristics have larger GPA impacts in the subject of math (-0.191) than

whites or blacks. It is interesting to note that science GPA drops by 0.182 grade

points at a more modest depression frequency of "a lot of the time".

Table 21: Results
OLS-GPA Impacts by Race/Ethnicity (Native American)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Native American)										
Depressed Some of the Time	-0.112	-1.700	-0.053	-0.740	-0.152	-1.760	-0.058	-0.700	-0.028	-0.320
Depressed a Lot of the Time	-0.091	-0.800	-0.175	-1.460	-0.114	-0.780	0.173	1.270	-0.257	-1.760
Depressed Most or All of the Time	-0.042	-0.240	-0.147	-0.810	-0.318	-1.360	0.327	1.520	-0.544	-2.110
Major Depression	-0.083	-0.710	-0.034	-0.270	-0.394	-2.680	0.326	2.430	-0.167	-1.080

The OLS results for Native American students in Table 21 are similar to the

results for the Hispanic group, with limited statistical significance of coefficients in

most scenarios and subjects, and large GPA impacts for the few subjects where

statistical significance is met. Native American students having characteristics of major depression see a 0.394 drop in Math GPA, the largest performance drop for this subject among all racial groups. Native American students reporting depression "most or all of the time" suffer a science GPA decline of more than one-half of a grade point (-0.544), the largest subject-specific performance drop of any ethnic group.

The results for Asian students in Table 22 also show few statistically significant depression coefficients at 5 percent LOS (only two of twenty), including none for overall GPA. Students with major depression suffer a 0.151 grade point decline in English, while those reporting mild depression ("some of the time") have a 0.109 lower social studies GPA.

Table 22: Results
OLS-GPA Impacts by Race/Ethnicity (Asian/Pacific Islander)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Asian/PI)										
Depressed Some of the Time	-0.053	-1.460	-0.030	-0.720	0.035	0.690	-0.109	-2.170	-0.056	-1.090
Depressed a Lot of the Time	0.054	0.770	0.041	0.520	-0.072	-0.760	-0.036	-0.370	0.039	0.390
Depressed Most or All of the Time	-0.126	-1.110	-0.036	-0.300	0.035	0.220	-0.002	-0.010	-0.290	-1.820
Major Depression	-0.010	-0.150	-0.151	-2.220	-0.108	-1.320	0.031	0.380	-0.087	-1.000

In Table 23, major depression is the only depression category where a statistically significant result is found for ethnic groups other than those previously defined. In math, students having major depression see their GPA fall by 0.271 grade points.

Table 23: Results
OLS-GPA Impacts by Race/Ethnicity (Other Races)

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Other Races)										
Depressed Some of the Time	*-0.039*	*-0.990*	-0.001	-0.020	-0.080	-1.510	-0.027	-0.520	-0.083	-1.460
Depressed a Lot of the Time	*-0.002*	*-0.030*	0.037	0.480	-0.087	-0.940	-0.076	-0.830	-0.104	-1.020
Depressed Most or All of the Time	*-0.072*	*-0.630*	0.072	0.550	-0.269	-1.750	-0.113	-0.780	-0.100	-0.590
Major Depression	*-0.068*	*-1.040*	0.072	0.990	-0.271	-3.080	-0.088	-1.020	-0.104	-1.060

5.10 OLS Regression – Persistence Depression Results

In sections 3.3 and 4.7.12 of the dissertation, we discuss the interest in and methodology for evaluating student grade impacts based on the persistent nature (or lack thereof) of depressed mood. Table 24 provides the results of this analysis. For those students experiencing persistent depression, overall GPA falls by 0.038 grade points. Math is the most affected subject (-0.085) for this group. For students displaying "onset depression", overall GPA is 0.071 grade points lower than for those who have never reported depressed mood.

Table 24: Results
OLS-Persistence Depression Effects on GPA

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Persistence Depression + Exogenous Variables + Motivation Proxies + Ability Proxies										
Persistence Depression	-0.038	-2.790	-0.029	-1.800	-0.085	-4.600	-0.052	-2.830	-0.062	-3.240
Onset Depression	-0.071	-5.640	-0.067	-4.400	-0.056	-3.150	-0.092	-5.280	-0.103	-5.690
Remittance Depression	-0.020	-1.380	0.024	1.430	-0.054	-2.700	-0.028	-1.430	0.002	0.080

Those with "remittance depression" characteristics only show a statistically significant impact in the subject of math, where GPA falls by 1/20 of a grade point. Overall, the negative influence of depression on student grades does

seem to increase with its persistence, potentially enhancing the already observed

effects on GPA.

5.11 First Differencing Results

Table 25 presents the results of first differencing in the primary OLS model.

The first differences were taken from responses of the 14,736 students who

participated in both the Wave 1 and Wave 2 surveys.

Table 25: Results
First Differencing of Responses for Students Reporting in Both Wave I and Wave II

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Wave FD)										
Depressed Some of the Time	-0.018	-1.280	-0.024	-1.290	-0.027	-1.250	0.002	0.080	-0.024	-1.030
Depressed a Lot of the Time	0.014	0.580	-0.009	-0.280	-0.023	-0.610	0.043	0.960	0.047	1.140
Depressed Most or All of the Time	0.013	0.340	0.005	0.100	-0.077	-1.380	0.093	1.390	0.030	0.490
Major Depression	-0.021	-0.840	-0.041	-1.240	-0.051	-1.360	0.047	1.050	-0.040	-0.960

The first differencing results are relatively small, mixed in sign across

various depression and subject scenarios, and never are statistically significant

at 5 percent LOS. A number of positive coefficients are generated for severity of

"*most of or all of the time*". Two plausible arguments exist. Either time-invariant

heterogeneity controlled for by first differencing dominates, and is not controlled

for by the other methods, or the first differencing method is not reliable because

of time-related issues in survey reporting. These time issues include a relatively

short period between the in-school (baseline) survey and the Wave 1 and Wave

2 surveys, and possibility that FD may be eliminating some cross-respondent

variation attributable to changes resulting from a wider variety of disorders that include depressed mood (e.g. dysthymic disorder).

With the "major depression" variable, because bi-directional changes in depression severity do not exist, the results can be interpreted in a more straightforward manner. Not withstanding, the results suggest that, once time-invariant factors are controlled for, a statistically significant relationship between major depression and GPA does not exist.

5.12 Sibling Fixed Effects Results

Wave-specific results when controlling for sibling effects are presented in Tables 26 and 27. The sample size varies from 1,448 to 2,129 in Wave I, and 984 to 1,718 in Wave II. The sample size for each reported GPA variable differs, based on number of students who reported a grade.

Wave I results are presented in Table 26. When sibling effects are controlled for, overall GPA is still negatively impacted by depressed mood, although the categorical effects are somewhat tempered relative to the results of the base OLS-proxy equation model presented in Section 5.5 and Table 5. For major depression, GPA impacts remain sizeable, even with a smaller sample.

Table 26: Results
Sibling Fixed Effects - Wave I

	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
Depression Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Sibs FE - Wave I)										
Depressed Some of the Time	*-0.061*	*-1.370*	-0.049	-0.960	-0.064	-1.060	-0.033	-0.560	-0.102	-1.670
Depressed a Lot of the Time	*-0.038*	*-0.420*	-0.112	-1.210	-0.002	-0.020	-0.185	-1.720	-0.006	-0.050
Depressed Most or All of the Time	*-0.049*	*-0.360*	0.311	2.060	0.016	0.100	0.003	0.020	0.045	0.240
Major Depression	*-0.095*	*-1.120*	-0.162	-1.670	-0.148	-1.340	-0.074	-0.690	-0.099	-0.860

73

Wave I overall GPA coefficients do not display statistical significance at 5 percent LOS, which again is likely a result of smaller sample size. Only the English GPA impact, at a depression frequency of "most or all of the time", is significant at 5 percent LOS, and this coefficient GPA has an unexpected positive sign.

Table 27: Results
Sibling Fixed Effects - Wave II

	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
Depression Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Depression + Exogenous Variables + Motivation Proxies + Ability Proxies (Sibs FE - Wave II)										
Depressed Some of the Time	*-0.172*	*-2.510*	-0.057	-0.860	-0.183	-2.080	-0.040	-0.440	0.084	0.990
Depressed a Lot of the Time	*-0.043*	*-0.330*	-0.181	-1.430	-0.160	-1.000	-0.249	-1.430	-0.068	-0.410
Depressed Most or All of the Time	*-0.389*	*-2.410*	-0.224	-1.210	-0.245	-1.080	-0.839	-3.500	-0.444	-2.100
Major Depression	*-0.025*	*-0.170*	-0.174	-1.370	-0.162	-0.990	-0.405	-2.320	-0.186	-1.060

The Wave II sibling FE results show much greater (and more statistically significant) GPA impacts from depression. Overall GPA for students depressed "most or all of the time" falls by 0.389 grade points, although those suffering from major depression have only a -0.025 overall grade impact. Save the latter coefficient, not only are these results larger in magnitude than in Wave I, they are in several cases larger than the overall GPA impacts for the base OLS-proxy equation discussed in Section 5.5 and Table 5. The explanation could be persistence depression effects, given that the base model includes data from both survey waves. As in the case of first differencing, we cannot ignore the potential issues that arise from interpreting the directional changes in depression frequency (some of time, a lot of the time, most or all of the time) across siblings.

Regardless, the results of this analysis indicate that the negative impacts of

depression on GPA hold amongst the sibling groups.

5.13 Two-Stage Least Squares Estimation Results

As section 4.7.16 notes, three candidate instruments were selected for final

evaluation in the two-stage least squares models: "moody12", "crying12", and

"fearful12".   Combinations of these three variables were used as instruments for

the "major depression" proxy in OLS modeling. Table 28 displays the first-stage

regression results.

Table 28: Results
Two-Stage Least Squares, First Stage Regressions

Instruments	Overall GPA	English GPA	Math GPA	SS GPA	Sci. GPA
moody 12 + fearful12 + crying 12					
Coefficients					
moody 12	0.038	0.041	0.039	0.040	0.039
fearful 12	0.081	0.089	0.085	0.089	0.080
crying 12	0.136	0.149	0.146	0.148	0.133
t-statistics					
moody 12	8.990	11.540	10.830	10.370	10.410
fearful 12	9.290	12.420	11.710	11.450	10.380
crying 12	15.760	21.320	20.440	19.230	17.800
F-statstic	17.290	29.610	27.160	24.230	22.230
moody 12 + fearful12					
Coefficients					
moody 12	0.050	0.053	0.052	0.053	0.050
fearful 12	0.113	0.127	0.121	0.125	0.112
t-statistics					
moody 12	11.820	15.190	14.330	13.690	13.470
fearful 12	13.110	18.010	16.850	16.320	14.730
F-statstic	13.300	22.240	20.400	18.240	17.150
fearful12 + crying 12					
Coefficients					
fearful 12	0.091	0.099	0.095	0.099	0.089
crying 12	0.149	0.163	0.160	0.162	0.147
t-statistics					
fearful 12	10.420	13.810	13.070	12.720	11.660
crying 12	17.550	23.530	22.520	21.230	19.760
F-statstic	16.160	27.750	25.550	22.740	20.710

Table 28 (continued): Results
Two-Stage Least Squares, First Stage Regressions

Instruments	Overall GPA	English GPA	Math GPA	SS GPA	Sci. GPA
moody 12 + crying12					
Coefficients					
moody 12	0.043	0.046	0.044	0.045	0.043
crying 12	0.154	0.170	0.166	0.169	0.151
t-statistics					
moody 12	10.150	13.030	12.280	11.760	11.690
crying 12	18.310	25.050	23.810	22.520	20.680
F-statstic	16.070	27.380	25.200	22.330	20.720

With significant coefficient t-statistics and joint F-statistics, all four of the

instrument combinations meet initial IV validity criteria.

Table 29 provides a summary of the 2SLS output for each of the second

stage depression coefficients.

Table 29: Results
Two-Stage Least Squares, Effects of Major Depression

	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
Depression Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
2SLS - Major Depression										
Instruments: "moody12 + *fearful12* + crying 12"	-0.358	-3.420	-0.324	-3.000	-0.385	-2.900	-0.372	-2.900	-0.462	-3.110
Instruments: "moody12 + *fearful12*"	-0.544	-3.930	-0.300	-2.160	-0.497	-2.910	-0.562	-3.320	-0.737	-3.840
Instruments: "fearful12 + *crying12*"	-0.290	-2.610	-0.303	-2.630	-0.328	-2.320	-0.330	-2.410	-0.329	-2.070
Instruments: "moody12 + *crying12*"	-0.318	-2.810	-0.358	-3.050	-0.382	-2.660	-0.306	-2.250	-0.430	-2.710

When all three instruments are used, overall GPA declines by 0.358 grade

points. English GPA falls by 0.324 grade points, math GPA lowers by 0.385

grade points, social studies GPA drops by 0.372 grade points, and science GPA

realizes a 0.462 grade point reduction.

Using only the "moody12" and "fearful12" combination of instruments, we

see that the depression IV coefficients for all but one GPA category exceed 0.5 in

absolute value, which suggests too great of a change between the 2SLS

coefficients and the corresponding OLS coefficients (-0.087 for overall, -0.127

for English, -0.157 for math, -0.081 for social studies, and -0.105 for science).

With the "fearful12" and "crying12" pair of instruments, overall GPA declines

by 0.290 grade points. English GPA drops by 0.303 grade points, math GPA

falls by 0.328 grade points, social studies GPA is lowered by 0.330 grade points,

and science GPA is reduced by 0.329 grade points.   This group of 2SLS

instruments generates coefficient results that are closer in magnitude to OLS

coefficients than any of the other instrument combination.

The final pair of instruments, "moody12" and "crying12", generate

coefficients that very similar to those in the "fearful12"/"crying12" IV scenario, and

are also kept as a potentially viable instrumentation set, leading into the

overidentification testing.

Table 30: Results
Two-Stage Least Squares Overidentification Tests

Depression Variable	Overall GPA		English GPA		Math GPA		Soc.Studies GPA		Science GPA	
2SLS - Major Depression, Overidentifcation Tests										
moody12+fearful12+crying12										
n (# of observations)	12,314		19,536		18,340		15,967		16,387	
R-squared of residual reg.	0.0005		0.0000		0.0001		0.0002		0.0005	
n R-squared	6.16		0.00		1.83		3.19		8.19	
Chi-Sq. CV, 5% LOS, 2 df		5.99		5.99		5.99		5.99		5.99
Pass/Fail Overid test		FAIL		PASS		PASS		PASS		FAIL
moody12+fearful12										
n (# of observations)	12,314		19,536		18,340		15,967		16,387	
R-squared of residual reg.	0.0004		0.0000		0.0000		0.0000		0.0001	
n R-squared	4.93		0.00		0.00		0.00		1.64	
Chi-Sq. CV, 5% LOS, 1 df		3.84		3.84		3.84		3.84		3.84
Pass/Fail Overid test		FAIL		PASS		PASS		PASS		PASS
moody12+crying12										
n (# of observations)	12,314		19,536		18,340		15,967		16,387	
R-squared of residual reg.	0.0000		0.0000		0.0001		0.0001		0.0004	
n R-squared	0.00		0.00		1.83		1.60		6.55	
Chi-Sq. CV, 5% LOS, 1 df		3.84		3.84		3.84		3.84		3.84
Pass/Fail Overid test		PASS		PASS		PASS		PASS		FAIL
fearful12+crying12										
n (# of observations)	12,314		19,536		18,340		15,967		16,387	
R-squared of residual reg.	0.0002		0.0000		0.0000		0.0002		0.0001	
n R-squared	2.46		0.00		0.00		3.19		1.64	
Chi-Sq. CV, 5% LOS, 1 df		3.84		3.84		3.84		3.84		3.84
Pass/Fail Overid test		PASS		PASS		PASS		PASS		PASS

All four instrument combinations were tested for overidentification, although only three of the IV scenarios were considered to be viable at this juncture. The results of the overidentification tests, displayed in Table 30, indicate that the "fearful12"/"crying12" IV pair was the only one to pass overidentification tests in each of the five GPA categories (overall, English, math, social studies, and science). To make the a final determination of consistency for the 2SLS IV pair "fearful12"/"crying12", Using this, a Hausman test of endogeneity was conducted for the major depression variable, adding the residuals from the first stage equation to the structural equation (for overall GPA on major depression, all exogenous variables). The robust t-statistic for the residual variable was 1.92, indicating moderate evidence that the major depression variable is endogenous with respect to GPA.

Although the "fearful12/crying12" IV pair passed all of the criteria established in Section 4.7.16 for a viable 2SLS analysis of major depression on GPA, we cannot ignore the fact that 2SLS coefficients for major depression are approximately three times as large as the OLS coefficients. It may be that factors related to measurement error account for this difference, with 2SLS estimates being correct and OLS estimates biased towards zero due to this measurement error. This brings back into relevance the discussion from Section 5.8 on differences between male and female coefficients due to self-reporting. In order to address this issue, a separate analysis of the differences in 2SLS results of males and females was conducted, assessing overall GPA impacts of

depression. A t-test of the 2SLS gender differences was performed, using the following formula:

(|male coefficient| – |female coefficient|)/(Var male – Var female)^0.5

The null hypothesis for this test is that the 2SLS results between males and females are similar. A t-statistic exceeding 1.96 at 5 percent rejects the hypothesis, and indicates significant differences in the 2SLS results between males and females. The results of this test are shown below:

(0.704 – 0.280)/(0.345 – 0.114)^0.5 = 2.174

The analysis indicates significant differences in the 2SLS results between males and females. Considering as well the difference in magnitude between OLS and 2SLS coefficients for males and females (males -0.103 OLS, -0.704 2SLS, -0.601 difference; females -0.080 OLS, -0.280 2SLS, -0.200 difference) 2SLS may be having a larger impact on males than females, measurement (self-reporting) error may be biasing the OLS results towards zero for male students. In this case, we would expect the 2SLS results to be larger in magnitude than the OLS results. This provides additional support for the validity of the model results.

5.14 Concluding Remarks on Study Results

The various OLS and 2SLS analyses offer results which support the hypothesis that depression has a negative impact on grade performance amongst middle and high school students. The magnitude of this grade impact increases as the severity/frequency of the reported depression increases. The

results have held when controlling for multiple confounding factors that may also contribute to lower academic performance.

The base OLS-proxy model output (discussed in Section 5.5 and Table 5) indicates that students who report depressed mood most or all of the time suffer an overall GPA reduction of 0.159 grade points. On a conventional four-point grade scale, using a plus-minus system, a student depressed most or all of the time would potentially see their grade slip by one "mark" (e.g. a B-plus student may fall to a B, or a B student may fall to a B-minus student). On an individual subject level, this severity of depression results in a 0.125 grade point drop in English, a 0.166 decline in math, a 0.061 reduction in social studies, and 0.258 grade point lowering in science GPA. This model also suggests that those suffering from symptoms consistent with major depression see a 0.087 grade point decline in their overall GPA. English GPA falls by 0.127 grade points, math by 0.157 grade points, social studies by 0.081 grade points, and science by 0.105 grade points. These changes are not large enough to alter the letter grade of a student who has a mid-to-high numeric score within a given letter grade range. However, they would reduce grades for students at the lower margin of each range.

Also of importance are the outcomes of OLS-proxy modeling for specific subcategories of the surveyed students. As Table 31 illustrates, 8th graders clearly appear to be the most profoundly impacted subgroup of any studied. Severe depression impacts this group from up to three times more than the

overall student sample, with GPA's slipping in some subjects by a half-grade

point or more.

Table 31
Summary of OLS Coefficients for Severely Depressed Mood
Comparions of Base Model vs. Most Significantly Impacted Sub-Groups

	Depressed Most or All of the Time			Major Depression		
	Coefficient	t-statistic	Source	Coefficient	t-statistic	Source
Overall GPA						
Base OLS/Proxy	-0.159	-5.000	Base Model	-0.087	-4.030	Base Model
Largest Magnitude	-0.425	-5.380	8th Graders	-0.174	-2.130	7th Graders
2nd Largest Magnitude	-0.389	-2.410	Sibs FE, Wave 2	-0.159	-3.590	Blacks
3rd Largest Magnitude	-0.200	-5.610	Females	-0.148	-2.390	8th Graders
4th Largest Magnitude	-0.169	-4.220	Caucasians	-0.103	-2.630	Males
English GPA						
Base OLS/Proxy	-0.125	-3.400	Base Model	-0.127	-5.160	Base Model
Largest Magnitude	-0.429	-4.060	8th Graders	-0.181	-3.480	Blacks
2nd Largest Magnitude	-0.185	-4.310	Females	-0.172	-2.180	8th Graders
3rd Largest Magnitude	-0.178	-1.960	9th Graders	-0.151	-2.220	Asians/PI
4th Largest Magnitude	-0.172	-3.700	Caucasians	-0.144	-2.350	9th Graders
Math GPA						
Base OLS/Proxy	-0.166	-3.890	Base Model	-0.157	-5.470	Base Model
Largest Magnitude	-0.534	-4.630	8th Graders	-0.394	-2.680	Native Americans
2nd Largest Magnitude	-0.232	-4.580	Females	-0.288	-2.480	7th Graders
3rd Largest Magnitude	-0.221	-2.390	11th Graders	-0.213	-2.440	8th Graders
4th Largest Magnitude	-0.166	-3.920	School FE Result	-0.191	-2.820	Hispanics
Social Studies GPA						
Base OLS/Proxy	-0.061	-1.430	Base Model	-0.081	-2.850	Base Model
Largest Magnitude	-0.839	-3.500	Sibs FE, Wave 2	-0.405	-2.320	Sibs FE, Wave 2
2nd Largest Magnitude	-0.335	-3.010	8th Graders	-0.157	-2.390	12th Graders
3rd Largest Magnitude	-0.107	-2.170	Females	-0.079	-2.770	School FE Result
4th Largest Magnitude	n/a	n/a		-0.075	-2.230	Females
Science GPA						
Base OLS/Proxy	-0.258	-5.840	Base Model	-0.105	-3.470	Base Model
Largest Magnitude	-0.544	-2.110	Native Americans	-0.227	-2.520	8th Graders
2nd Largest Magnitude	-0.444	-2.100	Sibs FE, Wave 2	-0.186	-1.060	Sibs FE, Wave 2
3rd Largest Magnitude	-0.437	-3.670	8th Graders	-0.174	-2.550	9th Graders
4th Largest Magnitude	-0.399	-2.320	7th Graders	-0.162	-2.540	Blacks

7th Graders and Black students also demonstrate widespread above

average declines in GPA as a result of severe depression. Female students also

display greater than normal GPA declines, possibly because of measurement

error, with males possibly being less likely to reveal their true depressed feelings

or grade performance.   Native American students appear to be particularly hard

hit by severe depression in the "technical" subjects of science and math, with grade declines of more than twice the norm. Further results suggest that the persistence of depression over time contributes to declines in grade performance. The data indicates that those who suffer from prolonged depressed mood will have lower overall GPA's than those who do not, and in some subjects the difference could approach 1/10th of a grade point. Also, the sibling fixed effects analysis for Wave II shows much greater negative impact on GPA than for Wave I, which could also be suggestive of depression persistence creating larger than normal impacts.

Table 32
Summary of OLS Coefficients for Severely Depressed Mood
Based on Key Model Outcomes

	Depr. Most/All of Time		Major Depression	
	Coefficient	t-statistic	Coefficient	t-statistic
First Differencing				
Overall GPA	0.013	0.340	-0.021	-0.840
English GPA	0.005	0.100	-0.041	-1.240
Math GPA	-0.077	-1.380	-0.051	-1.360
Social Studies GPA	0.093	1.390	0.047	1.050
Science GPA	0.030	0.490	-0.040	-0.960
Sibling FE, Wave I				
Overall GPA	-0.049	-0.360	-0.095	-1.120
English GPA	0.311	2.060	-0.162	-1.670
Math GPA	0.016	0.100	-0.148	-1.340
Social Studies GPA	0.003	0.020	-0.074	-0.690
Science GPA	0.045	0.240	-0.099	-0.860
Sibling FE, Wave II				
Overall GPA	-0.389	-2.410	-0.025	-0.170
English GPA	-0.224	-1.210	-0.174	-1.370
Math GPA	-0.245	-1.080	-0.162	-0.990
Social Studies GPA	-0.839	-3.500	-0.405	-2.320
Science GPA	-0.444	-2.100	-0.186	-1.060

Finally, the 2SLS-IV analysis also generates results that support the hypothesis of a negative relationship between severe depression and GPA.

Instrumenting for major depression generates coefficients that are larger in magnitude than the base OLS coefficients. The instrumental variables selected pass overidentification tests, and their larger magnitude relative to OLS can likely be explained, at least in part, by self-reporting measurement error issues, where OLS modeling would bias results (particularly for males) towards zero.

Chapter 6

Study Conclusions

6.1 Study Implications

This research has built upon past efforts in the field of social science that investigate the relationship between academic achievement and depression in young people. The limited inventory of previous literature on this subject stops at the simple recognition of a negative relationship, but does not go on to address the magnitude, specific sub-groups who may suffer greater impacts from severe depression, or causality.

The dissertation advances the understanding of the depression-academic performance relationship, as it more clearly and thoroughly addresses the relative magnitude that depression has on GPA outcomes of middle and high school students. In addition, this work identifies specific sub-groups of youngsters who may be at greater risk of significant academic difficulties from severe depression. In particular, these "at risk" sub groups include 7th and 8th graders, Blacks, Native Americans, females, and students suffering from prolonged depressed mood.

The results of this analysis indicate that depression, even severe depression, does not turn an A student into an F student. Nor is it likely to turn a B student into a D student. But, this research clearly shows that depression

hurts the academic performance of young people, and it could push certain students down a letter grade in their course(s), depending on where they stand in a given numeric grade range.

The subject of mental illness and schooling has received considerable attention recently in the mainstream media[2], and is now being emphasized at the highest levels of Federal government. A prevailing issue involves the role and responsibility of educational institutions to offer adequate student mental health counseling resources, in addition to the standard instructional curriculum.

At the collegiate level of education, officials are reporting that student demands for on-campus psychological services are on the rise, and insufficient numbers of trained professionals exist within the collegiate structure to deal with the increased demand. Anecdotal evidence from college counselors points to mental health problems as a major cause of student drop-outs[3].

For primary levels of education (K-12), similar, if not more significant, issues regarding mental health support services exist. The American School Counselor Association recommends a ratio of one school counselor be available for every 250 enrolled students. However, the most recently reported ratio[4] indicates that nationally, the ratio of students to counselor is 479 to 1. The deficiency at the pre-high school level is even more pronounced. At the K-8 grade level, the

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[2] Recent articles on the subject published in U.S. Newspapers include USA Today (*Reaching out to students*, 12/6/2004), the University of Michigan Record (*Increase in student counseling leads to plans for new center*, 3/6/06), the Tampa Tribune (*University counseling centers feel strain*, 2/11/2007), and the Seattle Post-Intelligencer (*College students seek therapy in record numbers*, 2/23/2007),

[3] Based on data from the 2005 National Survey of Counseling Center Directors.

[4] Taken from NCES Common Core Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education: 2004-2005 School Year", National Center for Education Statistics, U.S. Dept. of Education.

national ratio is 882 to 1. The research results in this study would seem to support the notion that deficiencies in the pre-high school mental health support structure exist, and student academic performance may be suffering as a result of these deficiencies. Specifically, the study results indicate greater academic performance issues exist amongst middle school students suffering from depressed mood than high school students.

On April 4, 2008, 11 United States Senators proposed legislation[5] that would provide increased appropriations in Fiscal Year 2009 for the Elementary and Secondary School Counseling Program. As part of this proposal, the Senators specifically noted the deficiencies in school counseling services nationwide, and stressed the need for additional funding in this area to improve student achievement.

Possible solutions to address the issue of student depression and academic performance outside of the school environment are easy to identify, but very difficult to implement, because they deal with individual families' abilities and willingness to address their children's problems and take appropriate corrective measures. In a society of substantial individual freedoms, government cannot legislate parents' choices regarding the mental health of their children. Ideally, the findings of this study will provide important new information on mental health and schooling, and draw more attention to the issue of depression and education.

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[5] A copy of the Senators' proposal is included as an appendix to this dissertation

6.2 Study Limitations

The work presented in this dissertation carries with it an important limitation, that a clear identification of depression effects on grade performance is not fully achieved.   There are three key factors involved this principal limitation, all relating to the data source utilized (AddHealth longitudinal database). Factor 1is the absence of a perfectly representative measure for depression or major depression, as it is defined in the APA-DSM IV. While the DSM-IV measures of major depression include a period of at least two weeks of depressed mood, the depression measures in AddHealth in-home surveys only ask about "past week" feelings. Factor 2 involves the fact that all AddHealth data on the student is self-reported, thus creating measurement error issues, particularly as they relate to the self reporting of depression and grades between the sexes. Finally, the AddHealth database lacks an abundance of high quality instruments to utilize in the 2SLS-IV modeling procedure. This is further complicated by the fact that confidentiality requirements and subsequent security practices related to the AddHealth database make it very difficult, if not almost impossible, to add variables from outside the database. It should be noted, however, that at least one combination of instruments used in 2SLS-IV for this study met the criteria necessary for a valid instrument.

6.3 Further Research

Suggestions for future research into this subject would include investigation of labor market impacts as some of the students surveyed in Add Health Wave 1

and Wave 2 graduate, and participate in the labor force. There does exist a third wave of the AddHealth survey; unfortunately, many of the Wave 1 and Wave 2 students (grades 7 – 12) had not been in the labor force long enough, if it all, to quantify tangible labor market impacts from depression.   UNC – Chapel Hill is currently in the process of conducting Wave 4 of the AddHealth survey. This wave should provide a richer inventory of responses from those young adults who were initially surveyed as students, but who are now graduates with some degree of labor market tenure. The goals of analyzing of this later wave of survey data would include the discovery of further trends in academic performance, as these students move through their academic careers, and the employment/wage outcomes of affected versus non-affected individuals.

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Appendices

Appendix A: Output Detail, OLS-Proxy Equation, Progressive Depression

English GPA

Source	SS	df	MS		
Model	5402.77529	63	85.7583379		
Residual	11880.6186	19472	.610138589		
Total	17283.3939	19535	.884739897		

Number of obs = 19536
F(63, 19472) = 140.56
Prob > F = 0.0000
R-squared = 0.3126
Adj R-squared = 0.3104
Root MSE = .78111

enggpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dep7smon	-0.044209	0.012757	-3.47	0.001	-0.069215	-0.019204
dep7lton	-0.080111	0.023317	-3.44	0.001	-0.125815	-0.034407
dep7alon	-0.125475	0.03688	-3.4	0.001	-0.197764	-0.053187
wave1	-0.001312	0.012854	-0.1	0.919	-0.026506	0.023882
female	0.230144	0.011674	19.71	0	0.207261	0.253026
jan	-0.056137	0.361558	-0.16	0.877	-0.764822	0.652548
feb	(dropped)					
mar	(dropped)					
apr	-0.347354	0.15324	-2.27	0.023	-0.647718	-0.04699
may	-0.277982	0.151105	-1.84	0.066	-0.574162	0.018197
june	-0.267319	0.151011	-1.77	0.077	-0.563313	0.028675
july	-0.273879	0.151247	-1.81	0.07	-0.570335	0.022578
aug	-0.290516	0.151571	-1.92	0.055	-0.587608	0.006577
sep	-0.239333	0.153253	-1.56	0.118	-0.539722	0.061056
oct	-0.23378	0.158948	-1.47	0.141	-0.545331	0.077772
nov	-0.203609	0.189655	-1.07	0.283	-0.575349	0.168132
agelt12	0.374717	0.479277	0.78	0.434	-0.564706	1.314141
age12	0.347885	0.128601	2.71	0.007	0.095817	0.599954
age13	0.295138	0.117404	2.51	0.012	0.065016	0.525261
age14	0.282006	0.113989	2.47	0.013	0.058578	0.505435
age15	0.258033	0.111527	2.31	0.021	0.039431	0.476635
age16	0.219608	0.109765	2	0.045	0.00446	0.434755
age17	0.184961	0.108308	1.71	0.088	-0.027333	0.397254
age18	0.169186	0.107575	1.57	0.116	-0.04167	0.380042
age19	0.126732	0.112777	1.12	0.261	-0.094321	0.347785
grade7	-0.205157	0.051504	-3.98	0	-0.306108	-0.104205
grade8	-0.195896	0.041297	-4.74	0	-0.276842	-0.114951
grade9	-0.254998	0.034175	-7.46	0	-0.321982	-0.188013
grade10	-0.166852	0.028111	-5.94	0	-0.221951	-0.111753
grade11	-0.088798	0.022136	-4.01	0	-0.132185	-0.04541
hisp_lat	-0.028317	0.018776	-1.51	0.132	-0.06512	0.008486
white	-0.017117	0.020877	-0.82	0.412	-0.058037	0.023804
black	-0.076228	0.023508	-3.24	0.001	-0.122306	-0.030151
nat_am	-0.070245	0.031124	-2.26	0.024	-0.131251	-0.009239
asian_pi	0.002767	0.027276	0.1	0.919	-0.050696	0.056229
twoparent	0.071239	0.012365	5.76	0	0.047002	0.095476
momdis	0.005955	0.026417	0.23	0.822	-0.045825	0.057734
daddis	-0.043785	0.02297	-1.91	0.057	-0.088808	0.001239
mo9_nohs	-0.030792	0.023578	-1.31	0.192	-0.077007	0.015424
movocnohs	-0.057181	0.064722	-0.88	0.377	-0.184041	0.06968
mohsgrad	0.005882	0.019803	0.3	0.766	-0.032933	0.044697
moged	-0.001268	0.033281	-0.04	0.97	-0.066502	0.063966
movocafhs	0.037497	0.027603	1.36	0.174	-0.016607	0.091601
mocolnogr	-0.008121	0.023128	-0.35	0.726	-0.053454	0.037213
mocol4yr	0.00038	0.022166	0.02	0.986	-0.043067	0.043827
mopostgr	0.046932	0.028003	1.68	0.094	-0.007957	0.10182
fa9_nohs	-0.020835	0.022394	-0.93	0.352	-0.06473	0.023059
favocnohs	0.055929	0.065645	0.85	0.394	-0.07274	0.184599
fahsgrad	0.003099	0.016714	0.19	0.853	-0.029662	0.03586
faged	-0.001254	0.03637	-0.03	0.972	-0.072542	0.070034
favocafhs	-0.044059	0.026874	-1.64	0.101	-0.096734	0.008617
facolnogr	0.01178	0.021579	0.55	0.585	-0.030518	0.054077
facol4yr	0.044096	0.019228	2.29	0.022	0.006409	0.081784
fapostgr	0.042587	0.024845	1.71	0.087	-0.006112	0.091286
abex_1_2	-0.084993	0.019225	-4.42	0	-0.122676	-0.047309
abex_3_10	-0.145673	0.018531	-7.86	0	-0.181995	-0.109352
abex_11pl	-0.24627	0.023448	-10.5	0	-0.292229	-0.200311
unexab	-0.012279	0.00104	-11.81	0	-0.014317	-0.01024
col_vl	-0.330569	0.034856	-9.48	0	-0.398891	-0.262247
col_low	-0.311246	0.038039	-8.18	0	-0.385801	-0.236687
col_med	-0.306773	0.020672	-14.84	0	-0.347292	-0.266254
col_hi	-0.182075	0.016986	-10.72	0	-0.215369	-0.14878
skipgrde	0.037178	0.036035	1.03	0.302	-0.033454	0.107809
adhltpvt	0.002443	0.00043	5.68	0	0.0016	0.003287
enggrd_is	0.41291	0.00615	67.14	0	0.400857	0.424964
_cons	1.732116	0.192723	8.99	0	1.354363	2.109869

Math GPA

Source	SS	df	MS		
Model	5391.52278	63	85.5797267		
Residual	14108.4938	18276	.771968363		
Total	19500.0166	18339	1.06330861		

Number of obs = 18340
F(63, 18276) = 110.86
Prob > F = 0.0000
R-squared = 0.2765
Adj R-squared = 0.2740
Root MSE = .87862

matgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dep7smon	-0.045931	0.01484	-3.09	0.002	-0.07502	-0.016842
dep7lton	-0.065619	0.027109	-2.42	0.016	-0.118755	-0.012483
dep7alon	-0.166013	0.042671	-3.89	0	-0.249651	-0.082374
wave1	0.001688	0.015001	0.11	0.91	-0.027715	0.031092
female	0.086808	0.013384	6.49	0	0.060574	0.113043
jan	-0.071275	0.409597	-0.17	0.862	-0.874123	0.731574
feb	(dropped)					
mar	(dropped)					
apr	-0.243544	0.179191	-1.36	0.174	-0.594775	0.107686
may	-0.1921	0.17668	-1.09	0.277	-0.538411	0.15421
june	-0.223307	0.176567	-1.26	0.206	-0.569394	0.122781
july	-0.242038	0.176849	-1.37	0.171	-0.588678	0.104602
aug	-0.185421	0.177215	-1.05	0.295	-0.53278	0.161937
sep	-0.166205	0.179088	-0.93	0.353	-0.517235	0.184825
oct	-0.232704	0.185787	-1.25	0.21	-0.596863	0.131455
nov	-0.134578	0.217886	-0.62	0.537	-0.561655	0.2925
agelt12	0.052345	0.540897	0.1	0.923	-1.007864	1.112553
age12	0.172641	0.150847	1.14	0.252	-0.123032	0.468315
age13	0.137466	0.139075	0.99	0.323	-0.135134	0.410066
age14	0.093073	0.135437	0.69	0.492	-0.172397	0.358543
age15	0.122209	0.132848	0.92	0.358	-0.138185	0.382604
age16	0.080138	0.130985	0.61	0.541	-0.176605	0.33688
age17	0.029186	0.129442	0.23	0.822	-0.224533	0.282905
age18	0.051798	0.128569	0.4	0.687	-0.20021	0.303805
age19	0.072338	0.136021	0.53	0.595	-0.194276	0.338953
grade7	-0.142889	0.058994	-2.43	0.015	-0.258337	-0.027441
grade8	-0.080893	0.04768	-1.7	0.09	-0.174349	0.012564
grade9	-0.132147	0.039958	-3.31	0.001	-0.210468	-0.053826
grade10	-0.180703	0.033489	-5.4	0	-0.246346	-0.115061
grade11	-0.090518	0.027175	-3.33	0.001	-0.143784	-0.037252
hisp_lat	-0.100701	0.021951	-4.59	0	-0.143726	-0.057676
white	0.000821	0.024251	0.03	0.973	-0.046714	0.048355
black	-0.077661	0.027311	-2.84	0.004	-0.131193	-0.024129
nat_am	-0.00731	0.0362	-0.2	0.84	-0.078265	0.063645
asian_pi	0.008833	0.031469	0.28	0.779	-0.052849	0.070514
twoparent	0.087433	0.014421	6.06	0	0.059166	0.115699
momdis	-0.001948	0.030782	-0.06	0.95	-0.062283	0.058387
daddis	-0.005323	0.026737	-0.2	0.842	-0.05773	0.047084
mo9_nohs	0.020938	0.027519	0.76	0.447	-0.033003	0.074878
movocnohs	-0.142684	0.073608	-1.94	0.053	-0.286962	0.001594
mohsgrad	-0.016029	0.023068	-0.69	0.487	-0.061244	0.029187
moged	0.074975	0.038815	1.93	0.053	-0.001105	0.151056
movocafhs	0.019675	0.032099	0.62	0.535	-0.043002	0.082833
mocolnogr	-0.007592	0.026916	-0.28	0.778	-0.060349	0.045165
mocol4yr	0.01595	0.025786	0.62	0.536	-0.034593	0.066493
mopostgr	0.073477	0.032516	2.26	0.024	0.009742	0.137212
fa9_nohs	-0.003362	0.026097	-0.13	0.897	-0.054514	0.047789
favocnohs	-0.063601	0.077612	-0.82	0.413	-0.215727	0.088526
fahsgrad	-0.000902	0.019394	-0.05	0.963	-0.038916	0.037113
faged	-0.059087	0.042284	-1.4	0.162	-0.141968	0.023794
favocafhs	-0.002093	0.031218	-0.07	0.947	-0.063284	0.059098
facolnogr	0.006415	0.025041	0.26	0.798	-0.042668	0.055499
facol4yr	0.019679	0.022356	0.88	0.379	-0.02414	0.063498
fapostgr	0.032613	0.028749	1.13	0.257	-0.023738	0.088964
abex_1_2	-0.084466	0.022119	-3.82	0	-0.127822	-0.041111
abex_3_10	-0.148919	0.021365	-6.97	0	-0.190797	-0.107041
abex_11pl	-0.213141	0.027304	-7.81	0	-0.26666	-0.159623
unexab	-0.011496	0.001281	-8.97	0	-0.014008	-0.008984
col_vl	-0.177921	0.042655	-4.17	0	-0.261529	-0.094313
col_low	-0.278101	0.044232	-6.29	0	-0.364799	-0.191403
col_med	-0.292966	0.024439	-11.99	0	-0.340868	-0.245063
col_hi	-0.175	0.019734	-8.87	0	-0.21368	-0.13632
skipgrde	0.007331	0.04211	0.17	0.862	-0.075209	0.089871
adhltpvt	0.001912	0.000492	3.83	0	0.000935	0.00289
matgrd_is	0.44859	0.006685	67.11	0	0.435488	0.461693
_cons	1.628386	0.226416	7.19	0	1.184589	2.072182

92

Appendix A (Continued)

Social Studies GPA

```
Source |       SS       df       MS              Number of obs =  15967
-------------+------------------------------         F( 63, 15903) = 111.06
       Model |  4628.40915    63  73.4668119         Prob > F      = 0.0000
    Residual |  10520.0056 15903 .661510758         R-squared     = 0.3055
-------------+------------------------------         Adj R-squared = 0.3028
       Total |  15148.4147 15966 .948792104         Root MSE      = .81333
```

socsgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
dep7smon	-0.067569	0.014756	-4.58	0	-0.096492 -0.038646
dep7lton	-0.066473	0.027374	-2.43	0.015	-0.120129 -0.012816
dep7alon	-0.060835	0.04267	-1.43	0.154	-0.144473 0.022802
wave1	-0.023529	0.014911	-1.58	0.115	-0.052757 0.005699
female	0.115408	0.013303	8.68	0	0.089334 0.141483
jan	-0.248628	0.382215	-0.65	0.515	-0.997813 0.500557
feb	(dropped)				
mar	(dropped)				
apr	-0.239282	0.173192	-1.38	0.167	-0.578758 0.100194
may	-0.222049	0.170558	-1.3	0.193	-0.556363 0.112264
june	-0.225317	0.170454	-1.32	0.186	-0.559426 0.108791
july	-0.21749	0.170751	-1.27	0.203	-0.55218 0.117201
aug	-0.214214	0.171073	-1.25	0.211	-0.549536 0.121109
sep	-0.226763	0.173061	-1.31	0.19	-0.565982 0.112456
oct	-0.110504	0.180195	-0.61	0.54	-0.463707 0.242699
nov	-0.20779	0.213266	-0.97	0.33	-0.625815 0.210235
agelt12	1.307306	0.504766	2.59	0.01	0.317907 2.296706
age12	0.508934	0.153444	3.32	0.001	0.208167 0.809702
age13	0.464969	0.143417	3.24	0.001	0.183855 0.746082
age14	0.418809	0.140414	2.98	0.003	0.143582 0.694037
age15	0.385652	0.138032	2.79	0.005	0.115094 0.65621
age16	0.288798	0.135947	2.12	0.034	0.022326 0.555271
age17	0.25116	0.134402	1.87	0.062	-0.012283 0.514603
age18	0.239553	0.133559	1.79	0.073	-0.022238 0.501345
age19	0.052437	0.139906	0.37	0.708	-0.221795 0.326669
grade7	-0.407524	0.057405	-7.1	0	-0.520045 -0.295004
grade8	-0.29435	0.04742	-6.21	0	-0.3873 -0.201401
grade9	-0.287976	0.040272	-7.15	0	-0.366914 -0.209037
grade10	-0.252957	0.033342	-7.59	0	-0.318311 -0.187603
grade11	-0.121547	0.026218	-4.64	0	-0.172937 -0.070156
hisp_lat	-0.032448	0.022077	-1.47	0.142	-0.075721 0.010826
white	-0.008482	0.024324	-0.35	0.727	-0.056161 0.039196
black	-0.068234	0.027321	-2.5	0.013	-0.121787 -0.014682
nat_am	-0.01652	0.035312	-0.47	0.64	-0.085736 0.052695
asian_pi	0.011604	0.031948	0.36	0.716	-0.051018 0.074225
twoparent	0.058136	0.014331	4.06	0	0.030045 0.086227
momdis	0.004609	0.030208	0.15	0.879	-0.054603 0.06382
daddis	-0.038918	0.026448	-1.47	0.141	-0.09076 0.012924
mo9_nohs	-0.015482	0.027369	-0.57	0.572	-0.069129 0.038165
movocnohs	-0.030515	0.076808	-0.4	0.691	-0.181066 0.120037
mohsgrad	0.015792	0.022876	0.69	0.49	-0.029047 0.060631
moged	0.02699	0.038699	0.7	0.486	-0.048864 0.102843
movocafhs	0.050573	0.031612	1.6	0.11	-0.01139 0.112535
mocolnogr	-0.000367	0.026705	-0.01	0.989	-0.052713 0.051978
mocol4yr	0.012587	0.025605	0.49	0.623	-0.037602 0.062776
mopostgr	0.050813	0.032379	1.57	0.117	-0.012653 0.114279
fa9_nohs	0.006473	0.025865	0.25	0.802	-0.044225 0.057172
favocnohs	0.032467	0.07604	0.43	0.669	-0.11658 0.181514
fahsgrad	0.000572	0.019211	0.03	0.976	-0.037083 0.038228
faged	-0.049517	0.042927	-1.15	0.249	-0.133658 0.034624
favocafhs	-0.011336	0.0309	-0.37	0.714	-0.071904 0.049232
facolnogr	0.00634	0.024948	0.25	0.799	-0.042562 0.055241
facol4yr	0.022845	0.022086	1.03	0.301	-0.020446 0.066137
fapostgr	0.054759	0.028627	1.91	0.056	-0.001352 0.110871
abex_1_2	-0.060611	0.022127	-2.74	0.006	-0.103981 -0.01724
abex_3_10	-0.125548	0.021385	-5.87	0	-0.167465 -0.083632
abex_11pl	-0.203783	0.026991	-7.55	0	-0.256688 -0.150877
unexab	-0.013385	0.001273	-10.51	0	-0.01588 -0.01089
col_vl	-0.367864	0.041468	-8.87	0	-0.449145 -0.286582
col_low	-0.336151	0.043332	-7.76	0	-0.421086 -0.251216
col_med	-0.290506	0.024145	-12.03	0	-0.337833 -0.243179
col_hi	-0.184743	0.019679	-9.39	0	-0.223316 -0.14617
skipgrde	0.011523	0.040767	0.28	0.777	-0.068384 0.09143
adhltpvt	0.003677	0.000499	7.37	0	0.0027 0.004655
socgrd_is	0.423585	0.006835	61.98	0	0.410189 0.436981
_cons	1.58283	0.224396	7.05	0	1.14299 2.022671

Science GPA

```
Source |       SS       df       MS              Number of obs =  16387
-------------+------------------------------         F( 63, 16323) =  95.63
       Model |  4318.01241    63  68.5398795         Prob > F      = 0.0000
    Residual |  11698.9537 16323 .716715905         R-squared     = 0.2696
-------------+------------------------------         Adj R-squared = 0.2668
       Total |  16016.9661 16386 .977478709         Root MSE      = .84659
```

scigpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
dep7smon	-0.071317	0.015168	-4.7	0	-0.101048 -0.041586
dep7lton	-0.081252	0.028304	-2.87	0.004	-0.13673 -0.025773
dep7alon	-0.258317	0.044252	-5.84	0	-0.345057 -0.171578
wave1	-0.011607	0.015371	-0.76	0.45	-0.041736 0.018522
female	0.142958	0.013666	10.46	0	0.11617 0.169745
jan	0.413909	0.396283	1.04	0.296	-0.36285 1.190667
feb	(dropped)				
mar	(dropped)				
apr	-0.014959	0.176416	-0.08	0.932	-0.360755 0.330836
may	0.019538	0.173782	0.11	0.91	-0.321094 0.360169
june	0.00399	0.173674	0.02	0.982	-0.33643 0.344409
july	-0.013077	0.173967	-0.08	0.94	-0.354071 0.327918
aug	0.035747	0.174376	0.21	0.838	-0.306048 0.377543
sep	0.033927	0.176338	0.19	0.847	-0.311715 0.379569
oct	-0.005487	0.183767	-0.03	0.976	-0.365691 0.354718
nov	-0.012843	0.219023	-0.06	0.953	-0.442152 0.416466
agelt12	1.002769	0.525864	1.91	0.057	-0.027983 2.03352
age12	0.52318	0.161434	3.24	0.001	0.206752 0.839608
age13	0.450245	0.150081	2.98	0.003	0.154502 0.745989
age14	0.40375	0.147549	2.74	0.006	0.114538 0.692962
age15	0.378666	0.145153	2.61	0.009	0.09415 0.663182
age16	0.329881	0.143432	2.3	0.021	0.048738 0.611024
age17	0.24843	0.141858	1.75	0.08	-0.029628 0.526488
age18	0.257408	0.141058	1.82	0.068	-0.019081 0.533897
age19	0.211463	0.149145	1.42	0.156	-0.080877 0.503802
grade7	-0.221414	0.059508	-3.72	0	-0.338056 -0.104772
grade8	-0.196957	0.048639	-4.05	0	-0.292295 -0.101618
grade9	-0.232315	0.041192	-5.64	0	-0.313056 -0.151574
grade10	-0.168524	0.034905	-4.83	0	-0.236943 -0.100106
grade11	-0.14268	0.028516	-5	0	-0.198575 -0.086786
hisp_lat	0.010966	0.022532	0.49	0.626	-0.033199 0.05513
white	0.04811	0.025122	1.92	0.056	-0.001133 0.097352
black	-0.022458	0.028146	-0.8	0.425	-0.077627 0.032712
nat_am	0.042331	0.037041	1.14	0.253	-0.030274 0.114936
asian_pi	0.05264	0.032775	1.61	0.108	-0.011603 0.116883
twoparent	0.061475	0.014764	4.16	0	0.032535 0.090414
momdis	-0.019168	0.031146	-0.62	0.538	-0.080216 0.041881
daddis	-0.031163	0.027299	-1.14	0.254	-0.084671 0.022345
mo9_nohs	-0.066597	0.0281	-2.37	0.018	-0.121677 -0.011518
movocnohs	0.029139	0.07677	0.38	0.704	-0.121338 0.179616
mohsgrad	-0.054758	0.023642	-2.32	0.021	-0.1011 -0.008417
moged	-0.06543	0.039611	-1.65	0.099	-0.143071 0.012212
movocafhs	-0.021222	0.032822	-0.65	0.518	-0.085557 0.043114
mocolnogr	-0.012118	0.027444	-0.44	0.659	-0.065912 0.041676
mocol4yr	0.011066	0.026268	0.42	0.674	-0.040421 0.062553
mopostgr	0.038499	0.033145	1.16	0.245	-0.026469 0.103468
fa9_nohs	0.024958	0.026621	0.94	0.348	-0.027222 0.077139
favocnohs	0.082679	0.076474	1.08	0.28	-0.067219 0.232576
fahsgrad	0.016786	0.019856	0.85	0.398	-0.022134 0.055705
faged	-0.022337	0.043551	-0.51	0.607	-0.107738 0.062992
favocafhs	-0.00787	0.03196	-0.25	0.806	-0.070515 0.054776
facolnogr	-0.02479	0.025525	-0.97	0.331	-0.074821 0.025242
facol4yr	0.027597	0.022777	1.21	0.226	-0.017053 0.072238
fapostgr	0.043239	0.029219	1.48	0.139	-0.014033 0.10051
abex_1_2	-0.098078	0.022443	-4.37	0	-0.142069 -0.054087
abex_3_10	-0.184773	0.021677	-8.52	0	-0.227263 -0.142283
abex_11pl	-0.265336	0.027884	-9.52	0	-0.319991 -0.210681
unexab	-0.010507	0.00127	-8.27	0	-0.012997 -0.008017
col_vl	-0.289188	0.045261	-6.39	0	-0.377905 -0.200471
col_low	-0.359134	0.046566	-7.71	0	-0.450409 -0.267859
col_med	-0.252023	0.02533	-9.95	0	-0.301671 -0.202374
col_hi	-0.189952	0.020449	-9.29	0	-0.230033 -0.14987
skipgrde	0.113224	0.042381	2.67	0.008	0.030153 0.196294
adhltpvt	0.003019	0.000513	5.89	0	0.002014 0.004024
scigrd_is	0.396663	0.006973	56.89	0	0.382995 0.41033
_cons	1.359801	0.231491	5.87	0	0.906053 1.813549

Appendix A (Continued)

Overall GPA

Source	SS	df	MS			
Model	3430.16933	63	54.4471321			
Residual	3183.25761	12250	.259857764			
Total	6613.42693	12313	.53710931			

Number of obs = 12314
F(63, 12250) = 209.53
Prob > F = 0.0000
R-squared = 0.5187
Adj R-squared = 0.5162
Root MSE = .50976

overallgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dep7smon	-0.045429	0.010595	-4.29	0	-0.066196	-0.024662
dep7lton	-0.040322	0.020234	-1.99	0.046	-0.079984	-0.000659
dep7alon	-0.158632	0.031716	-5	0	-0.220799	-0.096464
wave1	-0.005134	0.01081	-0.47	0.635	-0.026323	0.016056
female	0.120558	0.009548	12.63	0	0.101841	0.139274
jan	-0.029034	0.243326	-0.12	0.905	-0.505991	0.447925
feb	(dropped)					
mar	(dropped)					
apr	-0.1973	0.11681	-1.69	0.091	-0.426266	0.031667
may	-0.141362	0.114787	-1.23	0.218	-0.366362	0.083638
june	-0.164544	0.114698	-1.43	0.151	-0.38937	0.060283
july	-0.160833	0.114924	-1.4	0.162	-0.386102	0.064436
aug	-0.139892	0.115184	-1.21	0.225	-0.365671	0.085887
sep	-0.132198	0.116608	-1.13	0.257	-0.360768	0.096373
oct	-0.155153	0.122333	-1.27	0.205	-0.394945	0.084639
nov	-0.140032	0.143284	-0.98	0.328	-0.420892	0.140827
agelt12	0.735713	0.324836	2.26	0.024	0.098984	1.372441
age12	0.353274	0.121779	2.9	0.004	0.114568	0.591979
age13	0.307494	0.116068	2.65	0.008	0.079983	0.535005
age14	0.286666	0.114328	2.51	0.012	0.062564	0.510767
age15	0.291535	0.112955	2.58	0.01	0.070125	0.512944
age16	0.241894	0.111793	2.16	0.031	0.022763	0.461025
age17	0.200325	0.110819	1.81	0.071	-0.016898	0.417548
age18	0.22618	0.110295	2.05	0.04	0.009983	0.442376
age19	0.210372	0.11728	1.79	0.073	-0.019515	0.44026
grade7	-0.188	0.040864	-4.6	0	-0.268101	-0.1079
grade8	-0.148119	0.034476	-4.3	0	-0.215696	-0.080542
grade9	-0.18703	0.030065	-6.22	0	-0.245963	-0.128097
grade10	-0.151566	0.025753	-5.89	0	-0.202046	-0.101086
grade11	-0.093899	0.021177	-4.43	0	-0.135409	-0.05239
hisp_lat	-0.016785	0.016151	-1.04	0.299	-0.048444	0.014873
white	-0.006367	0.017849	-0.36	0.721	-0.041354	0.028621
black	-0.056733	0.019903	-2.85	0.004	-0.095747	-0.01772
nat_am	-0.012913	0.026017	-0.5	0.62	-0.06391	0.038084
asian_pi	-0.002238	0.023347	-0.1	0.924	-0.048002	0.043527
twoparent	0.059799	0.01038	5.76	0	0.039454	0.080145
momdis	-0.004796	0.021888	-0.22	0.827	-0.047699	0.038108
daddis	-0.03252	0.019137	-1.7	0.089	-0.07003	0.004991
mo9_nohs	-0.047989	0.019954	-2.4	0.016	-0.087103	-0.008875
movocnohs	-0.018107	0.055069	-0.33	0.742	-0.126051	0.089837
mohsgrad	-0.012658	0.016562	-0.76	0.445	-0.045121	0.019805
moged	0.016946	0.027916	0.61	0.544	-0.037775	0.071666
movocafhs	0.011259	0.022932	0.49	0.623	-0.033692	0.05621
mocolnogr	-0.011323	0.019243	-0.59	0.556	-0.049042	0.026397
mocol4yr	0.013929	0.01843	0.76	0.45	-0.022197	0.050055
mopostgr	0.043861	0.023079	1.9	0.057	-0.001378	0.0891
fa9_nohs	0.007549	0.018806	0.4	0.688	-0.029313	0.044411
favocnohs	0.066591	0.05511	1.21	0.227	-0.041432	0.174615
fahsgrad	0.020237	0.013857	1.46	0.144	-0.006926	0.047399
faged	-0.025566	0.030438	-0.84	0.401	-0.085228	0.034096
favocafhs	-0.009352	0.022272	-0.42	0.675	-0.053008	0.034304
facolnogr	0.003675	0.017789	0.21	0.836	-0.031194	0.038544
facol4yr	0.029337	0.015808	1.86	0.064	-0.00165	0.060324
fapostgr	0.059019	0.020261	2.91	0.004	0.019304	0.098734
abex_1_2	-0.081079	0.015406	-5.26	0	-0.111276	-0.050881
abex_3_10	-0.129914	0.014933	-8.7	0	-0.159186	-0.100643
abex_11pl	-0.204514	0.019409	-10.54	0	-0.242559	-0.166469
unexab	-0.009733	0.000989	-9.84	0	-0.011672	-0.007794
col_vl	-0.206377	0.032547	-6.34	0	-0.270174	-0.14258
col_low	-0.205404	0.033054	-6.21	0	-0.270196	-0.140612
col_med	-0.253252	0.018301	-13.84	0	-0.289124	-0.217379
col_hi	-0.15685	0.01443	-10.87	0	-0.185135	-0.128565
skipgrde	0.019152	0.029991	0.64	0.523	-0.039635	0.07794
adhltpvt	0.00178	0.000358	4.97	0	0.001078	0.002482
overallgpa-	0.561029	0.006492	86.41	0	0.548303	0.573755
_cons	1.217804	0.164499	7.4	0	0.895361	1.540247

Appendix B: Output Detail, OLS-Proxy Equation, Major Depression

English GPA

```
  Source |       SS       df       MS              Number of obs =   19536
---------+------------------------------           F( 61, 19474) =  145.15
   Model | 5402.07135     61  88.5585467           Prob > F      =  0.0000
Residual | 11881.3225  19474 .610112074            R-squared     =  0.3126
---------+------------------------------           Adj R-squared =  0.3104
   Total | 17283.3939  19535 .884739897            Root MSE      =  .7811
```

enggpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.126664	0.024544	-5.16	0	-0.174773	-0.078555
wave1	-0.003069	0.012845	-0.24	0.811	-0.028246	0.022107
female	0.225812	0.011574	19.51	0	0.203126	0.248498
jan	-0.056736	0.361513	-0.16	0.875	-0.765333	0.65186
feb	(dropped)					
mar	(dropped)					
apr	-0.349361	0.153231	-2.28	0.023	-0.649706	-0.049015
may	-0.279452	0.151096	-1.85	0.064	-0.575613	0.01671
june	-0.26771	0.151	-1.77	0.076	-0.563684	0.028263
july	-0.273881	0.151234	-1.81	0.07	-0.570314	0.022551
aug	-0.290303	0.151561	-1.92	0.055	-0.587375	0.006769
sep	-0.239829	0.153243	-1.57	0.118	-0.540198	0.060539
oct	-0.233906	0.158942	-1.47	0.141	-0.545447	0.077634
nov	-0.213752	0.18964	-1.13	0.26	-0.585464	0.157959
agelt12	0.372251	0.479264	0.78	0.437	-0.567148	1.31165
age12	0.351111	0.128569	2.73	0.006	0.099105	0.603118
age13	0.297265	0.117378	2.53	0.011	0.067194	0.527336
age14	0.282803	0.113966	2.48	0.013	0.059419	0.506187
age15	0.259492	0.111506	2.33	0.02	0.040931	0.478054
age16	0.221638	0.109745	2.02	0.043	0.006529	0.436748
age17	0.186752	0.108291	1.72	0.085	-0.025509	0.399012
age18	0.171505	0.10756	1.59	0.111	-0.039321	0.382331
age19	0.130622	0.112761	1.16	0.247	-0.0904	0.351643
grade7	-0.200829	0.051523	-3.9	0	-0.301819	-0.099839
grade8	-0.192926	0.04131	-4.67	0	-0.273864	-0.111955
grade9	-0.251839	0.034188	-7.37	0	-0.31885	-0.184828
grade10	-0.165935	0.028113	-5.9	0	-0.221039	-0.110832
grade11	-0.088485	0.022134	-4	0	-0.13187	-0.0451
hisp_lat	-0.027173	0.018774	-1.45	0.148	-0.063971	0.009625
white	-0.018221	0.020878	-0.87	0.383	-0.059143	0.0227
black	-0.076248	0.023505	-3.24	0.001	-0.12232	-0.030176
nat_am	-0.071817	0.03112	-2.31	0.021	-0.132815	-0.010819
asian_pi	0.003361	0.027269	0.12	0.902	-0.050089	0.056811
twoparent	0.072637	0.012357	5.88	0	0.048415	0.096858
momdis	0.004916	0.026415	0.19	0.852	-0.04686	0.056692
daddis	-0.044492	0.022967	-1.94	0.053	-0.089508	0.000525
mo9_nohs	-0.029087	0.023581	-1.23	0.217	-0.075307	0.017134
movocnohs	-0.059603	0.064721	-0.92	0.357	-0.186462	0.067256
mohsgrad	0.006359	0.019801	0.32	0.748	-0.032454	0.045171
moged	-0.002269	0.03328	-0.07	0.946	-0.067499	0.062962
movocafhs	0.036541	0.027602	1.32	0.186	-0.017561	0.090643
mocolnogr	-0.00678	0.023128	-0.29	0.769	-0.052112	0.038553
mocol4yr	0.000995	0.022165	0.04	0.964	-0.04245	0.044439
mopostgr	0.048285	0.028	1.72	0.085	-0.006597	0.103168
fa9_nohs	-0.021032	0.022392	-0.94	0.348	-0.064922	0.022858
favocnohs	0.059753	0.065645	0.91	0.363	-0.068916	0.188422
fahsgrad	0.00223	0.016715	0.13	0.894	-0.030532	0.034993
faged	-0.002612	0.03637	-0.07	0.943	-0.073901	0.068677
favocafhs	-0.043278	0.026873	-1.61	0.107	-0.095951	0.009395
facolnogr	0.011105	0.021579	0.51	0.607	-0.031191	0.053401
facol4yr	0.044378	0.019226	2.31	0.021	0.006694	0.082061
fapostgr	0.04198	0.024845	1.69	0.091	-0.006719	0.090678
abex_1_2	-0.086359	0.019225	-4.49	0	-0.124041	-0.048677
abex_3_10	-0.147431	0.018526	-7.96	0	-0.183743	-0.111119
abex_11pl	-0.249615	0.023415	-10.66	0	-0.29551	-0.20372
unexab	-0.012392	0.001038	-11.94	0	-0.014427	-0.010357
col_vl	-0.335653	0.034805	-9.64	0	-0.403874	-0.267433
col_low	-0.310985	0.038039	-8.18	0	-0.385544	-0.236426
col_med	-0.305929	0.020674	-14.8	0	-0.346451	-0.265407
col_hi	-0.181253	0.016989	-10.67	0	-0.214552	-0.147954
skipgrde	0.037808	0.036027	1.05	0.294	-0.032808	0.108423
adhltpvt	0.002444	0.00043	5.68	0	0.001601	0.003287
enggrd_is	0.413186	0.006147	67.22	0	0.401137	0.425234
_cons	1.71908	0.19257	8.93	0	1.341626	2.096533

Math GPA

```
  Source |       SS       df       MS              Number of obs =   18340
---------+------------------------------           F( 61, 18278) =  114.63
   Model | 5395.57025     61  88.4519712           Prob > F      =  0.0000
Residual | 14104.4463  18278 .771662454            R-squared     =  0.2767
---------+------------------------------           Adj R-squared =  0.2743
   Total | 19500.0166  18339 1.06330861            Root MSE      =  .87844
```

matgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.156907	0.028689	-5.47	0	-0.21314	-0.100675
wave1	-6.42E-05	0.014988	0	0.997	-0.029442	0.029313
female	0.083375	0.013272	6.28	0	0.057361	0.109389
jan	-0.07239	0.409476	-0.18	0.86	-0.875001	0.73022
feb	(dropped)					
mar	(dropped)					
apr	-0.247465	0.17915	-1.38	0.167	-0.598615	0.103685
may	-0.196253	0.17664	-1.11	0.267	-0.542483	0.149978
june	-0.225831	0.176525	-1.28	0.201	-0.571836	0.120174
july	-0.244819	0.176805	-1.38	0.166	-0.591373	0.101735
aug	-0.187255	0.177173	-1.06	0.291	-0.534531	0.160022
sep	-0.168589	0.179047	-0.94	0.346	-0.519538	0.182361
oct	-0.237429	0.18575	-1.28	0.201	-0.601516	0.126657
nov	-0.145729	0.217837	-0.67	0.504	-0.572709	0.281251
agelt12	0.035315	0.5408	0.07	0.948	-1.024703	1.095333
age12	0.16348	0.150831	1.08	0.278	-0.132164	0.459124
age13	0.126538	0.139074	0.91	0.363	-0.14606	0.399135
age14	0.080781	0.135441	0.6	0.551	-0.184695	0.346258
age15	0.11082	0.13285	0.83	0.404	-0.149579	0.371219
age16	0.070363	0.130982	0.54	0.591	-0.186375	0.327101
age17	0.018636	0.129445	0.14	0.886	-0.235088	0.272359
age18	0.042386	0.12857	0.33	0.742	-0.209624	0.294394
age19	0.063734	0.136012	0.47	0.639	-0.202862	0.330329
grade7	-0.13834	0.058898	-2.35	0.019	-0.253786	-0.022893
grade8	-0.077263	0.047678	-1.62	0.105	-0.170715	0.01619
grade9	-0.128159	0.03996	-3.21	0.001	-0.206483	-0.049835
grade10	-0.179545	0.03348	-5.36	0	-0.245169	-0.11392
grade11	-0.090147	0.027162	-3.32	0.001	-0.143387	-0.036907
hisp_lat	-0.099823	0.021944	-4.55	0	-0.142835	-0.056812
white	-0.001784	0.02425	-0.07	0.941	-0.049315	0.045748
black	-0.078703	0.027306	-2.88	0.004	-0.132225	-0.025181
nat_am	-0.00765	0.03619	-0.21	0.833	-0.078586	0.063286
asian_pi	0.010232	0.031456	0.33	0.745	-0.051425	0.071889
twoparent	0.088593	0.014408	6.15	0	0.060353	0.116834
momdis	-0.002096	0.030775	-0.07	0.946	-0.062418	0.058225
daddis	-0.00506	0.026731	-0.19	0.85	-0.057455	0.047336
mo9_nohs	0.022501	0.027515	0.82	0.414	-0.031431	0.076432
movocnohs	-0.144128	0.073591	-1.96	0.05	-0.288374	0.000118
mohsgrad	-0.015674	0.023062	-0.68	0.497	-0.060877	0.02953
moged	0.07362	0.038807	1.9	0.058	-0.002445	0.149685
movocafhs	0.019579	0.032093	0.61	0.542	-0.043326	0.082484
mocolnogr	-0.006125	0.026911	-0.23	0.82	-0.058872	0.046623
mocol4yr	0.016583	0.025779	0.64	0.52	-0.033947	0.067113
mopostgr	0.074412	0.032506	2.29	0.022	0.010698	0.138126
fa9_nohs	-0.003111	0.026089	-0.12	0.905	-0.054247	0.048025
favocnohs	-0.058951	0.077593	-0.76	0.447	-0.21104	0.093139
fahsgrad	-0.001448	0.019391	-0.07	0.94	-0.039456	0.036561
faged	-0.059327	0.042275	-1.4	0.161	-0.14219	0.023536
favocafhs	-0.001342	0.03121	-0.04	0.966	-0.062517	0.059833
facolnogr	0.00617	0.025036	0.25	0.805	-0.042902	0.055242
facol4yr	0.020595	0.022346	0.92	0.357	-0.023205	0.064395
fapostgr	0.031946	0.028744	1.11	0.266	-0.024394	0.088286
abex_1_2	-0.086071	0.022113	-3.89	0	-0.129415	-0.042728
abex_3_10	-0.150324	0.021354	-7.04	0	-0.19218	-0.108468
abex_11pl	-0.215238	0.027261	-7.9	0	-0.268673	-0.161803
unexab	-0.011592	0.001279	-9.06	0	-0.014099	-0.009085
col_vl	-0.183167	0.042585	-4.3	0	-0.266638	-0.099696
col_low	-0.276872	0.044224	-6.26	0	-0.363554	-0.19019
col_med	-0.291217	0.024435	-11.92	0	-0.339111	-0.243323
col_hi	-0.173606	0.019735	-8.8	0	-0.212288	-0.134925
skipgrde	0.006166	0.042093	0.15	0.884	-0.076341	0.088673
adhltpvt	0.001911	0.000499	3.83	0	0.000934	0.002888
matgrd_is	0.448902	0.006681	67.19	0	0.435807	0.461997
_cons	1.63092	0.226264	7.21	0	1.187421	2.074418

Appendix B (Continued)

Social Studies GPA

```
      Source |       SS       df       MS              Number of obs =   15967
-------------+------------------------------           F( 61, 15905) = 114.34
       Model |  4617.92077     61  75.7036192           Prob > F      = 0.0000
    Residual |  10530.494   15905  .662087014           R-squared     = 0.3048
-------------+------------------------------           Adj R-squared = 0.3022
       Total |  15148.4147  15966  .948792104           Root MSE      = .81369
```

socsgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.081478	0.028611	-2.85	0.004	-0.137559	-0.025397
wave1	-0.025883	0.014906	-1.74	0.083	-0.055101	0.003335
female	0.109642	0.013198	8.31	0	0.083773	0.13551
jan	-0.234231	0.382322	-0.61	0.54	-0.983625	0.515164
feb	(dropped)					
mar	(dropped)					
apr	-0.234841	0.173257	-1.36	0.175	-0.574443	0.104762
may	-0.217303	0.170623	-1.27	0.203	-0.551744	0.117138
june	-0.218576	0.170516	-1.28	0.2	-0.552806	0.115654
july	-0.209213	0.170807	-1.22	0.221	-0.544015	0.125589
aug	-0.20657	0.171134	-1.21	0.227	-0.542013	0.128873
sep	-0.218914	0.17312	-1.26	0.206	-0.55825	0.120421
oct	-0.105967	0.180271	-0.59	0.557	-0.459318	0.247384
nov	-0.209411	0.213324	-0.98	0.326	-0.62755	0.208729
agelt12	1.310453	0.50497	2.6	0.009	0.320655	2.300252
age12	0.521425	0.153473	3.4	0.001	0.220602	0.822249
age13	0.474546	0.143447	3.31	0.001	0.193304	0.755718
age14	0.426417	0.140451	3.04	0.002	0.151117	0.701717
age15	0.39209	0.138068	2.84	0.005	0.12146	0.662719
age16	0.295048	0.135984	2.17	0.03	0.028505	0.561591
age17	0.256581	0.134436	1.91	0.056	-0.006928	0.52009
age18	0.244427	0.133593	1.83	0.067	-0.017431	0.506285
age19	0.054132	0.139953	0.39	0.699	-0.220191	0.328456
grade7	-0.407178	0.057448	-7.09	0	-0.519782	-0.294574
grade8	-0.294415	0.047449	-6.2	0	-0.38742	-0.201409
grade9	-0.286987	0.040302	-7.12	0	-0.365982	-0.207991
grade10	-0.253158	0.03336	-7.59	0	-0.318547	-0.187769
grade11	-0.123263	0.026226	-4.7	0	-0.174669	-0.071857
hisp_lat	-0.031942	0.022085	-1.45	0.148	-0.075231	0.011348
white	-0.008603	0.024338	-0.35	0.724	-0.056308	0.039103
black	-0.068625	0.027335	-2.51	0.012	-0.122204	-0.015046
nat_am	-0.017013	0.035326	-0.48	0.63	-0.086255	0.052229
asian_pi	0.009742	0.031958	0.3	0.76	-0.0529	0.072384
twoparent	0.059874	0.014328	4.18	0	0.031749	0.087959
momdis	0.00316	0.030219	0.1	0.917	-0.056073	0.062393
daddis	-0.038877	0.026458	-1.47	0.142	-0.090737	0.012984
mo9_nohs	-0.014486	0.027381	-0.53	0.597	-0.068156	0.039184
movocnohs	-0.029462	0.07684	-0.38	0.701	-0.180077	0.121153
mohsgrad	0.017656	0.022882	0.77	0.44	-0.027195	0.062507
moged	0.025454	0.038714	0.66	0.511	-0.05043	0.101337
movocafhs	0.050138	0.031625	1.59	0.113	-0.01185	0.112126
mocolnogr	0.001737	0.026715	0.07	0.948	-0.050627	0.054102
mocol4yr	0.014318	0.025614	0.56	0.576	-0.035887	0.064524
mopostgr	0.052518	0.03239	1.62	0.105	-0.010971	0.116007
fa9_nohs	0.005998	0.025875	0.23	0.817	-0.044719	0.056715
favocnohs	0.034453	0.076071	0.45	0.651	-0.114655	0.183561
fahsgrad	-0.000273	0.019221	-0.01	0.989	-0.037949	0.037403
faged	-0.050522	0.042946	-1.18	0.239	-0.134702	0.033658
favocafhs	-0.010903	0.030911	-0.35	0.724	-0.071492	0.049686
facolnogr	0.005801	0.024961	0.23	0.816	-0.043126	0.054727
facol4yr	0.023393	0.022095	1.06	0.29	-0.019915	0.066701
fapostgr	0.054209	0.028641	1.89	0.058	-0.00193	0.110347
abex_1_2	-0.06179	0.022136	-2.79	0.005	-0.105178	-0.018401
abex_3_10	-0.127629	0.021388	-5.97	0	-0.169552	-0.085706
abex_11pl	-0.20813	0.026962	-7.72	0	-0.26098	-0.155281
unexab	-0.01348	0.001271	-10.6	0	-0.015971	-0.010988
col_vl	-0.371998	0.041434	-8.98	0	-0.453213	-0.290783
col_low	-0.338933	0.043347	-7.82	0	-0.423897	-0.253969
col_med	-0.291424	0.024155	-12.06	0	-0.33877	-0.244078
col_hi	-0.183993	0.019692	-9.34	0	-0.222592	-0.145393
skipgrde	0.013466	0.040774	0.33	0.741	-0.066455	0.093387
adhltpvt	0.003713	0.000499	7.44	0	0.002735	0.004691
socgrd_is	0.424505	0.006833	62.12	0	0.411112	0.437899
_cons	1.547908	0.224312	6.9	0	1.108231	1.987584

Science GPA

```
      Source |       SS       df       MS              Number of obs =   16387
-------------+------------------------------           F( 61, 16325) =  97.86
       Model |  4288.61426     61  70.3051517           Prob > F      = 0.0000
    Residual |  11728.3519  16325  .718428905           R-squared     = 0.2678
-------------+------------------------------           Adj R-squared = 0.2650
       Total |  16016.9661  16386  .977478709           Root MSE      =  .8476
```

scigpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.104911	0.030257	-3.47	0.001	-0.164218	-0.045605
wave1	-0.014635	0.015379	-0.95	0.341	-0.044779	0.01551
female	0.133644	0.013577	9.84	0	0.107032	0.160256
jan	0.425184	0.396708	1.07	0.284	-0.352407	1.202774
feb	(dropped)					
mar	(dropped)					
apr	-0.017649	0.176621	-0.1	0.92	-0.363844	0.328547
may	0.01767	0.173981	0.1	0.919	-0.323352	0.358692
june	0.004595	0.173871	0.03	0.979	-0.336212	0.345401
july	-0.011478	0.174162	-0.07	0.947	-0.352853	0.329898
aug	0.038192	0.174572	0.22	0.827	-0.303988	0.380373
sep	0.035577	0.176538	0.2	0.84	-0.310457	0.381611
oct	-0.004664	0.18398	-0.03	0.98	-0.365285	0.355958
nov	-0.023964	0.219266	-0.11	0.913	-0.45375	0.405821
agelt12	0.995473	0.526496	1.89	0.059	-0.036517	2.027463
age12	0.524177	0.161631	3.24	0.001	0.207363	0.84099
age13	0.4475	0.151071	2.96	0.003	0.151385	0.743615
age14	0.397072	0.147732	2.69	0.007	0.107502	0.686642
age15	0.371137	0.145334	2.55	0.011	0.086266	0.656007
age16	0.32257	0.143611	2.25	0.025	0.041078	0.604063
age17	0.240868	0.142037	1.7	0.09	-0.03754	0.519277
age18	0.250543	0.14123	1.77	0.076	-0.026282	0.527369
age19	0.203058	0.149324	1.36	0.174	-0.089634	0.495749
grade7	-0.219121	0.059591	-3.68	0	-0.335926	-0.102316
grade8	-0.194556	0.048706	-3.99	0	-0.290025	-0.099087
grade9	-0.228993	0.041252	-5.55	0	-0.309852	-0.148134
grade10	-0.167419	0.034949	-4.79	0	-0.235923	-0.098915
grade11	-0.143004	0.028552	-5.01	0	-0.198968	-0.08704
hisp_lat	0.012716	0.022557	0.56	0.573	-0.031497	0.05693
white	0.047197	0.025157	1.88	0.061	-0.002113	0.096507
black	-0.022371	0.028181	-0.79	0.427	-0.077608	0.032866
nat_am	0.040798	0.037079	1.1	0.271	-0.031882	0.113477
asian_pi	0.050753	0.03281	1.55	0.122	-0.013558	0.115065
twoparent	0.064234	0.014775	4.35	0	0.035275	0.093194
momdis	-0.019332	0.031181	-0.62	0.535	-0.08045	0.041787
daddis	-0.033698	0.027328	-1.23	0.218	-0.087264	0.019868
mo9_nohs	-0.065234	0.028136	-2.32	0.02	-0.120383	-0.010084
movocnohs	0.027817	0.076861	0.36	0.717	-0.122839	0.178473
mohsgrad	-0.052209	0.023666	-2.21	0.027	-0.098598	-0.005821
moged	-0.066313	0.039658	-1.67	0.095	-0.144046	0.011421
movocafhs	-0.02153	0.032861	-0.66	0.512	-0.085942	0.042881
mocolnogr	-0.010398	0.027478	-0.38	0.705	-0.064258	0.043461
mocol4yr	0.012594	0.026297	0.48	0.632	-0.038952	0.06414
mopostgr	0.041311	0.03318	1.25	0.213	-0.023725	0.106347
fa9_nohs	0.024993	0.026648	0.94	0.348	-0.027239	0.077225
favocnohs	0.086979	0.076563	1.14	0.256	-0.063093	0.237051
fahsgrad	0.016431	0.019882	0.83	0.409	-0.02254	0.055401
faged	-0.02299	0.043608	-0.53	0.598	-0.108466	0.062487
favocafhs	-0.006653	0.031997	-0.21	0.835	-0.06937	0.056064
facolnogr	-0.023246	0.025555	-0.91	0.363	-0.073335	0.026844
facol4yr	0.028753	0.0228	1.26	0.207	-0.015938	0.073444
fapostgr	0.042887	0.029254	1.47	0.143	-0.014454	0.100228
abex_1_2	-0.099232	0.022468	-4.42	0	-0.143272	-0.055191
abex_3_10	-0.188007	0.021696	-8.67	0	-0.230532	-0.145481
abex_11pl	-0.272615	0.027883	-9.78	0	-0.327268	-0.217962
unexab	-0.010903	0.00127	-8.59	0	-0.013393	-0.008414
col_vl	-0.303539	0.045249	-6.71	0	-0.392231	-0.214846
col_low	-0.362571	0.046624	-7.78	0	-0.453959	-0.271184
col_med	-0.254088	0.025358	-10.02	0	-0.303793	-0.204383
col_hi	-0.19107	0.020478	-9.33	0	-0.231209	-0.150931
skipgrde	0.111442	0.042426	2.63	0.009	0.028283	0.194602
adhltpvt	0.003053	0.000513	5.95	0	0.002047	0.004059
scigrd_is	0.398475	0.006974	57.14	0	0.384805	0.412145
_cons	1.337982	0.23163	5.78	0	0.883962	1.792003

Appendix B (Continued)

Overall GPA

```
      Source |       SS       df       MS              Number of obs =   12314
-------------+------------------------------           F( 61, 12252) =  215.64
       Model |  3424.08775    61  56.1325861           Prob > F      =  0.0000
    Residual |  3189.33918 12252  .260311719           R-squared     =  0.5177
-------------+------------------------------           Adj R-squared =  0.5153
       Total |  6613.42693 12313   .53710931           Root MSE      =  .51021
```

overallgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
majdep7	-0.087074	0.021581	-4.03	0	-0.129375 -0.044773
wave1	-0.006777	0.010814	-0.63	0.531	-0.027974 0.01442
female	0.115086	0.009471	12.15	0	0.096522 0.13365
jan	-0.020443	0.243494	-0.08	0.933	-0.497729 0.456843
feb	(dropped)				
mar	(dropped)				
apr	-0.198243	0.116907	-1.7	0.09	-0.427399 0.030914
may	-0.142007	0.114881	-1.24	0.216	-0.367192 0.083177
june	-0.16333	0.114792	-1.42	0.155	-0.38834 0.06168
july	-0.159822	0.115015	-1.39	0.165	-0.385269 0.065626
aug	-0.137904	0.115276	-1.2	0.232	-0.363864 0.088055
sep	-0.13034	0.116702	-1.12	0.264	-0.359094 0.098414
oct	-0.155582	0.122438	-1.27	0.204	-0.395579 0.084415
nov	-0.14495	0.143382	-1.01	0.312	-0.426001 0.136102
agelt12	0.722038	0.325123	2.22	0.026	0.084745 1.359331
age12	0.346693	0.121905	2.84	0.004	0.107739 0.585646
age13	0.29874	0.116189	2.57	0.01	0.070992 0.526488
age14	0.275596	0.114445	2.41	0.016	0.051266 0.499925
age15	0.281216	0.113067	2.49	0.013	0.059586 0.502846
age16	0.232497	0.111898	2.08	0.038	0.01316 0.451835
age17	0.190782	0.110922	1.72	0.085	-0.026643 0.408206
age18	0.217356	0.110391	1.97	0.049	0.000973 0.433739
age19	0.200773	0.117392	1.71	0.087	-0.029333 0.430879
grade7	-0.184007	0.040921	-4.5	0	-0.264218 -0.103795
grade8	-0.144024	0.034522	-4.17	0	-0.211692 -0.076355
grade9	-0.183004	0.030107	-6.08	0	-0.242019 -0.12399
grade10	-0.149018	0.025781	-5.78	0	-0.199553 -0.098483
grade11	-0.092472	0.021199	-4.36	0	-0.134024 -0.050919
hisp_lat	-0.014955	0.016162	-0.93	0.355	-0.046635 0.016726
white	-0.00656	0.017867	-0.37	0.714	-0.041582 0.028462
black	-0.056799	0.019922	-2.85	0.004	-0.095849 -0.017748
nat_am	-0.013805	0.026037	-0.53	0.596	-0.06484 0.037231
asian_pi	-0.002604	0.023365	-0.11	0.911	-0.048403 0.043196
twoparent	0.061597	0.010381	5.93	0	0.04125 0.081945
momdis	-0.006771	0.021902	-0.31	0.757	-0.049702 0.03616
daddis	-0.033309	0.019152	-1.74	0.082	-0.070851 0.004232
mo9_nohs	-0.045965	0.019974	-2.3	0.021	-0.085117 -0.006813
movocnohs	-0.019341	0.055119	-0.35	0.726	-0.127383 0.0887
mohsgrad	-0.010894	0.016572	-0.66	0.511	-0.043378 0.02159
moged	0.016267	0.027939	0.58	0.56	-0.038498 0.071032
movocafhs	0.012394	0.022951	0.54	0.589	-0.032593 0.057381
mocolnogr	-0.00944	0.01926	-0.49	0.624	-0.047192 0.028312
mocol4yr	0.015724	0.018443	0.85	0.394	-0.020427 0.051874
mopostgr	0.045825	0.023097	1.98	0.047	0.000551 0.091099
fa9_nohs	0.00813	0.018817	0.43	0.666	-0.028755 0.045014
favocnohs	0.068895	0.055155	1.25	0.212	-0.039217 0.177007
fahsgrad	0.020074	0.013872	1.45	0.148	-0.007117 0.047264
faged	-0.026716	0.030467	-0.88	0.381	-0.086435 0.033004
favocafhs	-0.009584	0.022289	-0.43	0.667	-0.053274 0.034106
facolnogr	0.003639	0.017807	0.2	0.838	-0.031265 0.038543
facol4yr	0.02959	0.015819	1.87	0.061	-0.001418 0.060598
fapostgr	0.057999	0.020279	2.86	0.004	0.018248 0.097749
abex_1_2	-0.081361	0.015418	-5.28	0	-0.111583 -0.051139
abex_3_10	-0.131125	0.014941	-8.78	0	-0.16041 -0.101839
abex_11pl	-0.20785	0.019395	-10.72	0	-0.245867 -0.169834
unexab	-0.009967	0.000988	-10.09	0	-0.011903 -0.00803
col_vl	-0.212327	0.032542	-6.52	0	-0.276113 -0.14854
col_low	-0.207824	0.033077	-6.28	0	-0.272659 -0.142988
col_med	-0.253061	0.018318	-13.81	0	-0.288968 -0.217155
col_hi	-0.156907	0.014445	-10.86	0	-0.185222 -0.128592
skipgrde	0.017399	0.030011	0.58	0.562	-0.041428 0.076225
adhltpvt	0.001789	0.000358	4.99	0	0.001087 0.002491
overallgpa·	0.562487	0.006488	86.7	0	0.549769 0.575204
_cons	1.207443	0.164544	7.34	0	0.884911 1.529975

Appendix C: Output Detail, OLS-Proxy Equation, Persistence Depression

English GPA

Source	SS	df	MS		
Model	5402.97019	63	85.7614317		
Residual	11880.4099	19471	.610159206		
Total	17283.3801	19534	.884784483		

Number of obs = 19535
F(63, 19471) = 140.56
Prob > F = 0.0000
R-squared = 0.3126
Adj R-squared = 0.3104
Root MSE = .78113

enggpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
perdep	-0.028684	0.015931	-1.8	0.072	-0.059911	0.002543
onsetdep	-0.066994	0.015211	-4.4	0	-0.096808	-0.037179
remitdep	0.024376	0.017086	1.43	0.154	-0.009114	0.057866
wave1	-0.002701	0.012861	-0.21	0.834	-0.027909	0.022507
female	0.223878	0.011786	19	0	0.200776	0.246979
jan	-0.052024	0.361579	-0.14	0.886	-0.760749	0.656701
feb	(dropped)					
mar	(dropped)					
apr	-0.344235	0.153265	-2.25	0.025	-0.644647	-0.043824
may	-0.274192	0.15113	-1.81	0.07	-0.570419	0.022035
june	-0.263588	0.151035	-1.75	0.081	-0.559629	0.032452
july	-0.270174	0.151271	-1.79	0.074	-0.566678	0.02633
aug	-0.286231	0.151597	-1.89	0.059	-0.583374	0.010911
sep	-0.234986	0.153279	-1.53	0.125	-0.535426	0.065453
oct	-0.225273	0.158989	-1.42	0.157	-0.536905	0.086359
nov	-0.204757	0.189668	-1.08	0.28	-0.576522	0.167009
agelt12	0.379499	0.479272	0.79	0.428	-0.559915	1.318914
age12	0.346218	0.128608	2.69	0.007	0.094136	0.5983
age13	0.292981	0.117412	2.5	0.013	0.062844	0.523119
age14	0.278303	0.113998	2.44	0.015	0.054858	0.501748
age15	0.254754	0.111534	2.28	0.022	0.036137	0.473371
age16	0.217037	0.10977	1.98	0.048	0.001878	0.432196
age17	0.183207	0.108311	1.69	0.091	-0.029091	0.395505
age18	0.167084	0.10758	1.55	0.12	-0.043782	0.37795
age19	0.12612	0.112778	1.12	0.263	-0.094936	0.347175
grade7	-0.199094	0.051567	-3.86	0	-0.300169	-0.098019
grade8	-0.190725	0.041353	-4.61	0	-0.27178	-0.10967
grade9	-0.25249	0.034194	-7.38	0	-0.319513	-0.185468
grade10	-0.165111	0.028122	-5.87	0	-0.220233	-0.10999
grade11	-0.087891	0.022138	-3.97	0	-0.131284	-0.044498
hisp_lat	-0.026965	0.018778	-1.44	0.151	-0.063772	0.009842
white	-0.017214	0.020876	-0.82	0.41	-0.058133	0.023705
black	-0.074742	0.02351	-3.18	0.001	-0.120824	-0.028661
nat_am	-0.072274	0.031128	-2.32	0.02	-0.133287	-0.011261
asian_pi	0.004236	0.027275	0.16	0.877	-0.049226	0.057697
twoparent	0.071913	0.012366	5.82	0	0.047675	0.09615
momdis	0.006427	0.026419	0.24	0.808	-0.045357	0.058211
daddis	-0.04452	0.022968	-1.94	0.053	-0.089539	0.000499
mo9_nohs	-0.032149	0.023587	-1.36	0.173	-0.078382	0.014084
movocnohs	-0.055408	0.064728	-0.86	0.392	-0.182282	0.071465
mohsgrad	0.00552	0.019806	0.28	0.78	-0.033301	0.044342
moged	-0.002342	0.033288	-0.07	0.944	-0.067589	0.062904
movocafhs	0.036176	0.02761	1.31	0.19	-0.017941	0.090294
mocolnogr	-0.00879	0.023133	-0.38	0.704	-0.054143	0.036554
mocol4yr	-0.000167	0.02217	-0.01	0.994	-0.043623	0.043289
mopostgr	0.046383	0.028006	1.66	0.098	-0.008511	0.101276
fa9_nohs	-0.021592	0.022394	-0.96	0.335	-0.065487	0.022303
favocnohs	0.055078	0.06565	0.84	0.401	-0.073601	0.183758
fahsgrad	0.003977	0.016716	0.24	0.812	-0.028787	0.036741
faged	0.000614	0.036373	0.02	0.987	-0.07068	0.071908
favocafhs	-0.043386	0.026876	-1.61	0.106	-0.096065	0.009293
facolnogr	0.01226	0.02158	0.57	0.57	-0.030039	0.054559
facol4yr	0.044	0.019228	2.29	0.022	0.006311	0.081688
fapostgr	0.042948	0.024847	1.73	0.084	-0.005753	0.091649
skipgrde	0.036619	0.036029	1.02	0.309	-0.034	0.107238
adhltpvt	0.002384	0.000431	5.53	0	0.001539	0.003228
abex_1_2	-0.084553	0.019226	-4.4	0	-0.122238	-0.046868
abex_3_10	-0.146746	0.018537	-7.92	0	-0.183081	-0.110412
abex_11pl	-0.250676	0.023452	-10.69	0	-0.296643	-0.204708
unexab	-0.012483	0.001038	-12.02	0	-0.014518	-0.010448
col_vl	-0.334198	0.034819	-9.6	0	-0.402447	-0.265949
col_low	-0.312579	0.038042	-8.22	0	-0.387144	-0.238014
col_med	-0.308233	0.02067	-14.91	0	-0.348748	-0.267719
col_hi	-0.183073	0.016988	-10.78	0	-0.21637	-0.149776
enggrd_is	0.413125	0.00615	67.17	0	0.40107	0.425181
_cons	1.732878	0.192782	8.99	0	1.355009	2.110748

Math GPA

Source	SS	df	MS		
Model	5392.44995	63	85.5944437		
Residual	14107.4785	18275	.771955048		
Total	19499.9285	18338	1.06336179		

Number of obs = 18339
F(63, 18275) = 110.88
Prob > F = 0.0000
R-squared = 0.2765
Adj R-squared = 0.2740
Root MSE = .87861

matgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
perdep	-0.08512	0.018522	-4.6	0	-0.121426	-0.048815
onsetdep	-0.05553	0.017649	-3.15	0.002	-0.090124	-0.020936
remitdep	-0.054041	0.019995	-2.7	0.007	-0.093234	-0.014849
wave1	0.002551	0.01501	0.17	0.865	-0.026871	0.031972
female	0.090813	0.013508	6.72	0	0.064336	0.117291
jan	-0.097337	0.409622	-0.24	0.812	-0.900235	0.705561
feb	(dropped)					
mar	(dropped)					
apr	-0.258389	0.179228	-1.44	0.149	-0.609693	0.092915
may	-0.207935	0.176721	-1.18	0.239	-0.554324	0.138454
june	-0.238784	0.176605	-1.35	0.176	-0.584947	0.107379
july	-0.257812	0.176886	-1.46	0.145	-0.604526	0.088901
aug	-0.200117	0.177255	-1.13	0.259	-0.547554	0.147319
sep	-0.180915	0.179131	-1.01	0.313	-0.532028	0.170199
oct	-0.248398	0.18585	-1.34	0.181	-0.612682	0.115886
nov	-0.150275	0.217912	-0.69	0.49	-0.577402	0.276853
agelt12	0.055555	0.540876	0.1	0.918	-1.004612	1.115723
age12	0.176508	0.150853	1.17	0.242	-0.119178	0.472194
age13	0.141538	0.139085	1.02	0.309	-0.131082	0.414158
age14	0.096595	0.135447	0.71	0.476	-0.168893	0.362083
age15	0.125518	0.132856	0.94	0.345	-0.134892	0.385929
age16	0.083478	0.130991	0.64	0.524	-0.173278	0.340233
age17	0.032422	0.129443	0.25	0.802	-0.221298	0.286142
age18	0.055762	0.128572	0.43	0.665	-0.19625	0.307774
age19	0.073577	0.136023	0.54	0.589	-0.19304	0.340195
grade7	-0.149631	0.058981	-2.54	0.011	-0.26524	-0.034021
grade8	-0.086657	0.047747	-1.81	0.07	-0.180245	0.006932
grade9	-0.13515	0.039983	-3.38	0.001	-0.213519	-0.05678
grade10	-0.182371	0.033505	-5.44	0	-0.248043	-0.116699
grade11	-0.090992	0.027178	-3.35	0.001	-0.144264	-0.037721
hisp_lat	-0.101452	0.021952	-4.62	0	-0.14448	-0.058424
white	0.000893	0.02425	0.04	0.971	-0.046638	0.048425
black	-0.078642	0.027312	-2.88	0.004	-0.132177	-0.025108
nat_am	-0.005574	0.036205	-0.15	0.878	-0.076539	0.065391
asian_pi	0.009414	0.031469	0.3	0.765	-0.052268	0.071095
twoparent	0.087753	0.014422	6.08	0	0.059484	0.116021
momdis	-0.003189	0.030785	-0.1	0.918	-0.06353	0.057153
daddis	-0.006732	0.026735	-0.25	0.801	-0.059135	0.045671
mo9_nohs	0.021498	0.027528	0.78	0.435	-0.032459	0.075455
movocnohs	-0.145599	0.073612	-1.98	0.048	-0.289886	-0.001313
mohsgrad	-0.016013	0.023072	-0.69	0.488	-0.061236	0.02921
moged	0.076385	0.038819	1.97	0.049	0.000295	0.152475
movocafhs	0.021497	0.032108	0.67	0.503	-0.041437	0.084432
mocolnogr	-0.006958	0.026922	-0.26	0.796	-0.059727	0.045811
mocol4yr	0.016779	0.02579	0.65	0.515	-0.033772	0.06733
mopostgr	0.074224	0.032517	2.28	0.022	0.010488	0.13796
fa9_nohs	-0.00261	0.026095	-0.1	0.92	-0.053758	0.048539
favocnohs	-0.060589	0.077616	-0.78	0.435	-0.212724	0.091547
fahsgrad	-0.001042	0.019396	-0.05	0.957	-0.03906	0.036976
faged	-0.058959	0.042285	-1.39	0.163	-0.141841	0.023923
favocafhs	-0.002935	0.031219	-0.09	0.925	-0.064147	0.058238
facolnogr	0.006008	0.025045	0.24	0.81	-0.043082	0.055099
facol4yr	0.01868	0.022356	0.84	0.403	-0.025139	0.062499
fapostgr	0.031571	0.028751	1.1	0.272	-0.024784	0.087925
skipgrde	0.004721	0.042103	0.11	0.911	-0.077805	0.087247
adhltpvt	0.001999	0.0005	4	0	0.001019	0.002978
abex_1_2	-0.083303	0.022117	-3.77	0	-0.126655	-0.039951
abex_3_10	-0.146838	0.021372	-6.87	0	-0.188729	-0.104947
abex_11pl	-0.211421	0.027312	-7.74	0	-0.264955	-0.157888
unexab	-0.011649	0.001279	-9.11	0	-0.014156	-0.009142
col_vl	-0.183284	0.04261	-4.3	0	-0.266803	-0.099765
col_low	-0.27686	0.044236	-6.26	0	-0.363566	-0.190154
col_med	-0.292442	0.024433	-12	0	-0.340333	-0.244551
col_hi	-0.174855	0.019734	-8.86	0	-0.213534	-0.136175
matgrd_is	0.448547	0.006686	67.09	0	0.435442	0.461651
_cons	1.642758	0.226487	7.25	0	1.198822	2.086694

Appendix C (Continued)

Social Studies GPA

Source	SS	df	MS		
Model	4632.1283	63	73.525846		
Residual	10516.2864	15903	.661276893		
Total	15148.4147	15966	.948792104		

Number of obs = 15967
F(63, 15903) = 111.19
Prob > F = 0.0000
R-squared = 0.3058
Adj R-squared = 0.3030
Root MSE = .81319

socsgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
perdep	-0.052498	0.018534	-2.83	0.005	-0.088827	-0.016169
onsetdep	-0.092327	0.017496	-5.28	0	-0.126621	-0.058033
remitdep	-0.028123	0.019711	-1.43	0.154	-0.066758	0.010512
wave1	-0.024142	0.014916	-1.62	0.106	-0.053379	0.005096
female	0.115216	0.013409	8.59	0	0.088932	0.141499
jan	-0.250999	0.382138	-0.66	0.511	-1.000032	0.498034
feb	(dropped)					
mar	(dropped)					
apr	-0.23924	0.173165	-1.38	0.167	-0.578663	0.100184
may	-0.221862	0.170535	-1.3	0.193	-0.55613	0.112407
june	-0.22491	0.170429	-1.32	0.187	-0.558971	0.10915
july	-0.216878	0.170724	-1.27	0.204	-0.551515	0.11776
aug	-0.213838	0.171049	-1.25	0.211	-0.549114	0.121437
sep	-0.225707	0.173035	-1.3	0.192	-0.564874	0.113461
oct	-0.110622	0.180197	-0.61	0.539	-0.463828	0.242584
nov	-0.213375	0.213219	-1	0.317	-0.631309	0.204559
agelt12	1.305594	0.504641	2.59	0.01	0.316441	2.294748
age12	0.506253	0.153407	3.3	0.001	0.205557	0.806949
age13	0.461725	0.143371	3.22	0.001	0.180701	0.74275
age14	0.416244	0.140374	2.97	0.003	0.141096	0.691391
age15	0.383397	0.137992	2.78	0.005	0.112918	0.653877
age16	0.286909	0.135912	2.11	0.035	0.020506	0.553311
age17	0.250093	0.134356	1.86	0.063	-0.013261	0.513446
age18	0.238149	0.13352	1.78	0.075	-0.023565	0.499862
age19	0.050947	0.139858	0.36	0.716	-0.223191	0.325085
grade7	-0.405145	0.057459	-7.05	0	-0.51777	-0.292519
grade8	-0.292914	0.047465	-6.17	0	-0.385951	-0.199876
grade9	-0.287356	0.04028	-7.13	0	-0.36631	-0.208403
grade10	-0.252646	0.033348	-7.58	0	-0.318012	-0.18728
grade11	-0.121584	0.026217	-4.64	0	-0.172971	-0.070196
hisp_lat	-0.032265	0.022074	-1.46	0.144	-0.075532	0.011003
white	-0.00864	0.02432	-0.36	0.722	-0.05631	0.03903
black	-0.068076	0.027319	-2.49	0.013	-0.121625	-0.014528
nat_am	-0.01704	0.035309	-0.48	0.629	-0.08625	0.05217
asian_pi	0.012476	0.031942	0.39	0.696	-0.050133	0.075086
twoparent	0.05744	0.01433	4.01	0	0.029353	0.085528
momdis	0.005528	0.030206	0.18	0.855	-0.05368	0.064736
daddis	-0.038673	0.026439	-1.46	0.144	-0.090496	0.01315
mo9_nohs	-0.016413	0.027369	-0.6	0.549	-0.070059	0.037234
movocnohs	-0.030441	0.076801	-0.4	0.692	-0.18098	0.120099
mohsgrad	0.015601	0.022872	0.68	0.495	-0.02923	0.060432
moged	0.027128	0.038697	0.7	0.483	-0.048721	0.102978
movocafhs	0.050624	0.03161	1.6	0.109	-0.011334	0.112582
mocolnogr	-0.000775	0.026702	-0.03	0.977	-0.053114	0.051563
mocol4yr	0.012562	0.025602	0.49	0.624	-0.03762	0.062744
mopostgr	0.0507	0.032373	1.57	0.117	-0.012755	0.114154
fa9_nohs	0.006173	0.02586	0.24	0.811	-0.044516	0.056862
favocnohs	0.029368	0.076037	0.39	0.699	-0.119673	0.178408
fahsgrad	0.000632	0.019207	0.03	0.974	-0.037015	0.038279
faged	-0.048571	0.042926	-1.13	0.258	-0.132711	0.035568
favocafhs	-0.011227	0.030893	-0.36	0.716	-0.07178	0.049326
facolnogr	0.006898	0.024945	0.28	0.782	-0.041997	0.055793
facol4yr	0.022675	0.022082	1.03	0.305	-0.020608	0.065957
fapostgr	0.055073	0.028622	1.92	0.054	-0.00103	0.111175
skipgrde	0.011884	0.040752	0.29	0.771	-0.067995	0.091763
adhltpvt	0.003646	0.000499	7.3	0	0.002667	0.004625
abex_1_2	-0.060178	0.022123	-2.72	0.007	-0.10354	-0.016815
abex_3_10	-0.125071	0.02139	-5.85	0	-0.166997	-0.083145
abex_11pl	-0.204199	0.026996	-7.56	0	-0.257115	-0.151283
unexab	-0.013394	0.001271	-10.5	0	-0.015884	-0.010904
col_vl	-0.367292	0.041422	-8.87	0	-0.448483	-0.286101
col_low	-0.335648	0.043328	-7.75	0	-0.420576	-0.25072
col_med	-0.290016	0.024141	-12	0	-0.337335	-0.242698
col_hi	-0.184586	0.019676	-9.38	0	-0.223154	-0.146018
socgrd_is	0.423469	0.006832	61.98	0	0.410077	0.436861
_cons	1.594313	0.224399	7.1	0	1.154464	2.034161

Science GPA

Source	SS	df	MS		
Model	4307.13734	63	68.3672594		
Residual	11708.5681	16322	.717348859		
Total	16015.7054	16385	.977461423		

Number of obs = 16386
F(63, 16322) = 95.31
Prob > F = 0.0000
R-squared = 0.2689
Adj R-squared = 0.2661
Root MSE = .84696

scigpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
perdep	-0.061894	0.019093	-3.24	0.001	-0.099319	-0.02447
onsetdep	-0.102714	0.018046	-5.69	0	-0.138086	-0.067342
remitdep	0.001687	0.020179	0.08	0.933	-0.037867	0.04124
wave1	-0.013008	0.015384	-0.85	0.398	-0.043163	0.017147
female	0.137976	0.013796	10	0	0.110934	0.165019
jan	0.414461	0.396474	1.05	0.296	-0.362671	1.191593
feb	(dropped)					
mar	(dropped)					
apr	-0.017506	0.176522	-0.1	0.921	-0.363509	0.328497
may	0.017378	0.173884	0.1	0.92	-0.323454	0.35821
june	0.002259	0.173775	0.01	0.99	-0.33836	0.342877
july	-0.015469	0.174067	-0.09	0.929	-0.356659	0.325722
aug	0.03436	0.174478	0.2	0.844	-0.307636	0.376357
sep	0.033333	0.176445	0.19	0.85	-0.312519	0.379185
oct	-0.00374	0.183886	-0.02	0.984	-0.364177	0.356697
nov	-0.018822	0.219127	-0.09	0.932	-0.448335	0.41069
agelt12	0.996858	0.526076	1.89	0.058	-0.034309	2.028025
age12	0.51335	0.161503	3.18	0.001	0.196787	0.829914
age13	0.438516	0.150943	2.91	0.004	0.142651	0.73438
age14	0.390057	0.147605	2.64	0.008	0.100736	0.679378
age15	0.366635	0.14521	2.52	0.012	0.082009	0.651261
age16	0.319629	0.143489	2.23	0.026	0.038375	0.600883
age17	0.239651	0.141913	1.69	0.091	-0.038514	0.517815
age18	0.248779	0.141119	1.76	0.078	-0.027829	0.525386
age19	0.203866	0.149204	1.37	0.172	-0.088591	0.496322
grade7	-0.214621	0.059613	-3.6	0	-0.331469	-0.097773
grade8	-0.190446	0.048724	-3.91	0	-0.285958	-0.094934
grade9	-0.228342	0.041235	-5.54	0	-0.309166	-0.147518
grade10	-0.165931	0.034935	-4.75	0	-0.234408	-0.097454
grade11	-0.141143	0.028535	-4.95	0	-0.197074	-0.085212
hisp_lat	0.011707	0.022543	0.52	0.604	-0.032479	0.055894
white	0.047117	0.025135	1.87	0.061	-0.00215	0.096384
black	-0.021875	0.02816	-0.78	0.437	-0.077072	0.033321
nat_am	0.0418	0.037061	1.13	0.259	-0.030843	0.114443
asian_pi	0.053837	0.03279	1.64	0.101	-0.010434	0.118108
twoparent	0.06204	0.014773	4.2	0	0.033083	0.090997
momdis	-0.017887	0.031161	-0.57	0.566	-0.078965	0.043191
daddis	-0.032691	0.027307	-1.2	0.231	-0.086216	0.020834
mo9_nohs	-0.067765	0.028124	-2.41	0.016	-0.122891	-0.012639
movocnohs	0.030968	0.076807	0.4	0.687	-0.119582	0.181519
mohsgrad	-0.05475	0.023657	-2.31	0.021	-0.101121	-0.008379
moged	-0.065825	0.039638	-1.66	0.097	-0.143519	0.01187
movocafhs	-0.022514	0.032846	-0.69	0.493	-0.086896	0.041868
mocolnogr	-0.012995	0.027464	-0.47	0.636	-0.066826	0.040837
mocol4yr	0.010904	0.026285	0.41	0.678	-0.040619	0.062426
mopostgr	0.037885	0.033162	1.14	0.253	-0.027117	0.102886
fa9_nohs	0.024166	0.026631	0.91	0.364	-0.028034	0.076365
favocnohs	0.081862	0.076514	1.07	0.285	-0.068114	0.231837
fahsgrad	0.017974	0.019867	0.9	0.366	-0.020968	0.056916
faged	-0.020094	0.043573	-0.46	0.645	-0.105501	0.065313
favocafhs	-0.007792	0.031975	-0.24	0.807	-0.070466	0.054882
facolnogr	-0.022995	0.025538	-0.9	0.368	-0.073052	0.027063
facol4yr	0.026957	0.022788	1.18	0.237	-0.017711	0.071624
fapostgr	0.043692	0.029233	1.49	0.135	-0.013608	0.100992
skipgrde	0.111235	0.042395	2.62	0.009	0.028136	0.194334
adhltpvt	0.002966	0.000514	5.77	0	0.001958	0.003973
abex_1_2	-0.096711	0.022454	-4.31	0	-0.140723	-0.052698
abex_3_10	-0.185284	0.021696	-8.54	0	-0.227811	-0.142758
abex_11pl	-0.268863	0.027898	-9.64	0	-0.323545	-0.214181
unexab	-0.010863	0.001269	-8.56	0	-0.01335	-0.008377
col_vl	-0.296979	0.045237	-6.56	0	-0.385648	-0.208309
col_low	-0.359727	0.046592	-7.72	0	-0.451053	-0.2684
col_med	-0.253619	0.025337	-10.01	0	-0.303283	-0.203955
col_hi	-0.191594	0.020457	-9.37	0	-0.231692	-0.151496
scigrd_is	0.396919	0.006977	56.89	0	0.383243	0.410595
_cons	1.377661	0.231623	5.95	0	0.923654	1.831668

Appendix C (Continued)

Overall GPA

```
      Source |       SS       df       MS              Number of obs =  12314
-------------+------------------------------           F( 63, 12250) = 209.32
       Model |  3428.54238    63  54.4213076           Prob > F      = 0.0000
    Residual |  3184.88455 12250  .259990576           R-squared     = 0.5184
-------------+------------------------------           Adj R-squared = 0.5159
       Total |  6613.42693 12313   .53710931           Root MSE      = .50989
```

overallgpa	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
perdep	-0.037591	0.013466	-2.79	0.005	-0.063986	-0.011196
onsetdep	-0.070623	0.012521	-5.64	0	-0.095167	-0.046079
remitdep	-0.019628	0.014193	-1.38	0.167	-0.047448	0.008191
wave1	-0.005834	0.010822	-0.54	0.59	-0.027046	0.015378
female	0.1186	0.009627	12.32	0	0.09973	0.137469
jan	-0.0305	0.243391	-0.13	0.9	-0.507584	0.446585
feb	(dropped)					
mar	(dropped)					
apr	-0.199509	0.116852	-1.71	0.088	-0.428557	0.029539
may	-0.144374	0.114832	-1.26	0.209	-0.369463	0.080715
june	-0.166618	0.114742	-1.45	0.146	-0.391529	0.058294
july	-0.163596	0.114966	-1.42	0.155	-0.388948	0.061757
aug	-0.142393	0.115227	-1.24	0.217	-0.368256	0.083471
sep	-0.133979	0.116655	-1.15	0.251	-0.36264	0.094683
oct	-0.156868	0.122405	-1.28	0.2	-0.396801	0.083065
nov	-0.147895	0.143321	-1.03	0.302	-0.428828	0.133037
agelt12	0.729714	0.324893	2.25	0.025	0.092873	1.366554
age12	0.346757	0.121797	2.85	0.004	0.108015	0.585498
age13	0.299785	0.116078	2.58	0.01	0.072253	0.527317
age14	0.278058	0.114335	2.43	0.015	0.053944	0.502172
age15	0.284197	0.112966	2.52	0.012	0.062767	0.505627
age16	0.23501	0.111805	2.1	0.036	0.015854	0.454166
age17	0.194124	0.110828	1.75	0.08	-0.023117	0.411365
age18	0.220318	0.110308	2	0.046	0.004097	0.436538
age19	0.206227	0.117298	1.76	0.079	-0.023696	0.43615
grade7	-0.184982	0.040921	-4.52	0	-0.265194	-0.10477
grade8	-0.14525	0.034518	-4.21	0	-0.212911	-0.07759
grade9	-0.185352	0.030082	-6.16	0	-0.244316	-0.126387
grade10	-0.149942	0.025764	-5.82	0	-0.200443	-0.099441
grade11	-0.092437	0.021183	-4.36	0	-0.133959	-0.050915
hisp_lat	-0.016182	0.016154	-1	0.316	-0.047847	0.015483
white	-0.006592	0.017856	-0.37	0.712	-0.041591	0.028408
black	-0.056097	0.019909	-2.82	0.005	-0.095122	-0.017073
nat_am	-0.013739	0.026028	-0.53	0.598	-0.064757	0.037279
asian_pi	-0.001206	0.023353	-0.05	0.959	-0.046982	0.044569
twoparent	0.059579	0.010384	5.74	0	0.039224	0.079933
momdis	-0.004129	0.021897	-0.19	0.85	-0.04705	0.038793
daddis	-0.034222	0.019136	-1.79	0.074	-0.07173	0.003287
mo9_nohs	-0.048821	0.019966	-2.45	0.014	-0.087958	-0.009684
movocnohs	-0.018778	0.055086	-0.34	0.733	-0.126756	0.089201
mohsgrad	-0.013099	0.016568	-0.79	0.429	-0.045575	0.019376
moged	0.016367	0.027931	0.59	0.558	-0.038382	0.071117
movocafhs	0.011769	0.022943	0.51	0.608	-0.033203	0.05674
mocolnogr	-0.012158	0.019253	-0.63	0.528	-0.049898	0.025582
mocol4yr	0.014134	0.018438	0.77	0.443	-0.022007	0.050275
mopostgr	0.043714	0.023086	1.89	0.058	-0.001539	0.088967
fa9_nohs	0.008059	0.018806	0.43	0.668	-0.028803	0.044921
favocnohs	0.064331	0.055134	1.17	0.243	-0.043741	0.172403
fahsgrad	0.021112	0.013863	1.52	0.128	-0.006063	0.048286
faged	-0.023707	0.030456	-0.78	0.436	-0.083405	0.035991
favocafhs	-0.009596	0.022277	-0.43	0.667	-0.053262	0.03407
facolnogr	0.004974	0.017797	0.28	0.78	-0.02991	0.039858
facol4yr	0.028747	0.015812	1.82	0.069	-0.002247	0.05974
fapostgr	0.059194	0.020268	2.92	0.004	0.019465	0.098923
abex_1_2	-0.079725	0.01541	-5.17	0	-0.109931	-0.049518
abex_3_10	-0.129256	0.01494	-8.65	0	-0.158542	-0.099971
abex_11pl	-0.205886	0.019407	-10.61	0	-0.243927	-0.167845
unexab	-0.009991	0.000988	-10.12	0	-0.011926	-0.008055
col_vl	-0.209894	0.032528	-6.45	0	-0.273654	-0.146134
col_low	-0.205385	0.03307	-6.21	0	-0.270208	-0.140562
col_med	-0.253286	0.018306	-13.84	0	-0.289168	-0.217403
col_hi	-0.157609	0.014433	-10.92	0	-0.1859	-0.129318
skipgrde	0.017267	0.029993	0.58	0.565	-0.041524	0.076059
adhltpvt	0.00175	0.000359	4.88	0	0.001047	0.002454
overallgpa-	0.561088	0.006495	86.39	0	0.548356	0.573819
_cons	1.233937	0.164573	7.5	0	0.911349	1.556525

English GPA - "fearful 12 + crying 12"
Second-stage regressions
IV (2SLS) regression with robust std. errors   Number of obs =   19536
F(61, 19474) = 152.18
Prob > F   = 0.0000
R-squared   = 0.3107
Root MSE   = .78213

enggpa	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.303294	0.115429	-2.63	0.009	-0.529545	-0.077044
wave1	-0.001984	0.013207	-0.15	0.881	-0.027871	0.023904
female	0.233028	0.012543	18.58	0	0.208442	0.257614
jan	-0.066473	0.268527	-0.25	0.804	-0.592809	0.459864
feb	(dropped)					
mar	(dropped)					
apr	-0.352314	0.167307	-2.11	0.035	-0.68025	-0.024377
may	-0.280793	0.164877	-1.7	0.089	-0.603966	0.04238
june	-0.270134	0.164773	-1.64	0.101	-0.593104	0.052835
july	-0.277457	0.164954	-1.68	0.093	-0.600782	0.045867
aug	-0.295309	0.165254	-1.79	0.074	-0.619221	0.028603
sep	-0.244764	0.16643	-1.47	0.141	-0.57098	0.081452
oct	-0.237797	0.170454	-1.4	0.163	-0.571901	0.096307
nov	-0.220717	0.194429	-1.14	0.256	-0.601815	0.16038
agelt12	0.337612	0.539308	0.63	0.531	-0.719479	1.394702
age12	0.322129	0.128563	2.51	0.012	0.070134	0.574125
age13	0.26984	0.119456	2.26	0.024	0.035696	0.503985
age14	0.258141	0.115865	2.23	0.026	0.031036	0.485246
age15	0.239698	0.112659	2.13	0.033	0.018878	0.460519
age16	0.204573	0.110401	1.85	0.064	-0.011822	0.420968
age17	0.170847	0.108542	1.57	0.115	-0.041905	0.383599
age18	0.15845	0.107458	1.47	0.14	-0.052178	0.369078
age19	0.122347	0.112178	1.09	0.275	-0.097532	0.342226
grade7	-0.188261	0.053684	-3.51	0	-0.293487	-0.083035
grade8	-0.183143	0.043713	-4.19	0	-0.268823	-0.097462
grade9	-0.243612	0.035971	-6.77	0	-0.314118	-0.173107
grade10	-0.160924	0.029008	-5.55	0	-0.217782	-0.104065
grade11	-0.084076	0.022314	-3.77	0	-0.127813	-0.040339
hisp_lat	-0.026681	0.019448	-1.37	0.17	-0.0648	0.011438
white	-0.02084	0.021725	-0.96	0.337	-0.063423	0.021743
black	-0.077919	0.024476	-3.18	0.001	-0.125893	-0.029945
nat_am	-0.070285	0.031427	-2.24	0.025	-0.131884	-0.008686
asian_pi	0.008354	0.027203	0.31	0.759	-0.044965	0.061673
twoparent	0.070947	0.012758	5.56	0	0.045942	0.095953
momdis	0.005448	0.027282	0.2	0.842	-0.048028	0.058924
daddis	-0.042941	0.02387	-1.8	0.072	-0.089729	0.003846
mo9_nohs	-0.026242	0.024655	-1.06	0.287	-0.074568	0.022084
movocnohs	-0.061966	0.06978	-0.89	0.375	-0.198741	0.074808
mohsgrad	0.005894	0.020375	0.29	0.772	-0.034043	0.045831
moged	-0.002462	0.034322	-0.07	0.943	-0.069737	0.064812
movocafhs	0.036202	0.027896	1.3	0.194	-0.018476	0.09088
mocolnogr	-0.005546	0.023657	-0.23	0.815	-0.051916	0.040823
mocol4yr	0.000525	0.022271	0.02	0.981	-0.043129	0.044178
mopostgr	0.048564	0.027375	1.77	0.076	-0.005094	0.102222
fa9_nohs	-0.020824	0.023126	-0.9	0.368	-0.066154	0.024506
favocnohs	0.063635	0.060447	1.05	0.292	-0.054845	0.182116
fahsgrad	0.00055	0.017259	0.03	0.975	-0.033279	0.034378
faged	-0.005549	0.037569	-0.15	0.883	-0.079188	0.06809
favocafhs	-0.04358	0.026884	-1.62	0.105	-0.096275	0.009115
facolnogr	0.009155	0.022088	0.41	0.679	-0.03414	0.052449
facol4yr	0.043687	0.019307	2.26	0.024	0.005843	0.081531
fapostgr	0.040925	0.024529	1.67	0.095	-0.007153	0.089004
skipgrde	0.039027	0.037663	1.04	0.3	-0.034797	0.11285
adhltpvt	0.002352	0.000444	5.3	0	0.001483	0.003222
abex_1_2	-0.087791	0.018434	-4.76	0	-0.123923	-0.05166
abex_3_10	-0.14708	0.017846	-8.24	0	-0.182059	-0.112101
abex_11pl	-0.243744	0.02428	-10	0	-0.291334	-0.196153
unexab	-0.011995	0.001329	-9.02	0	-0.014601	-0.009389
col_vl	-0.327956	0.042108	-7.79	0	-0.410491	-0.24542
col_low	-0.304159	0.041965	-7.25	0	-0.386414	-0.221904
col_med	-0.300138	0.022898	-13.1	0	-0.34502	-0.255256
col_hi	-0.17827	0.017855	-9.98	0	-0.213267	-0.143273
enggrd_is	0.411662	0.006638	62.02	0	0.398652	0.424673
_cons	1.754659	0.205005	8.56	0	1.352831	2.156487

Instrumented: majdep7

Math GPA - "fearful 12 + crying 12"
Second-stage regressions
IV (2SLS) regression with robust std. errors   Number of obs =   18340
F(61, 18278) = 121.74
Prob > F   = 0.0000
R-squared   = 0.2753
Root MSE   = .87929

matgpa	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.327588	0.14129	-2.32	0.02	-0.604529	-0.050647
wave1	0.000901	0.015395	0.06	0.953	-0.029274	0.031076
female	0.089806	0.014168	6.34	0	0.062036	0.117577
jan	-0.082804	0.303932	-0.27	0.785	-0.678539	0.512932
feb	(dropped)					
mar	(dropped)					
apr	-0.250985	0.146785	-1.71	0.087	-0.538698	0.036727
may	-0.198943	0.143069	-1.39	0.164	-0.479372	0.081486
june	-0.228936	0.142954	-1.6	0.109	-0.50914	0.051267
july	-0.248824	0.143344	-1.74	0.083	-0.529792	0.032144
aug	-0.19231	0.143705	-1.34	0.181	-0.473984	0.089364
sep	-0.174029	0.145593	-1.2	0.232	-0.459404	0.111346
oct	-0.244505	0.152037	-1.61	0.108	-0.542511	0.053502
nov	-0.154579	0.197964	-0.78	0.435	-0.542607	0.23345
agelt12	-0.005706	0.838847	-0.01	0.995	-1.649924	1.638512
age12	0.127681	0.159641	0.8	0.424	-0.18523	0.440592
age13	0.091957	0.149104	0.62	0.537	-0.200301	0.384216
age14	0.048536	0.145944	0.33	0.739	-0.236646	0.333718
age15	0.082333	0.14224	0.58	0.563	-0.196471	0.361138
age16	0.044452	0.140103	0.32	0.751	-0.230164	0.319067
age17	-0.006501	0.138398	-0.05	0.963	-0.277774	0.264772
age18	0.019949	0.137147	0.15	0.884	-0.248871	0.288769
age19	0.045499	0.143931	0.32	0.752	-0.23662	0.327617
grade7	-0.128915	0.060061	-2.15	0.032	-0.246639	-0.011191
grade8	-0.069806	0.04946	-1.41	0.158	-0.166752	0.02714
grade9	-0.121325	0.041203	-2.94	0.003	-0.202086	-0.040564
grade10	-0.175772	0.034195	-5.14	0	-0.242797	-0.108748
grade11	-0.086977	0.02748	-3.17	0.002	-0.14084	-0.033114
hisp_lat	-0.099824	0.022413	-4.45	0	-0.143756	-0.055892
white	-0.004978	0.025582	-0.19	0.846	-0.055122	0.045166
black	-0.080793	0.028743	-2.81	0.005	-0.137133	-0.024453
nat_am	-0.005478	0.037876	-0.14	0.885	-0.079718	0.068762
asian_pi	0.015706	0.032672	0.48	0.631	-0.048335	0.079747
twoparent	0.086486	0.01491	5.8	0	0.057261	0.115711
momdis	-0.000318	0.032372	-0.01	0.992	-0.063771	0.063135
daddis	-0.00297	0.027374	-0.11	0.914	-0.056626	0.050685
mo9_nohs	0.024296	0.028406	0.86	0.392	-0.031382	0.079974
movocnohs	-0.145681	0.074749	-1.95	0.051	-0.292197	0.000835
mohsgrad	-0.016289	0.023696	-0.69	0.492	-0.062735	0.030157
moged	0.072856	0.040744	1.79	0.074	-0.007004	0.152716
movocafhs	0.019425	0.032502	0.6	0.55	-0.044283	0.083132
mocolnogr	-0.004784	0.027356	-0.17	0.861	-0.058405	0.048836
mocol4yr	0.016058	0.025929	0.62	0.536	-0.034765	0.066882
mopostgr	0.074222	0.032616	2.29	0.022	0.010561	0.137883
fa9_nohs	-0.00331	0.02677	-0.12	0.902	-0.055781	0.049161
favocnohs	-0.057792	0.087178	-0.66	0.507	-0.228668	0.113084
fahsgrad	-0.003161	0.019968	-0.16	0.874	-0.0423	0.035977
faged	-0.061135	0.044984	-1.36	0.173	-0.14908	0.026811
favocafhs	-0.001953	0.031615	-0.06	0.951	-0.06392	0.060015
facolnogr	0.004342	0.02541	0.17	0.864	-0.045464	0.054148
facol4yr	0.020214	0.022611	0.89	0.371	-0.024106	0.064533
fapostgr	0.030782	0.028616	1.08	0.282	-0.025309	0.086873
skipgrde	0.005591	0.04189	0.13	0.894	-0.076517	0.087699
adhltpvt	0.001829	0.000509	3.59	0	0.000831	0.002826
abex_1_2	-0.087842	0.02093	-4.2	0	-0.128867	-0.046817
abex_3_10	-0.149936	0.020342	-7.37	0	-0.189808	-0.110064
abex_11pl	-0.209782	0.028146	-7.45	0	-0.264951	-0.154612
unexab	-0.011169	0.001536	-7.27	0	-0.014179	-0.008158
col_vl	-0.175358	0.049165	-3.57	0	-0.271726	-0.07899
col_low	-0.269279	0.048156	-5.59	0	-0.363669	-0.17489
col_med	-0.285173	0.026619	-10.71	0	-0.337349	-0.232997
col_hi	-0.170131	0.020633	-8.25	0	-0.210574	-0.129687
matgrd_is	0.447984	0.007011	63.9	0	0.434242	0.461727
_cons	1.675621	0.209064	8.01	0	1.265837	2.085406

Instrumented: majdep7

Appendix D (Continued)

Social Studies GPA - "fearful 12 + crying 12"
Second-stage regressions
IV (2SLS) regression with robust std. errors   Number of obs = 15967

F(61, 15905)	= 115.23
Prob > F	= 0.0000
R-squared	= 0.3016
Root MSE	= .81561

socsgpa	Coef. (Robust)	Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.329744	0.137018	-2.41	0.016	-0.598315	-0.061172
wave1	-0.024958	0.015219	-1.64	0.101	-0.054789	0.004874
female	0.119449	0.014167	8.43	0	0.091681	0.147217
jan	-0.238781	0.348238	-0.69	0.493	-0.921367	0.443805
feb	(dropped)					
mar	(dropped)					
apr	-0.23126	0.186075	-1.24	0.214	-0.595987	0.133467
may	-0.211864	0.183169	-1.16	0.247	-0.570895	0.147168
june	-0.214366	0.18306	-1.17	0.242	-0.573185	0.144453
july	-0.206326	0.183323	-1.13	0.26	-0.56566	0.153009
aug	-0.205273	0.183578	-1.12	0.264	-0.565106	0.15456
sep	-0.217014	0.185459	-1.17	0.242	-0.580535	0.146507
oct	-0.104721	0.193293	-0.54	0.588	-0.483598	0.274156
nov	-0.211056	0.227375	-0.93	0.353	-0.656737	0.234626
agelt12	1.255294	0.357754	3.51	0	0.554055	1.956533
age12	0.476217	0.134612	3.54	0	0.212362	0.740072
age13	0.429217	0.124018	3.46	0.001	0.186127	0.672307
age14	0.385106	0.120042	3.21	0.001	0.14981	0.620402
age15	0.356918	0.116292	3.07	0.002	0.128973	0.584862
age16	0.263928	0.113082	2.33	0.02	0.042275	0.485582
age17	0.224284	0.11104	2.02	0.043	0.006633	0.441934
age18	0.217433	0.109463	1.99	0.047	0.002874	0.431992
age19	0.029494	0.11819	0.25	0.803	-0.202171	0.261159
grade7	-0.392544	0.060876	-6.45	0	-0.511868	-0.273221
grade8	-0.284592	0.05009	-5.68	0	-0.382774	-0.186411
grade9	-0.277336	0.042581	-6.51	0	-0.360801	-0.193872
grade10	-0.247659	0.034494	-7.18	0	-0.315272	-0.180047
grade11	-0.117671	0.026456	-4.45	0	-0.169528	-0.065813
hisp_lat	-0.032252	0.022582	-1.43	0.153	-0.076516	0.012012
white	-0.012783	0.025166	-0.51	0.612	-0.06211	0.036545
black	-0.07232	0.028331	-2.55	0.011	-0.127853	-0.016788
nat_am	-0.012741	0.03631	-0.35	0.726	-0.083911	0.05843
asian_pi	0.017148	0.032083	0.53	0.593	-0.045738	0.080034
twoparent	0.057667	0.015064	3.83	0	0.02814	0.087194
momdis	0.006531	0.032431	0.2	0.84	-0.057038	0.070101
daddis	-0.034348	0.028501	-1.21	0.228	-0.090213	0.021517
mo9_nohs	-0.012126	0.028731	-0.42	0.673	-0.068442	0.04419
movocnohs	-0.035676	0.079018	-0.45	0.652	-0.190561	0.119208
mohsgrad	0.017144	0.023454	0.73	0.465	-0.028828	0.063116
moged	0.024828	0.039425	0.63	0.529	-0.052452	0.102104
movocafhs	0.050028	0.031914	1.57	0.117	-0.012527	0.112584
mocolnogr	0.00315	0.026913	0.12	0.907	-0.049603	0.055903
mocol4yr	0.013838	0.025742	0.54	0.591	-0.036619	0.064296
mopostgr	0.05339	0.031734	1.68	0.093	-0.008812	0.115593
fa9_nohs	0.005439	0.026738	0.2	0.839	-0.04697	0.057848
favocnohs	0.036086	0.078906	0.46	0.647	-0.118579	0.190751
fahsgrad	-0.003214	0.01994	-0.16	0.872	-0.042299	0.035871
faged	-0.054341	0.045424	-1.2	0.232	-0.143377	0.034696
favocafhs	-0.01146	0.031478	-0.36	0.716	-0.073161	0.050241
facolnogr	0.002669	0.024998	0.11	0.915	-0.046331	0.051668
facol4yr	0.022162	0.022321	0.99	0.321	-0.02159	0.065915
fapostgr	0.051428	0.02775	1.85	0.064	-0.002964	0.105821
skipgrde	0.01369	0.04188	0.33	0.744	-0.0684	0.09578
adhltpvt	0.003598	0.000519	6.94	0	0.002581	0.004614
abex_1_2	-0.063852	0.020954	-3.05	0.002	-0.104924	-0.02278
abex_3_10	-0.126551	0.020485	-6.18	0	-0.166704	-0.086398
abex_11pl	-0.200224	0.027999	-7.15	0	-0.255106	-0.145342
unexab	-0.012986	0.001589	-8.17	0	-0.016099	-0.009872
col_vl	-0.360592	0.048214	-7.48	0	-0.455097	-0.266087
col_low	-0.330511	0.048465	-6.82	0	-0.425509	-0.235514
col_med	-0.284841	0.02661	-10.7	0	-0.336999	-0.232682
col_hi	-0.179533	0.02112	-8.5	0	-0.220929	-0.138136
socgrd_is	0.421877	0.007394	57.06	0	0.407385	0.43637
_cons	1.601396	0.224238	7.14	0	1.161864	2.040927

Instrumented: majdep7

Science GPA - "fearful 12 + crying 12"
Second-stage regressions
IV (2SLS) regression with robust std. errors   Number of obs = 16387

F(61, 16325)	= 97.67
Prob > F	= 0.0000
R-squared	= 0.2653
Root MSE	= .84903

scigpa	Coef. (Robust)	Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.329127	0.159051	-2.07	0.039	-0.640885	-0.017368
wave1	-0.012958	0.015777	-0.82	0.411	-0.043882	0.017966
female	0.141607	0.014562	9.72	0	0.113064	0.170149
jan	0.410192	0.287539	1.43	0.154	-0.153416	0.9738
feb	(dropped)					
mar	(dropped)					
apr	-0.024206	0.168273	-0.14	0.886	-0.354039	0.305628
may	0.01247	0.164905	0.08	0.94	-0.310761	0.335701
june	-0.002091	0.164807	-0.01	0.99	-0.325131	0.320949
july	-0.018625	0.165166	-0.11	0.91	-0.342369	0.305119
aug	0.028732	0.165432	0.17	0.862	-0.295532	0.352996
sep	0.027644	0.167543	0.16	0.869	-0.300758	0.356047
oct	-0.011231	0.176006	-0.06	0.949	-0.356222	0.33376
nov	-0.033511	0.204332	-0.16	0.87	-0.434025	0.367002
agelt12	0.951903	0.344448	2.76	0.006	0.276746	1.627059
age12	0.491514	0.158828	3.09	0.002	0.180193	0.802835
age13	0.413632	0.149344	2.77	0.006	0.120901	0.706363
age14	0.364905	0.145523	2.51	0.012	0.079664	0.650145
age15	0.343897	0.142329	2.42	0.016	0.064917	0.622877
age16	0.298661	0.139988	2.13	0.033	0.024269	0.573053
age17	0.217202	0.137945	1.57	0.115	-0.053184	0.487589
age18	0.231666	0.13687	1.69	0.091	-0.036615	0.499946
age19	0.188696	0.14529	1.3	0.194	-0.096088	0.47348
grade7	-0.208845	0.062495	-3.34	0.001	-0.331343	-0.086347
grade8	-0.185949	0.051791	-3.58	0	-0.287065	-0.084033
grade9	-0.220769	0.04398	-5.02	0	-0.306975	-0.134563
grade10	-0.163147	0.036496	-4.47	0	-0.234683	-0.09161
grade11	-0.138623	0.029064	-4.77	0	-0.195592	-0.081654
hisp_lat	0.012637	0.023178	0.55	0.586	-0.032795	0.058069
white	0.04314	0.026021	1.66	0.097	-0.007864	0.094143
black	-0.025038	0.028967	-0.86	0.387	-0.081816	0.03174
nat_am	0.043444	0.037935	1.15	0.252	-0.030912	0.117801
asian_pi	0.056636	0.033054	1.71	0.087	-0.008153	0.121425
twoparent	0.061837	0.015418	4.01	0	0.031616	0.092057
momdis	-0.017492	0.033137	-0.53	0.598	-0.082444	0.047461
daddis	-0.030567	0.027519	-1.11	0.267	-0.084506	0.023373
mo9_nohs	-0.062448	0.0296	-2.11	0.035	-0.120467	-0.004429
movocnohs	0.026777	0.075707	0.35	0.724	-0.121617	0.17517
mohsgrad	-0.052969	0.024251	-2.18	0.029	-0.100503	-0.005434
moged	-0.066667	0.041898	-1.59	0.112	-0.148791	0.015458
movocafhs	-0.022807	0.034075	-0.67	0.503	-0.089598	0.043985
mocolnogr	-0.008404	0.027654	-0.3	0.761	-0.062609	0.0458
mocol4yr	0.011724	0.02653	0.44	0.659	-0.040278	0.063726
mopostgr	0.042384	0.032335	1.31	0.19	-0.020995	0.105766
fa9_nohs	0.024425	0.02714	0.9	0.368	-0.028772	0.077622
favocnohs	0.088749	0.080743	1.1	0.272	-0.069516	0.247014
fahsgrad	0.013974	0.020202	0.69	0.489	-0.025624	0.053573
faged	-0.028859	0.044592	-0.65	0.518	-0.116264	0.058547
favocafhs	-0.008422	0.03257	-0.26	0.796	-0.072264	0.055419
facolnogr	-0.02609	0.026082	-1	0.317	-0.077213	0.025034
facol4yr	0.027076	0.022854	1.18	0.236	-0.017719	0.071872
fapostgr	0.040962	0.02879	1.42	0.155	-0.015469	0.097393
skipgrde	0.111169	0.045064	2.47	0.014	0.022839	0.199498
adhltpvt	0.002973	0.000529	5.62	0	0.001935	0.00401
abex_1_2	-0.100829	0.021657	-4.66	0	-0.143279	-0.058379
abex_3_10	-0.186865	0.021164	-8.83	0	-0.228348	-0.145381
abex_11pl	-0.265587	0.029132	-9.12	0	-0.322688	-0.208485
unexab	-0.010395	0.001958	-5.31	0	-0.014233	-0.006558
col_vl	-0.295252	0.052228	-5.65	0	-0.397624	-0.192881
col_low	-0.353432	0.052235	-6.77	0	-0.455817	-0.251046
col_med	-0.247323	0.028363	-8.72	0	-0.302917	-0.19173
col_hi	-0.186135	0.021467	-8.67	0	-0.228213	-0.144057
scigrd_is	0.396503	0.007528	52.67	0	0.381748	0.411258
_cons	1.387841	0.225159	6.16	0	0.946504	1.829178

Instrumented: majdep7

Appendix D (Continued)

Overall GPA - "fearful 12 + crying 12"

Second-stage regressions

IV (2SLS) regression with robust std. errors   Number of obs = 12314

F(61, 12252) = 218.42
Prob > F = 0.0000
R-squared = 0.5143
Root MSE = .51204

overallgpa	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
majdep7	-0.289861	0.111164	-2.61	0.009	-0.50776	-0.071961
wave1	-0.006117	0.011207	-0.55	0.585	-0.028084	0.015849
female	0.122271	0.010276	11.9	0	0.102128	0.142414
jan	-0.026276	0.178219	-0.15	0.883	-0.375615	0.323062
feb	(dropped)					
mar	(dropped)					
apr	-0.197734	0.131386	-1.5	0.132	-0.45527	0.059803
may	-0.139721	0.129222	-1.08	0.28	-0.393017	0.113575
june	-0.162421	0.129148	-1.26	0.209	-0.415572	0.09073
july	-0.160328	0.129385	-1.24	0.215	-0.413944	0.093287
aug	-0.139379	0.129483	-1.08	0.282	-0.393186	0.114428
sep	-0.130303	0.130749	-1	0.319	-0.386591	0.125985
oct	-0.160179	0.135534	-1.18	0.237	-0.425847	0.105488
nov	-0.146077	0.156629	-0.93	0.351	-0.453094	0.160941
agelt12	0.675309	0.345888	1.95	0.051	-0.002686	1.353304
age12	0.308687	0.132353	2.33	0.02	0.049254	0.568119
age13	0.260371	0.127035	2.05	0.04	0.011363	0.509379
age14	0.239115	0.125196	1.91	0.056	-0.006288	0.484518
age15	0.250001	0.123402	2.03	0.043	0.008114	0.491888
age16	0.205668	0.121925	1.69	0.092	-0.033324	0.444661
age17	0.163899	0.121055	1.35	0.176	-0.073389	0.401186
age18	0.196504	0.120234	1.63	0.102	-0.039174	0.432182
age19	0.178768	0.12682	1.41	0.159	-0.069821	0.427356
grade7	-0.170865	0.042147	-4.05	0	-0.25348	-0.08825
grade8	-0.133135	0.035479	-3.75	0	-0.202679	-0.063592
grade9	-0.173671	0.03067	-5.66	0	-0.233789	-0.113553
grade10	-0.143198	0.025308	-5.66	0	-0.192804	-0.093591
grade11	-0.087081	0.020512	-4.25	0	-0.127288	-0.046874
hisp_lat	-0.015102	0.016396	-0.92	0.357	-0.04724	0.017037
white	-0.009827	0.01839	-0.53	0.593	-0.045873	0.02622
black	-0.059747	0.020602	-2.9	0.004	-0.100129	-0.019364
nat_am	-0.012046	0.027188	-0.44	0.658	-0.065339	0.041247
asian_pi	0.003783	0.023109	0.16	0.87	-0.041514	0.049079
twoparent	0.059791	0.010966	5.45	0	0.038295	0.081286
mo9_nohs	-0.042954	0.021123	-2.03	0.042	-0.084358	-0.00155
movocnohs	-0.024494	0.05757	-0.43	0.671	-0.13734	0.088352
mohsgrad	-0.011378	0.017022	-0.67	0.504	-0.044743	0.021988
moged	0.016704	0.029291	0.57	0.569	-0.040712	0.07412
movocafhs	0.011745	0.023845	0.49	0.622	-0.034995	0.058486
mocolnogr	-0.007642	0.019314	-0.4	0.692	-0.045501	0.030217
mocol4yr	0.01513	0.018527	0.82	0.414	-0.021186	0.051446
mopostgr	0.047029	0.022955	2.05	0.041	0.002035	0.092024
fa9_nohs	0.006692	0.019616	0.34	0.733	-0.031758	0.045142
favocnohs	0.066842	0.066639	1	0.316	-0.063781	0.197464
fahsgrad	0.017219	0.014323	1.2	0.229	-0.010856	0.045294
faged	-0.031068	0.030085	-1.03	0.302	-0.09004	0.027905
favocafhs	-0.011401	0.022559	-0.51	0.613	-0.055619	0.032818
facolnogr	-6.73E-05	0.018001	0	0.997	-0.035352	0.035218
facol4yr	0.027766	0.015976	1.74	0.082	-0.00355	0.059081
fapostgr	0.055841	0.020409	2.74	0.006	0.015836	0.095846
momdis	-0.005424	0.024341	-0.22	0.824	-0.053137	0.04229
daddis	-0.028721	0.020558	-1.4	0.162	-0.069018	0.011576
col_vl	-0.204455	0.03869	-5.28	0	-0.280294	-0.128616
col_low	-0.202955	0.038171	-5.32	0	-0.277777	-0.128134
col_med	-0.247719	0.02044	-12.12	0	-0.287784	-0.207655
col_hi	-0.152858	0.015312	-9.98	0	-0.182872	-0.122844
abex_1_2	-0.082561	0.014844	-5.56	0	-0.111656	-0.053465
abex_3_10	-0.130075	0.014643	-8.88	0	-0.158778	-0.101372
abex_11pl	-0.201902	0.02067	-9.77	0	-0.242419	-0.161385
unexab	-0.009608	0.001574	-6.11	0	-0.012693	-0.006524
skipgrde	0.016482	0.032461	0.51	0.612	-0.047148	0.080111
adhltpvt	0.001712	0.000374	4.58	0	0.00098	0.002444
overallgpa_	0.559925	0.007448	75.18	0	0.545326	0.574523
_cons	1.253276	0.184286	6.8	0	0.892046	1.614506

Instrumented: majdep7

Appendix E: U.S. Senate Proposal, FY 09 ESSCP Funding Increase

United States Senate
WASHINGTON, DC 20510

April 4, 2008

The Honorable Tom Harkin
Chairman
Subcommittee on Labor, Health
and Human Services, and Education
Senate Appropriations Committee
184 Dirksen Senate Office Building
Washington, DC 20510

The Honorable Arlen Specter
Ranking Member
Subcommittee on Labor, Health
and Human Services, and Education
Senate Appropriations Committee
184 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Harkin and Ranking Member Specter:

We are writing to respectfully request that you provide the highest fiscally responsible
increase in funding for the Elementary and Secondary School Counseling Program
(ESSCP) in the fiscal year 2009 appropriations bill for the Departments of Labor, Health
and Human Services, and Education. ESSCP provides federal funding for critical school
counseling programs and is authorized under Title V, Part D, Subpart 2 of the Elementary
and Secondary Education Act (20 U.S.C. §7245.)

Since initial passage of the Elementary and Secondary Education Act (ESEA) in 1965, the
federal government has made a commitment to providing financial assistance to states,
local school districts, and individual schools to help improve educational opportunities for
low income and disadvantaged students. ESSCP is a valuable ESEA program that assists
in this effort to improve education opportunities by providing funding for expanded
counseling services for students. Pupil service professionals like school counselors, school
social workers, and school psychologists provide crucial daily academic and social services
to elementary and high school students and increased ESSCP funding in fiscal year 2009
will help provide additional services to an even larger number of students.

As you know, the ESSCP's statutory language contains a funding trigger directing the
Department of Education to award ESSCP grants only to elementary school programs
unless the funding for ESSCP surpasses $40 million. Under your leadership, Congress
appropriated over $48 million for ESSCP in fiscal year 2008, the first time that the
statutory trigger was exceeded. The fiscal year 2008 appropriation ensured that secondary
school programs were able to participate in the ESSCP program and helped to extend the
benefits of ESSCP resources to our nation's middle and high school students. We urge
you to provide increased appropriations to ESSCP to not only ensure the statutory trigger
is met again, but to also ensure that we can provide as many ESSCP resources as possible
to both our elementary and secondary schools.

School counseling fulfills a vital role in American public education and supplements the
important academic work that goes on in our nation's classrooms by providing valuable
guidance and support to students and their families through academic and social

programming. School counselors and other pupil service professionals help to ensure that our schools meet the educational needs of the whole child, including students' social and health needs as well as academic needs. Unfortunately, this nation still has a long way to go in providing adequate pupil services to our nation's students. According to the American School Counselor Association, the recommended student-to-counselor ratio is 250 to 1, but in reality, the average student-to-counselor ratio now approaches 476 to 1. The recommended student-to-school social worker ratio is 400 to 1, but in many states, the number of students that social workers provide services to exceeds that ratio. The National Association of School Psychologists' Guidelines recommend a student-to-school psychology service staff ratio no higher than 1000 to 1, a ratio that is also exceeded in many states and school districts. Local, state, and federal resources will all be necessary to lower the student-to-pupil service provider ratios and ESSCP funds are critical to those ongoing efforts.

In order to close the pervasive achievement gap that exists in this nation and improve the quality of education for all of America's children, regardless of their background, much more needs to be done to improve our nation's schools. Providing increases in the ESSCP fiscal year 2009 funding is one way that we can continue efforts to improve the quality of educational services provided to all of America's children.

Thank you for your commitment to this program and your attention to this request.
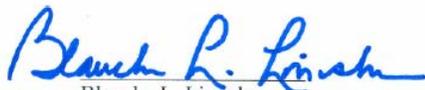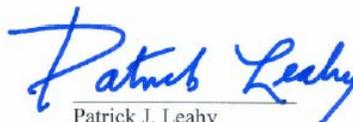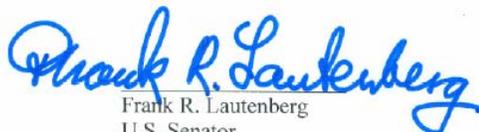
Sincerely,

Russell D. Feingold
U.S. Senator

Herb Kohl
U.S. Senator

Blanche L. Lincoln
U.S. Senator

Patrick J. Leahy
U.S. Senator

Frank R. Lautenberg
U.S. Senator

Barack Obama
U.S. Senator

FY09 Elementary and Secondary School Counseling Program Letter 2
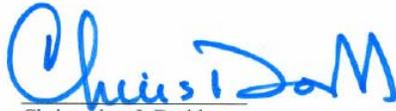
Sheldon Whitehouse
U.S. Senator

Robert Menendez
U.S. Senator

Richard J. Durbin
U.S. Senator

Carl Levin
U.S. Senator

Christopher J. Dodd
U.S. Senator

FY09 Elementary and Secondary School Counseling Program Letter 3

About the Author

Chris Jones received a bachelor's degree in Food & Resource Economics from the University of Florida in 1990, and a Master's Degree in Business Administration from Rollins College in 1992. He began his career as a consulting economist with the firm of Fishkind & Associates, Inc. in Orlando, Florida. He has spent his entire 16-year professional career as a regional and real estate economist, including positions as Director of Economics for MSCW, Inc. in Orlando, Chief Economist for the City of Orlando, and now as the President of Florida Economic Advisors, LLC in Valrico.

While in the Economics Ph.D. program at the University of South Florida, Mr. Jones earned his M.A. in Business Economics (2005), and has broadened his scope of research interest to include the field of mental health economics. He has also taught the Principles of Macroeconomics course to USF undergraduate students and business majors.