Post-Secondary Enrollment Decisions of High School Students: The Effect of Socioeconomic Status

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Abstract

Discrepancies exist in the type of students who attend, and graduate from, post-secondary institutions. This study investigates the impact of socioeconomic status on students' enrollment decisions using the Education Longitudinal Study (ELS:2002). Using an ordinary least square (OLS) model specification, attendance is regressed against a combination of demographic and socioeconomic characteristics. The findings reveal that the statistical significance of the independent variables changes based on the inclusion of school income or parental income categories. Differences were observed among sex, race, standardized test scores, student work hours, and parental educational attainment variables.

Keywords: post-secondary enrollment, socioeconomic status, college choice, student decision, Education Longitudinal Study (ELS), free lunch program

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1 Introduction

The college decision process comes down to two explicit steps: acceptance and enrollment. There is abundant research regarding the admission of students based on certain qualitative and quantitative factors, but less research exists regarding students' enrollment decisions (Engberg and Wolniak, 2010; Lovenheim and Reynolds, 2011; Sackett et al., 2012; Declercq and Verboven, 2015; Dunifon and Kowaleski-Jones, 2003; Hoxby and of Economic Research, 2004). The primary explication for this gap in research is the availability of data. As researchers attempt to explain the behavior of students over time, they need access to detailed accounts of their background. Most researchers focus on the main factors that impact students' enrollment decisions such academic ability, socioeconomic status, demographics, and financial aid offers (Lovenheim and Reynolds, 2011; Sackett et al., 2012; Declercq and Verboven, 2015). Other researchers expand into specific aspects of the process, such as access to information about colleges or the effects of high school related factors (Engberg and Wolniak, 2010). While examining the impacts of many of the variables noted in previous studies, I will expand upon the research of many economists, most notably Engberg and Wolniak (2010), by exploring the significance that enrollment in the National School Lunch Program (NSLP) has on students' enrollment decisions. Like their study, I will utilize the Educational Longitudinal Study (ELS:2002).

2 Literature Review

Students' enrollment decisions vary depending on combinations of various factors unique to each student. One factor studied significantly is academic ability. It is logical that academically-inclined students would be more likely to attend college. This academic ability is exhibited and studied using different metrics such as SAT Scores (Sackett et al., 2012) the Armed Forces Qualifying Test (AFQT) (Lovenheim and Reynolds, 2011) and grade point averages, if available (Engberg and Wolniak, 2010). Lovenheim and Reynolds (2011) found that middle and high ability students (on the basis of AFQT scores) had lower nonattendance rates than low-ability students. These results are consistent with another study that finds the odds of enrolling in two-year and four-year colleges, relative to non-enrollment, are significantly higher for students with the highest level of math, and higher GPA (Engberg and Wolniak, 2010). This area of research is further supported by the correlation between SAT scores and socioeconomic status; "21.2% of the variance in SAT scores is shared with SES" (Sackett et al., 2012). Overall, the ability constraint can be a stronger influence for some students because financial difficulties can be offset by financial aid offerings. Many of these offerings are extended to high performing students but the complexities of this system often make it difficult for students to take full advantage of what could be offered to them (Lovenheim and Reynolds, 2011; Hoxby and of Economic Research, 2004).

Some high performing students are plagued by the relationship between socioeconomic status and college enrollment. Socioeconomic status has an impact on academic ability, as noted in the correlation of SAT score and socioeconomic status (Sackett et al., 2012). This is supported by the finding that the "effect of socioeconomic status on enrollment in higher education decreases when controlling for academic ability" (Declercq and Verboven, 2015). In another study, socioeconomic status was statistically significant across two-year and four-year enrollment, relative to non-enrollment, implying that as socioeconomic status increases so does enrollment regardless of institution (Engberg and Wolniak, 2010). Declercq and Verboven (2015) came to a

similar conclusion that below a certain level, socioeconomic status determines the decision to enroll at any institution, rather than merely influencing the type of institution chosen: two-year or four-year enrollment vs. non enrolment.

It is predictable that as socioeconomic status decreases, enrollment would also decrease. This can be explained through the lower preference for education among lower socioeconomic status students, along with the increased opportunity cost of attendance and higher sensitivity to changes in the cost of higher education (Declercq and Verboven, 2015). Furthermore, only 16.1% of low-income students in one study enrolled in higher education compared to the 25.8% of students who were high income (Declercq and Verboven, 2015). In many studies, socioeconomic status and income are evaluated not only through income information, but by proxy using parental education achievement, parental occupation, perceived spending abilities, and the receipt of need-based grants (Engberg and Wolniak, 2010; Declercq and Verboven, 2015; Dunifon and Kowaleski-Jones, 2003).

Socioeconomic status can be an indicator and follow similar patterns of other demographic qualities that impact students' enrollment decisions. In the United States, where 47.1% of college students are non-white, multiracial students were found to be less likely to attend 2-year college than white students, relative to not enrolling (Engberg and Wolniak, 2010). Female enrollment in higher education has increased over the past 50 years but significant differences in the behaviors of male and female students remain. Theoretically due to different opportunity costs for females such as raising a family (Lovenheim and Reynolds, 2011). These demographic differences often coincide with different learning environments such as school income and urbanicity. Some unique variables used were parental social networks, the number students' friends attending college, as well as the aspirations these friends and family have for students (Engberg and Wolniak, 2010; MacAllum, 2007). These variables have a significant influence on 4-year college enrollment, amplifying the importance of human, cultural, and social capital (Engberg and Wolniak, 2010).

Credit constraints are another factor influenced by socioeconomic status; lower income levels are correlated with lower access to credit. If these constrains are significant, they can become essential to the students' enrollment decision, especially if they cannot be overcome by the availability of financial aid. Financial aid provides limited equalization of price across school types, making it more difficult for students to enroll in colleges where their academic abilities are better fitting. This is especially evident for students who are medium-income and not eligible for federal aid (Lovenheim and Reynolds, 2011). Financial aid is another indicating component of student's decision, with an extra thousand dollars raising the probability of enrollment by 11% in one study (Hoxby and of Economic Research, 2004).

The previously mentioned factors have influences on students' lives beyond their enrollment decisions. A prime example of this is the availability of essential nutrition. Food insecurity, which is defined by the USDA as a "household-level of economic and social condition of limited or uncertain access to adequate food" can lead to both nutritional and non-nutritional consequences including poor health and increased stress (USDA, 2020a). Food insecurity can come in many forms, with variable coping strategies. Two of the most common of these is watering down food or drinks and purchasing inexpensive but unhealthy food (FRCA, 2017). Many studies show that childhood poverty and associated food insecurity have effects that carry through adulthood such as degraded mental health, disease, learning impairments, and lower academic achievement as a result of continued high stress load (FRCA, 2017; Dunifon and Kowaleski-Jones, 2003; Jyoti et al., 2005; Silva et al., 2017). As previously noted, strong correlations have been found between academic performance

and college enrollment, suggesting another avenue in which food insecurity could impact students' enrollment decisions outside of their current socioeconomic state (Sackett et al., 2012; Lovenheim and Reynolds, 2011; Engberg and Wolniak, 2010). These studies on enrollment decisions have not mentioned the direct impact of food insecurity.

3 Descriptive Statistics

The Education Longitudinal Study (ELS:2002) is the source of data for this study. The ELS was performed by the National Center for Education Statistics beginning in 2002 and presents panel data via longitudinal study of 10^{th} graders starting in 2002. In 2002, the baseline survey was performed on high school sophomores, with follow up surveys completed in 2004, 2005, 2006, 2012 and 2013 (NCES, 2021). Separate surveys were administered to students, parents, teachers, and school administrators comprising over 15,000 students and parents from 750 schools around the United States (NCES, 2021). Students were also subjected to reading and math cognitive tests (NCES, 2021).

As mentioned previously, other studies have focused on the impacts of traditional factors (i.e. socioeconomic status, parental occupation, and education attainment). I made an attempt to investigate in more detail the influence of food insecurity, as represented by the receipt of free or reduced lunches. To do so, I planned to estimate the impact of food security by evaluating the influence of eligibility for the National School Lunch Program (NSLP), as included in the ELS:2002 data set. The NSLP program runs in the United States with the goal of bringing food and nutrition to students who do not have consistent or sufficient access to nutritious food in their homes. A recent estimate found that 92% of students in the United States have access to this program, and 56% participate (Dunifon and Kowaleski-Jones, 2003).

Although this program is structured to help reduce food insecurity and improve the nutrition of school-aged children, eligibility is based purely off relation to the poverty level. In this case, families within 130% of the poverty level receive a free lunch subsidy, and those within 185% of the poverty level received a reduced-price subsidy (USDA, 2001). In addition to being collinear with our income variables, previous researchers concluded that income was not the only factor in food insecurity (El Zein et al., 2019). Availability of nutrients is correlated with student's cognition and behavior. Food insecurity has been found to produce "fatigue, difficulty, concentrating, and irritably" in addition to raising students stress levels and lowering their attendance rates (Silva et al., 2017). These factors can influence academic ability, which impacts students' college enrollment decisions. However, upon preliminary evaluation, the free lunch percentage variable proved not to be as descriptive as previously thought. Instead of inducing a diverse perspective on students' educational decision, it repeats the similar results to other variables due to a strong correlation with already included variables.

The interim goal of this research is comparing the decision of outliers – lower income students at higher income schools, and higher income students at lower income schools – to determine if there is variability in the factors that influence their decisions. The key variables compared in this study are parental income, parental educational status, school income (via NSLP)[1], number of hours a student works per week, standardized

[1]In this analysis, the free lunch percentage variable is re purposed to describe the overall income of the school, because it was gathered at the school level.

Table 3.1: Descriptive Statistics

Sex	**N**	%	**Race**	**N**	%
Female	6377	52%	Amer. Indian / AK Native	101	1%
Male	5944	48%	Asian, Pacific Islander	1103	9%
			Black / African American	1621	13%
			Hispanic	1709	14%
Parental Educational Attainment	**N**	%	More than 1 Race	580	5%
DNF High School	709	90%	White	7121	58%
Graduate High School	2360	298%			
Some 2-Year	1316	166%			
Graduated 2-year	1275	161%			
Some 4-Year	1400	177%	**Percent of School that Receive NSLP**	**N**	%
Graduated 4-Year	2832	358%	0-5%	4301	33%
Completed Masters / Eq.	1496	189%	6-10%	1226	10%
Completed PhD/MD/Eq.	902	114%	11-20%	2116	16%
			21-30%	1591	12%
# Hours Worked by Student (2004)	**N**	%	31-50%	1817	14%
Part-Time	12107	94%	51-75%	1127	9%
Full-Time	791	6%	76-100%	720	6%

test scores, and basic demographic characteristics such as sex and race. A descriptive list of the variables and their coding has been included in Appendix 1.

To get a better understanding of the population surveyed for this report, a number of the variables are described above in Table 3.1. The following are some important points to mention. There were a greater number of females surveyed than males. 58% of students surveyed were White, followed by 14% Hispanic, 13% Black/African American and 9% Asian/Pacific Islanders. Of the students who held jobs during their senior year, only 6% of them worked full time[2]. In regards to income-related variables, 86% of participants went to school where less than half of the population received NSLP subsidies. Lastly, 75% of students surveyed through the second follow up attended (not necessarily graduated) from a post-secondary institution.

To more clearly see how the independent variables are related to enrollment decisions, they have been cross-tabulated in Table 3.2. As mentioned before, a higher number of females were surveyed. Our understanding of this statistic develops further with the knowledge that, in our data set, 79% of females and 72% of males attend post secondary institutions (Table 3.2). Another key characteristic of this data is the change in hours worked between sophomores and seniors. A larger number of seniors did not work their senior year, yet the majority of these students still attended college. Of the students that did work, at least half in each category attended college. A side by side comparison is included in Appendix 2.

Additional insights are provided by Figure 1. Numerically, there are a larger number of students who attend college in higher-income groups. However, the percentage of students who attend college within each group is relatively similar until income becomes greater than $25,000. At this point, there is an increasing trend in the percentage of students who attend college within each income category.

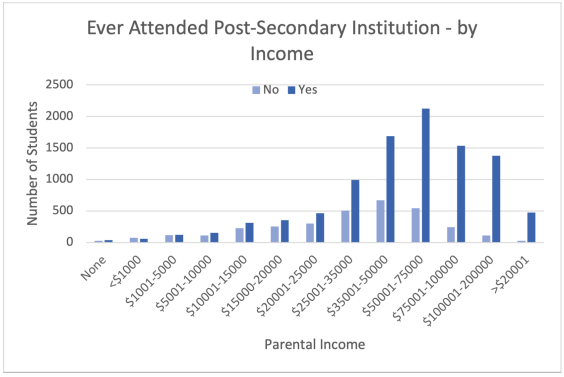
[2]Full time is defined as working at least 26 hours per week

Table 3.2: Cross Tabulations by Post-Secondary Institution Attendance

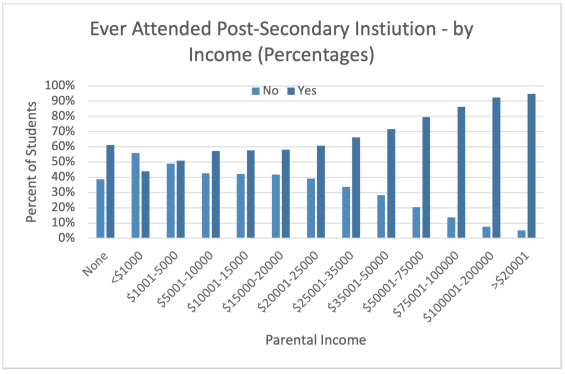
	Ever Attended	
SEX	**No**	**Yes**
Female	1351	5026
Male	1691	4253
RACE	**No**	**Yes**
Amer.Ind.	47	54
Asian	154	949
Black/African American	518	1103
Hispanic	623	1086
White	1466	5655
>1 Race	178	402
INCOME	**No**	**Yes**
None	24	38
<$1000	75	59
$1001-5000	115	120
$5001-10000	113	152
$10001-15000	229	313
$15000-20000	255	354
$20001-25000	299	463
$25001-35000	504	989
$35001-50000	669	1687
$50001-75000	545	2126
$75001-100000	242	1535
$100001-200000	113	1378
>$20001	26	475
% SCHOOL FLP	**No**	**Yes**
0-5%	494	3807
6-10%	279	947
11-20%	582	1534
21-30%	450	1141
21-50%	650	1167
51-75%	443	684
76-100%	311	409
URBANICITY	**No**	**Yes**
Urban	1019	3521
Suburban / Rural	2190	6168

	Ever Attended	
PARENTAL ED.	**No**	**Yes**
DNF High school	354	355
High school Grad	970	1390
Some 2-Year	414	902
Graduate 2-Year	339	936
Some 4-Year	344	1056
Graduate 4-Year	390	2442
Graduate Masters/Eq	128	1368
Graduate PhD/MD/Eq	83	819
10^{th} **GRD WRK HRS**	**No**	**Yes**
Did not work (10)	1414	5076
1-5 hrs/wk	121	690
6-10 hrs/wk	160	782
11-15 hrs/wk	146	413
16-20 hrs/wk	172	464
21-25 hrs/wk	80	178
26-30 hrs/wk	76	105
31-25 hrs/wk	29	40
36-40 hrs/wk	45	64
>40 hrs/wk	31	55
12^{th} **GD WRK HRS**	**No**	**Yes**
Did not work	741	2510
1-5 hrs/wk	149	744
6-10 hrs/wk	147	1120
11-15 hrs/wk	207	1215
16-20 hrs/wk	313	1444
21-25 hrs/wk	281	893
26-30 hrs/wk	236	555
31-25 hrs/wk	183	256
36-40 hrs/wk	309	333
>40 hrs/wk	160	159
REGION	**No**	**Yes**
Northeast	495	1845
Midwest	784	2534
South	1298	3427
West	632	1883

Figure 1: Post-Secondary School Cross Tabulations



(a) Number of Students



(b) Percentage of Students

4 Methods

The main goal of this paper has been to better understand high school students' decision-making behaviors in regards to college enrollment. This can be broken down into two main components; acceptance and the decision to attend. This paper focuses on the latter. Education researchers traditionally use multinomial logit models or hierarchical general linear modelling to answer these questions, with researchers referenced above utilizing them either on their own or in combination with other models (Nguyen and Taylor, 2003; Engberg and Wolniak, 2010; Lovenheim and Reynolds, 2011). These advanced econometric techniques are performed by those possessing advanced degrees in economics. To make this research tractable for an undergraduate student, I have modified my econometric approach to use ordinary least squares (OLS) to answer my research question. For the following model, the dependent variable *Attend* is defined as follows:

$$Attend_i = \begin{cases} 1 : student\ ever\ attended\ post-secondary\ institution \\ 0 : student\ never\ attended\ post-secondary\ institution \end{cases} \tag{1}$$

When regressing with a dummy dependent variable, OLS is also known as a linear probability model. It is applied in this situation to estimate the impact of various independent variables on whether a student goes to college. This model's goal is to minimize the sum of the squared residuals between the observed data and the predicted model. For this particular model, the dependent variable is a dummy of whether a student goes to college. The interpretation of the generated coefficients will provide us with an understanding of how each independent variable impacts the probability of a student attending college. The full OLS equation is included below. The variables *race*, parental education (*ParEd*), and *income* are categorical, and representative of a group of variables and their respective coefficients.

$$Attend_i = \beta_0 + \beta_1 sex_i + \beta_2 race_i + \beta_3 ParEd_i + \beta_4 urban_i + \beta_5 income_i + \beta_6 FullTime_i + \varepsilon_i \tag{2}$$

One complication of this data set is the number of categorical independent variables. This impacts the interpretation of the coefficients. For example, income is given in categories, not dollar values. Instead of being able to interpret the effect of each additional dollar, we instead must interpret the differences between income groups. Although this interpretation can be difficult, OLS provides the most digestible way to interpret the results.

5 Estimation

To explore the impact of a variety of variables on students' educational decision, I started with a basic regression of sex, race, parental education, income, urbanicity, standardized test scores, free lunch percentage (FLP), and hours worked against the dependent attendance variable. The two regressions are compared in Table 5.1. The first column includes 12^{th} grade work hours (F1WRKHRS), and the second 10^{th} grade work hours (BYWRKRS). The 12^{th} grade work hours produce a better fit, with an R-squared value of 0.224 compared to 0.203 for the 10^{th} grade values. If both 10^{th} and 12^{th} grade work hours are regressed in the same equation, high correlation would be expected. 10^{th} grade hours have been dropped from the equation for future regressions. A few other notable results from Table 5.1 are that parental income is not significant for either specification of the model. This is likely due to high correlation between the students' income and the income level of the school (as reported by free lunch percentage).

Table 5.1: Initial Regression Results

	F1WRKHRS	BYWRKHRS
Sex	-0.0642***	-0.0706***
Amer.Indian/Alaska Native	0.0000	0.0000
Asian, Hawaii/Pac.Isl	0.1368***	0.1407**
Black/AfAm	0.1030*	0.1218**
Hispanic	0.0561	0.0762
More than 1 Race	-0.0164	-0.0132
White	0.0422	0.0503
$1,000	-0.1035	-0.2394***
$1,001-$5,000	-0.0377	-0.1568*
$5,001-$10,000	0.0075	-0.0856
$10,001-$15,000	-0.0324	-0.1270*
$15,001-$20,000	-0.0105	-0.1119
$20,001-$25,000	0.0039	-0.0986
$25,001-$35,000	0.0216	-0.0745
$35,001-$50,000	0.0356	-0.0520
$50,001-$75,000	0.0696	-0.0201
$75,001-$100,000"	0.0840	-0.0127
$100,001-$200,000	0.0806	-0.0119
$\$200,001$	0.0779	-0.0227
Graduate High School	0.0178	0.0273
Some 2-Year	0.0804***	0.0978***
Graduate 2-Year	0.0894***	0.1135***
Some 4-Year	0.1038***	0.1164***
Graduated 4-Year	0.1421***	0.1696***
Completed Masters/Eq	0.1475***	0.1713***
Completed PhD, MD, Other	0.1206***	0.1438***
0-5%	0.0000	0.0000
6-10%	-0.0400**	-0.0454**

11-20%	-0.0519***	-0.0639***
21-30%	-0.0328**	-0.0335**
31-50%	-0.0577***	-0.0653***
51-75%	-0.0880***	-0.0889***
76-100%	-0.0734***	-0.0950***
Senior did not work	0.0000	
Senior worked 1-5 hrs/wk	0.0099	
Senior worked 6-10 hrs/wk	0.0634***	
Senior worked 11-15 hrs/wk	0.0393**	
Senior worked 16-20 hrs/wk	0.0476***	
Senior worked 21-25 hrs/wk	0.0069	
Senior worked 26-30 hrs/wk	-0.0249	
Senior worked 31-35 hrs/wk	-0.1079***	
Senior worked 36-40 hrs/wk	-0.1609***	
Senior worked over 40 hrs/wk	-0.1598***	
Sophomore did not work		0.0000
Sophomore worked 1-5 hrs/wk		0.0109
Sophomore worked 6-10 hrs/wk		0.0221
Sophomore worked 11-15 hrs/wk		-0.0389*
Sophomore worked 16-20 hrs/wk		-0.0125
Sophomore worked 21-25 hrs/wk		-0.0289
Sophomore worked 26-30 hrs/wk		-0.1275***
Sophomore worked 31-35 hrs/wk		-0.1027*
Sophomore worked 36-40 hrs/wk		-0.0752*
Sophomore worked over 40 hrs/wk		-0.0392
Standardized test composite score	0.0116***	0.0120***
School urbanicity	-0.0304***	-0.0283***
Observations	11350	10141
R^2	0.224	0.203

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

To test for multicollinearity and get a better sense of the model, a variable inflation factor analysis (VIF) was performed and the output is included in Appendix 3. As expected, some of the income dummies have VIF scores above 10, which indicates high correlation. Surprising, most of the race VIF scores are also above 10. To control for this multicollinearity of income, it is better to examine the effects of the included variables for people of different socioeconomic status, therefore BY10FLP and BYINCOME will not be regressed together.

Table 5.2 separates the regression results by parental income as reported on the base year survey. From this point forward, work hours have been re-coded to part-time and full-time[3]. The intention of this specification of the model is to compare which variables are significant and the direction of their impact across students

[3]Full time is defined as 26 hours or more per week.

Table 5.2: Effect on College Enrollment, by Student Income

	None	<$1,000	$1,001-5,000	$5,001-10,000	$10,001-15,000	$15,001-20,000	$20,001-25,000	$25,001-35,000	$35,001-50,000	$50,001-75,000	$75,001-100,000	$100,001-200,000	>$200,001
Sex	-0.1339	-0.1696*	-0.1222	-0.1802**	-0.1596***	-0.1050**	-0.1368***	-0.0987***	-0.0685***	-0.0678***	-0.0493**	-0.0387**	-0.0267
Asian, Hawaii/Pac.Isl	-0.0729	-0.0279	0.1161	0.2627	0.6348**	0.2776	0.0736	0.1011	0.2532*	0.0859	0.0448	0.2021	0.5231***
Black/AfAm	0.1227	-0.1862	0.0388	0.1086	0.5830**	0.2148	-0.0614	0.0995	0.1933*	0.0864	0.0538	0.1125	0.4430**
Hispanic	-0.2263	-0.1428	0.0775	0.0664	0.4411*	0.1999	-0.0371	0.0115	0.1184	-0.0268	0.0549	0.2011	0.4119**
More than 1 Race	-0.3677	0.0359	0.0215	0.0771	0.3084	-0.0653	-0.2653	-0.1420	0.1409	-0.0069	-0.0929	0.1741	0.5047**
White	-0.2792	-0.2608	0.0337	-0.1127	0.3861*	0.0459	-0.1893	-0.0287	0.1338	0.0299	0.0077	0.1798	0.4582**
Graduate High School	-0.3366	0.4103**	-0.1140	0.0680	0.0506	-0.0417	0.0424	0.0348	-0.0136	0.1239*	0.3361***	0.7044***	0.0887
Some 2-Year	-0.4843	0.3277*	-0.0983	0.1930	0.0292	-0.0565	0.0444	0.1401**	0.1166*	0.1618**	0.3832***	0.6276***	0.2172
Graduate 2-Year	-0.4220	0.0443	0.1190	0.0623	-0.0130	-0.0411	0.1539*	0.1310*	0.1023*	0.1878**	0.4345***	0.7532***	0.3006
Some 4-Year	-0.7168*	0.2988	-0.0030	0.0654	0.0730	0.0744	0.1086	0.1154*	0.0900	0.2184***	0.3857***	0.7413***	0.3332*
Graduated 4-Year	-0.5869	0.4639*	0.1402	0.1666	0.1789*	0.0805	0.1667*	0.1741***	0.1182**	0.2692***	0.4329***	0.7543***	0.2594
Completed Masters/Eq	-0.6790	0.7219*	0.0842	0.2940	0.1327	0.0668	0.2492**	0.1954**	0.1465**	0.2752***	0.4614***	0.7558***	0.2537
Completed PhD, MD, Other	-0.1172	0.6771*	-0.0664	0.2120	0.0118	0.0357	0.0617	0.2064**	0.1915**	0.2642***	0.4097***	0.7314***	0.2540
Standardized Test Composite Score	0.0175*	0.0165**	0.0182***	0.0216***	0.0178***	0.0184***	0.0150***	0.0159***	0.0136***	0.0113***	0.0097***	0.0078***	0.0042***
School Urbanicity	-0.0439	0.0884	0.0492	0.0834	0.0439	0.0415	0.0123	0.0396	0.0518*	0.0209	0.0256	0.0380**	0.0321
6-10%	-0.3321	-0.3019	-0.3398*	-0.0969	-0.2077*	-0.1479	-0.0209	-0.0386	-0.0366	-0.0687**	0.0044	-0.0162	0.0363
11-20%	-0.4667	0.2884	-0.0639	-0.2255	-0.1225	-0.1416*	-0.0978	-0.0979*	-0.0348	-0.0733***	-0.0331	-0.0565**	-0.0516
21-30%	-0.0441	0.2140	-0.1744	-0.1112	0.0050	-0.0120	-0.0697	-0.0161	-0.0555	-0.0575*	-0.0318	0.0184	-0.2802***
31-50%	-0.1266	-0.0321	-0.2937*	-0.1108	-0.1314	-0.1169	-0.0936	-0.0461	-0.0674*	-0.0327	-0.1153***	-0.0542	-0.0752
51-75%	-0.4508	0.1945	-0.2036	-0.0916	-0.1734*	-0.1324	-0.0949	-0.0762	-0.1122**	-0.1018**	-0.1600***	-0.0407	-0.1619
76-100%	-0.1555	0.0905	-0.3379*	-0.1154	-0.0494	-0.0878	-0.1734*	-0.0238	-0.1205**	-0.1269**	-0.2737***	-0.1480*	0.0999
Full-Time (F1)	0.2898	0.1082	-0.0371	-0.0193	0.0628	0.0872	-0.0201	-0.0403	-0.0373	-0.0012	-0.0411	-0.0157	-0.0940
Observations	57	125	223	248	512	580	722	1415	2246	2531	1682	1417	477
R^2	0.458	0.360	0.227	0.259	0.195	0.197	0.180	0.164	0.162	0.152	0.165	0.159	0.205

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

of different income groups. Two factors that are significant across most income groups are sex (being male) and standardized test scores. Gender has a greater (negative) impact as income decreases and the effect of standardized test scores on probability decreases as income increases with a significance at the 0.1% level. Parental educational attainment has a significant impact only for incomes between $25,000 and $200,000 per year across attainment levels with varying significance levels, becoming more significant (at 0.1%) for higher income levels. The most significant and greatest positive effect on probability of attendance is observed for students whose parents make between $100,000 and $200,000 per year. A few notable results that go against expectations are the limited number of income categories where school income levels are correlated with increased probability of attendance. The few categories that are statistically significant are for the middle- and higher-income students in lower-income schools[4]. Additionally, there is an increased probability of attending college for persons of color, however significance is only observed across races the highest income group ($200,000+ annually).

Table 5.3: Effect on College Enrollment, by Student Income; School Income Removed

	None	<$1,000	$1,001-5,000	$5,001-10,000	$10,001-15,000	$15,001-20,000	$20,001-25,000	$25,001-35,000	$35,001-50,000	$50,001-75,000	$75,001-100,000	$100,001-200,000	>$200,001
Sex	-0.1815	-0.1295	-0.1313*	-0.1785**	-0.1490***	-0.0980*	-0.1417***	-0.1005***	-0.0675***	-0.0668***	-0.0513***	-0.0374**	-0.0237
Amer.Indian/Alaska Native	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Asian, Hawaii/Pac.Isl	-0.2755	-0.0226	0.1858	0.2367	0.5637**	0.2567	0.1035	0.0846	0.2617**	0.0951	0.1079	0.1995	0.4779**
Black/AfAm	0.0194	-0.2305	0.1016	0.0769	0.5451**	0.2059	-0.0363	0.0875	0.1899*	0.0931	0.0984	0.1085	0.4193**
Hispanic	-0.3208	-0.1748	0.1254	0.0481	0.3970*	0.1885	-0.0111	-0.0014	0.1203	-0.0134	0.1171	0.1967	0.3951*
More than 1 Race	-0.3774	-0.0031	0.0977	-0.0082	0.2622	-0.0972	-0.2431	-0.1533	0.1553	0.0067	-0.0243	0.1754	0.4432**
White	-0.4461	-0.3265	0.1067	-0.1285	0.3542	0.0513	-0.1487	-0.0370	0.1551	0.0531	0.0921	0.1827	0.4284**
DNF High School	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graduate High School	-0.2638	0.3938**	-0.0855	0.0600	0.0620	-0.0440	0.0484	0.0327	-0.0044	0.1380*	0.3687***	0.7530***	0.1205
Some 2-Year	-0.3594	0.2995	-0.0805	0.1937	0.0399	-0.0633	0.0484	0.1378**	0.1270**	0.1776**	0.4121***	0.6702***	0.2767
Graduate 2-Year	-0.2051	0.0277	0.1166	0.0675	0.0087	-0.0465	0.1599*	0.1306*	0.1153*	0.2042***	0.4627***	0.8012***	0.4331**
Some 4-Year	-0.5936*	0.3088	0.0194	0.0653	0.0742	0.0837	0.1138	0.1159*	0.1023*	0.2324***	0.4270***	0.7900***	0.4088*
Graduated 4-Year	-0.5002	0.4708*	0.1726	0.1995	0.1957*	0.0942	0.1877**	0.1758***	0.1372**	0.2898***	0.4730***	0.8024***	0.3644*
Completed Masters/Eq	-0.3995	0.6302*	0.1773	0.2652	0.1512	0.0733	0.2705**	0.1952**	0.1689**	0.2946***	0.5043***	0.8058***	0.3709*
Completed PhD, MD, Other	-0.0918	0.5734*	-0.0634	0.2436	0.0669	0.0301	0.0654	0.2160**	0.2133***	0.2932***	0.4518***	0.7811***	0.3661*
Standardized Test Composite Score	0.0216*	0.0158**	0.0189***	0.0219***	0.0184***	0.0190***	0.0157***	0.0161***	0.0141***	0.0119***	0.0106***	0.0081***	0.0048***
School Urbanicity	-0.0225	0.0852	0.0295	0.0902	0.0642	0.0493	0.0098	0.0436	0.0476*	0.0264	0.0241	0.0396**	0.0365
Full-Time (F1)	-0.0107	0.1364	0.0223	-0.0043	0.0684	0.0852	-0.0248	-0.0468	-0.0390	-0.0026	-0.0439	-0.0172	-0.1173*
Observations	57	125	223	248	512	580	722	1415	2246	2531	1682	1417	477
R^2	0.350	0.300	0.180	0.247	0.175	0.185	0.171	0.159	0.156	0.144	0.138	0.149	0.139

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.3 represents the results of the model after removing the school-level income variable, which was not significant for the majority of student income levels. The implications for sex and standardized test scores remain unchanged, as do the results for parental educational attainment. Urbanicity remains largely

[4]School income is represented by %FLP, a higher percent FLP is a lower-income school.

insignificant, and the impact of working full time only becomes significant at the 5% level for the highest-income students, who experience a decreased probability of attending post-secondary school of 11.73%.

The previous two tables (5.2 and 5.3) provide insight to how the independent variables impact attendance across students' family income levels. The following two tables will compare the results at the school income level, both with student income (Table 5.4) and without student income (Table 5.5) included in the regression. The purpose of these tables is to assess the underlying impact of peers with similar or different income categories. It might be expected that higher income schools also offer better resources to their students, but I am unable to test this hypothesis with the available data.

Table 5.4: Effect on College Enrollment, by School Income (FLP %)

	0-5%	6-10%	11-20%	21-30%	31-50%	51-75%	76-100%
Sex	-0.0409***	-0.0406	-0.0783***	-0.1074***	-0.1046***	-0.1619***	-0.0890*
Amer.Indian/Alaska Native	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Asian, Hawaii/Pac.Isl	-0.0087	-0.1333	0.2508*	0.3944***	-0.1241	0.4063*	0.3926**
Black/AfAm	-0.0536	-0.1164	0.1951	0.2709*	-0.1208	0.3409	0.3396***
Hispanic	-0.0527	-0.1853	0.1460	0.2422*	-0.2095*	0.2707	0.2806**
More than 1 Race	-0.0678	-0.2059	0.0680	0.1096	-0.2741*	0.2116	0.0814
White	-0.0653	-0.1722	0.1258	0.2179	-0.2506*	0.2193	0.1874
None	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<$1,000	-0.2383	-0.2391	0.0866	-0.3347	-0.3044	0.1173	-0.3258
$1,001-$5,000	0.1008	0.1081	0.1008	-0.3242	-0.1773	0.0855	-0.3862
$5,001-$10,000	0.0021	0.2715	-0.0772	-0.3017	-0.0590	0.2036	-0.1902
$10,001-$15,000	-0.0192	0.1580	-0.0170	-0.2243	-0.0924	0.0644	-0.1705
$15,001-$20,000	-0.0029	0.1714	-0.0429	-0.2228	-0.1021	0.1075	-0.1939
$20,001-$25,000	0.0142	0.3210	0.0189	-0.2806	-0.0626	0.1537	-0.2697
$25,001-$35,000	0.0104	0.3103	0.0117	-0.2337	-0.0170	0.1516	-0.1372
$35,001-$50,000	0.0351	0.3228	0.0985	-0.2444	-0.0125	0.1393	-0.2317
$50,001-$75,000	0.0745	0.3372	0.0986	-0.2051	0.0686	0.1756	-0.1727
$75,001-$100,000	0.0888	0.4198	0.1362	-0.1544	-0.0035	0.1608	-0.2826
$100,001-$200,000	0.0917	0.3973	0.0940	-0.1292	0.0095	0.2181	-0.1827
>$200,001	0.0971	0.4133	0.1027	-0.3625*	0.0819	-0.0394	0.2279
DNF High School	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graduate High School	0.1237**	0.2176***	0.0050	0.1003*	0.0227	-0.0580	0.0091
Some 2-Year	0.2326***	0.1675*	0.1226*	0.1836***	0.0426	-0.0476	0.0535
Graduate 2-Year	0.2392***	0.2849***	0.1366*	0.1473**	0.0611	0.0355	0.0509
Some 4-Year	0.2452***	0.2545***	0.1326*	0.1725**	0.0462	0.0413	0.0862
Graduated 4-Year	0.2872***	0.2744***	0.1949***	0.2223***	0.1301**	0.0571	0.0647
Completed Masters/Eq	0.2953***	0.3225***	0.2031***	0.2015***	0.1430*	0.0500	0.1690
Completed PhD, MD, Other	0.2503***	0.2842***	0.2437***	0.2208**	0.1382*	0.1046	0.0382
Standardized test composite score	0.0081***	0.0127***	0.0134***	0.0134***	0.0159***	0.0182***	0.0165***
School urbanicity	0.0420***	-0.0059	0.0533*	0.0248	0.0468	0.0232	-0.0318
Full-Time (F1)	-0.0653**	0.0316	0.0046	-0.0459	-0.0051	0.0082	0.1221
Observations	4093	1155	2025	1510	1745	1042	665
R^2	0.156	0.235	0.202	0.181	0.184	0.202	0.161

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.4 compares enrollment decisions across school income groups. Note, a higher FLP percentage relates to a larger number of students within 185% of the poverty line. Male students at schools with 50-75% of the population within 185% of the poverty line see a negative impact on the probability of post-secondary school

attendance of 16.19%. Similar effects are observed for males in the 21-30% income category (-10.74%) and 31-50% income category (-10.46%), all of which are significant at the 0.1% level. Standardized test scores have a similar impact for students in schools where 6% more of students are receive free and reduced lunches, with the greatest impact being for students at schools where 51-75% of students receive these subsidies. Similar to the results of Table 5.3, students that work full time see a significant impact, at the 0.1% level, on their probability of attending post-secondary school of -6.53% if they are in the highest-income school category. Race is significant for students in schools at where 76-100% of students receive lunch subsidies, which is likely correlated with lower parental income categories. Parental income itself is not a significant predictor in any income category, disproving the hypothesis that lower-income students at higher-income schools would be more likely to attend college because of the resources available to them.

Table 5.5: Effect on College Enrollment, by School Income (FLP%); Parent Income Removed

	0-5%	6-10%	11-20%	21-30%	31-50%	51-75%	76-100%
Sex	-0.0397***	-0.0389	-0.0786***	-0.1049***	-0.1016***	-0.1569***	-0.0857*
Amer.Indian/Alaska Native	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Asian, Hawaii/Pac.Isl	-0.0011	-0.1629	0.2566*	0.3987***	-0.1371	0.3830	0.3853**
Black/AfAm	-0.0521	-0.1448	0.1986	0.2751*	-0.1371	0.3253	0.3390***
Hispanic	-0.0459	-0.2216	0.1573	0.2504*	-0.2088*	0.2543	0.2935**
More than 1 Race	-0.0585	-0.2201	0.0790	0.1198	-0.2891**	0.1967	0.0903
White	-0.0501	-0.1855	0.1422	0.2341*	-0.2399*	0.2130	0.2010*
DNF High School	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graduate High School	0.1334**	0.2317***	0.0246	0.1032*	0.0406	-0.0576	0.0053
Some 2-Year	0.2548***	0.1926**	0.1566**	0.1936***	0.0702	-0.0382	0.0577
Graduate 2-Year	0.2641***	0.3289***	0.1778**	0.1596**	0.0927*	0.0475	0.0410
Some 4-Year	0.2709***	0.2866***	0.1780**	0.1840***	0.0831	0.0486	0.0890
Graduated 4-Year	0.3256***	0.3332***	0.2487***	0.2445***	0.1805***	0.0777	0.0657
Completed Masters/Eq	0.3383***	0.3865***	0.2581***	0.2403***	0.1869***	0.0710	0.1862
Completed PhD, MD, Other	0.2948***	0.3572***	0.3000***	0.2540***	0.1925**	0.1154	0.0145
Standardized test composite score	0.0086***	0.0139***	0.0142***	0.0140***	0.0169***	0.0183***	0.0168***
School urbanicity	0.0434***	-0.0070	0.0497*	0.0193	0.0490	0.0219	-0.0302
Full-Time (F1)	-0.0647**	0.0371	0.0055	-0.0404	-0.0057	0.0025	0.1256
Observations	4093	1155	2025	1510	1745	1042	665
R^2	0.146	0.208	0.190	0.170	0.166	0.195	0.141

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Income is removed from the regression and the results are exhibited in Table 5.5. The interpretation of sex and standardized test scores remain the same, as well as that of the interpretation of race. In this model, parental educational attainment has the greatest positive impact, with 0.1% significance, in influencing the probability of college attendance for the highest-income schools and lacks significance for the two lowest-income school categories. Urbanicity is significant only for the highest income schools, with a significant (1% level) impact on probability of 4.34%. Full-time again had a negative, significant impact on if the student attended post-secondary school only for the highest-income schools.

These results were prepared with some understanding of multicollinearity between variables, especially race, parental income, and school income. Additionally, it is likely that there are omitted variables - most notably the variable of interest, food security.

6 Conclusion

The original goal of this paper was to explore the impact of food insecurity on college attendance decisions. Data availability constraints resulted in a transition to estimating the effects of demographics and socioeconomic characterises for students of different socioeconomic statuses. A linear probability model across income groups, incorporating both student-level and school-level variables, was used to evaluate these differences. Additionally, there is a high probability of omitted variable bias, most notably with the original variable of interest, food security.

In both the student-income and school-income models, being male decreased the probability of attending a post-secondary school. The magnitude of this effect was greater for lower-income students, and students at lower-income schools. This reflects the current trend in higher education of increased female enrollment which surpassed male admission in the 1980s and the gap has widened overtime (Mather, 2007). This could also be suggestive of traditional gender roles, where men are more likely to pursue roles in fields that do not require a college education, such as trades.

Across both models, standardized test composite scores were also a significant factor in students' decision, with a slightly larger impact in the student-level income model than the school-level income mode across all categories. Both follow a similar trend that as income increases, the impact of test scores decreases. These tests were conducted by the surveyors and results were reported specifically for the ELS:2002 and are not representative of the test scores received by college admissions offices. These results suggest that higher academically achieving students have a greater probability of going to college, and this probability becomes greater for students with low-income or in low-income schools.

Parental educational achievement produced the most puzzling results across both model specifications, with the greatest positive significant impacts observed for higher-income students and schools. While it was expected that increased parental education would increase a student's chance of attending college, based on parental expectations and environment, it was not expected that these effects would not carry across income groups. One possible explanation for the lack of significant results is the decreased number of students that are low-income or attend lower-income schools whose parents received education.

The impact of race across income groups also did not meet expectations, and the results from the student-level and school-level were conflicting. At the school level, race had a significant positive effect only in the poorest schools. At the student level, negative (not significant) results were observed for students of color in the lowest income categories. However, positive and significant increases in probability were observed for Black, Hispanic, and Asian students in the \$10,000-\$15,000 group, and in the \$200,001+ income group at 1% and .1% significance levels.

Urbanicity was significant in the initial regression (Table 5.1), however lacks significance across income categories. The same goes for students who work full time. The only students who saw a significant impact of full-time employment was those of highest parental and school income groups, and the result was a negative impact on the probability of their college attendance. It is difficult to pinpoint why this might be. It could be potentially due to a lack of financial aid associated with the expected family contribution, or even that a family's income may not be an accurate indicator of their willingness or ability to pay for post-secondary education.

Overall, these results do provide evidence that there are some differences and similarities in the decision making of students from different socioeconomic statuses attending college. However, without significant results across income categories, it can be difficult to interpret most of the variables, except for sex and standardized test scores. Additionally, omitted variable bias is a big concern with this model, understanding that students' decisions are often complicated by factors not related to their demographic or socioeconomic statistics surrounding their activities and incomes. More detailed analysis needs to be performed to draw conclusions regarding how these other factors might have an impact on students' decisions and to uncover which other variables have a significant impact.

7 Applications to Future Research

While this data provides insight on the decisions of college students, there are ways that it can be expanded. The first is through different econometric modeling techniques. Previously mentioned in this paper are the multinomial logit model and hierarchical general linear model. Both are complex both in their technique and interpretation. A less complex model that could be used to replicate the results of this research is a binomial logit model. This method does not rely on the assumption of OLS that the distribution of the dependent variable is normal. The assumption that the relationship between probability and predictors is not linear holds valid in this situation. It is expected that those at either end of the spectrum of our variables are increasingly more or less likely to choose to attend, or not attend post-secondary institutions. Using the logit model, the results are reported in log odds and can be interpreted as: students who have some characteristics will be x-times more likely to attend a post-secondary institution. The equation for the binomial logit model is included below:

$$Prob(Attend_i = 1) = \frac{e^{\beta_0 + \beta_1 sex_i + \beta_2 race_i + \beta_3 ParEd_i + \beta_4 urban_i + \beta_5 income_i + \beta_6 fulltime_i}}{1 + e^{\beta_0 + \beta_1 sex_i + \beta_2 race_i + \beta_3 ParEd_i + \beta_4 urban_i + \beta_5 income_i + \beta_6 fulltime_i}} \quad (3)$$

These models are applicable to the reported results. However, the original research question, "What is the impact of food insecurity on student's decision to attend post-secondary school?" was undermined by data limitations and not able to be reported. Upon investigation, not only was the original ELS data set not appropriate for answering this question, there are not available data sets that can properly answer this question. The Current Population Survey offered some hope with the Food Security Supplement, but this data set did not overlap with the education supplements and are difficult to interpret due to the different types of people that can respond to the survey. The research that I completed did suggest that the factors for decision making are different between lower and higher socioeconomic status students, and it is logical to believe that there could be a relationship between their food consumption and nutrition, and college attendance decisions. Additionally, food consumption is likely to be correlated with other factors, such as income and hours students work per week, further complicating the study.

Generally, there has been limited exploration of the relationship between young adults' academic ability, food insecurity, and other factors relative to college enrollment. This is likely the result of limited data available and the expense of gathering data. In addition, food insecurity can be difficult to disentangle from other factors mentioned above, including the potential for omitted variable bias. If provided with the opportunity to conduct future research on this topic, I would survey high school students in their senior year. I would

repeat this survey on the same age range of students for many years to account for differences in economic conditions. The main sets of questions that I include would mirror that of the ELS to gather demographic information such as race, sex, family background, income, etc. To cover food security variables, I would directly follow the guidelines that the USDA has published (USDA, 2020b). Additional groups of variables could be added as appropriate to make this survey applicable for various researchers and research questions.

While there is nuance associated with measuring food security and the way that information is gathered, the topic is very important and there are notable policy implications. As mentioned previously, the current free and reduce lunch program subsidies by the US government is based entirely off of income. However, there is concern that other groups could be left behind nutritionally, such as those whose income is not an accurate representation of their access to food or those who cannot provide income numbers to the government for many reasons. There may be ways that we can assist these populations, provided that we gather more research on their needs. Additionally, programs such as the Supplemental Nutrition Assistance Program (SNAP) are traditionally available only to households, and not individual students themselves who are often registered as dependents, even if they are independent in actuality. If these factors could be made more widely available to students, perhaps more students would be able to attend college because they would be able to afford living there and feeding themselves.

It is hard to support changes to these policies without continued and proper research into food insecurity and the additional factors that prevent students for accessing higher education. The question then comes down to if it is a governmental responsibility, or if colleges should be doing more to provide for their low-income or food insecure students. Information regarding the impact on attendance produced by changes in financial aid, college-funded, and federally-funded subsidies could be influential to deciding whose role this is. This could follow a structure similar to Hoxby and of Economic Research (2004), who use a conditional logit model to compare the schools of which students were admitted to, and those they attended and gauge the effect on school-specific and individual-specific attributes on students enrollment decisions.

Regardless of who assumes the role of providing this support, it is essential that more students from disadvantaged backgrounds have access to resources that help them provide for themselves and receive proper nutrition to help maintain their future economic potential.

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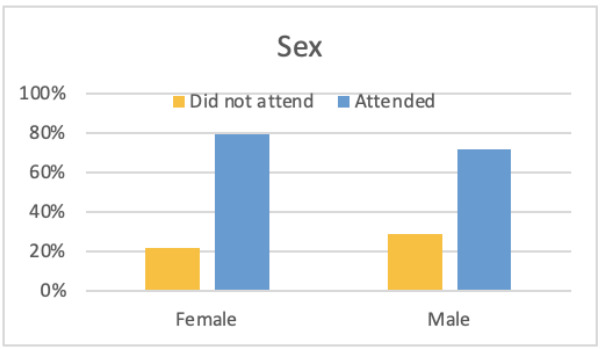
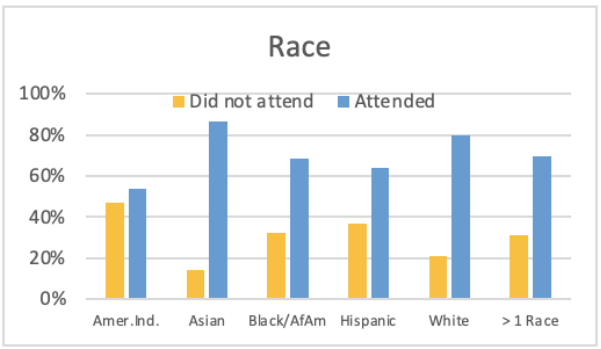
9 Appendix

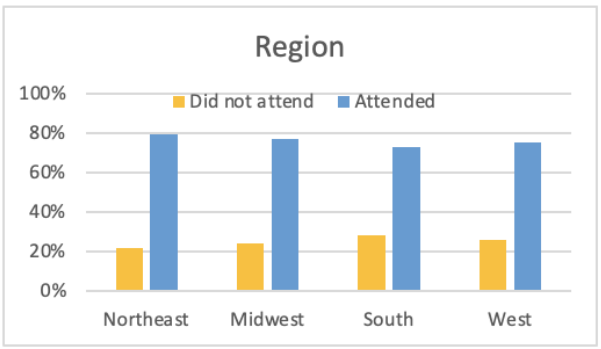
Appendix 1: Variable Descriptions and Coding

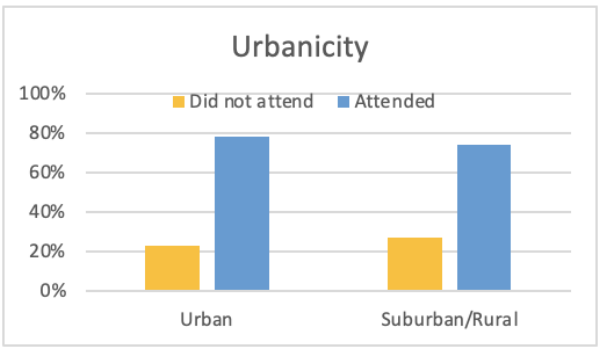
Variable	Description of Values	Variable	Description of Values
BYSEX	1 = Male 0 = Female	**BYTXSCTD**	Standardized test composite (reading/math) score
BYRACE	1 = Amer. Indian/AK Native, non-Hispanic 2 = Asian, HI/Pac. Islander, non-Hispanic 3 = Black or African American, non-Hispanic 4 = Hispanic 5 = More than one race, non-Hispanic 6 = White, non-Hispanic	**BY10FLP**	1 = 0-5 percent 2 = 6-10 percent 3 = 11-20 percent 4 = 21-30 percent 5 = 31-50 percent 6 = 51-75 percent 7 = 76-100 percent
BYPARED	1 = Did not finish high school 2 = Graduated from high school or GED 3 = Attended 2-year school, no degree 4 = Graduated from 2-year school 5 = Attended college, no 4-year degree 6 = Graduated from college 7 = Completed Master's degree/equivalent 8 = Completed PhD, MD, advanced degree	3***BYINCOME**	1 = None 2 = $1,000 or less 3 = $1,001-$5,000 4 = $5,001-$10,000 5 = $10,001-$15,000 6 = $15,001-$20,000 3*7 = $20,001-$25,000 8 = $25,001-$35,000 9 = $35,001-$50,000 10 = $50,001-$75,000 11 = $75,001-$100,000 12 = $100,001-$200,000 13 = $200,001 or more
BYURBAN	1 = Urban 0 = Rural or Suburban		
F1FULLTIME	1 = Full Time (26 or more hours) 0 = Part-Time		
BYWRKHRS	0 = Did not work 01-02 school year 1 = 1-5 hours a week 2 = 6-10 hours a week 3 = 11-15 hours a week 4 = 16-20 hours a week 5 = 21-25 hours a week 6 = 26-30 hours a week 7 = 31-35 hours a week 8 = 36-40 hours a week 9 = Over 40 hours a week	**F1WRKHRS**	0 = Did not work 03-04 school year 1 = 1-5 hours a week 2 = 6-10 hours a week 3 = 11-15 hours a week 4 = 16-20 hours a week 5 = 21-25 hours a week 6 = 26-30 hours a week 7 = 31-35 hours a week 8 = 36-40 hours a week 9 = Over 40 hours a week

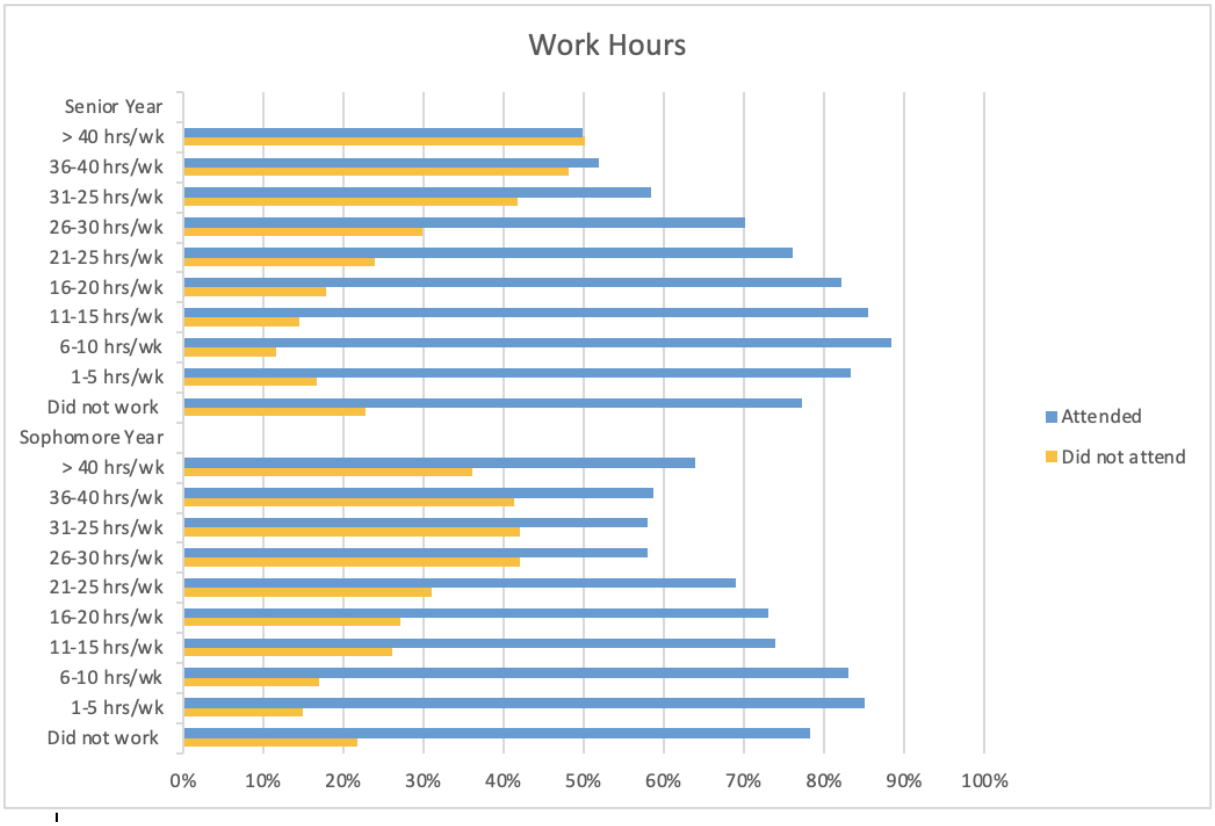
Appendix 2: Cross-tabulations











Appendix 3: VIF

Variable	VIF	1/VIF
BYSEX	1.02	0.983505
BYRACE		
2	11.84	0.084434
3	15.43	0.064798
4	16.10	0.062131
5	6.60	0.151426
6	32.13	0.031123
BYINCOME		
2	3.06	0.326754
3	4.60	0.217314
4	5.15	0.194265
5	9.10	0.109937
6	10.31	0.096997
7	12.64	0.079100
8	22.59	0.044258
9	33.37	0.029964
10	36.76	0.027203
11	27.03	0.036999
12	23.99	0.041677
13	9.29	0.107689
BYPARED		
2	3.93	0.254245
3	2.88	0.346685
4	2.89	0.345604
5	3.06	0.327253
6	4.91	0.203747
7	3.54	0.282540
8	2.67	0.374064
BYTXCSTD	1.41	0.707095
BYURBAN	1.15	0.866733
BY10FLP		
2	1.22	0.822835
3	1.35	0.743065
4	1.31	0.761155
5	1.42	0.705661
6	1.34	0.745967
7	1.31	0.760996
F1WRKHRS		
1	1.20	0.836113
2	1.27	0.785065
3	1.30	0.767825
4	1.36	0.737201
5	1.26	0.793852
6	1.19	0.843024
7	1.11	0.899840
8	1.16	0.861239
9	1.09	0.915165
Mean VIF	7.77	

Variable	VIF	1/VIF
BYSEX	1.01	0.985700
BYRACE		
2	11.83	0.084528
3	15.42	0.064840
4	16.07	0.062222
5	6.59	0.151644
6	32.06	0.031191
BYPARED		
2	3.90	0.256711
3	2.84	0.352601
4	2.83	0.353047
5	2.99	0.334892
6	4.68	0.213461
7	3.36	0.297193
8	2.52	0.396809
BYTXCSTD	1.38	0.726539
BYURBAN	1.15	0.870570
BY10FLP		
2	1.21	0.829530
3	1.32	0.757708
4	1.28	0.779999
5	1.37	0.727974
6	1.31	0.766268
7	1.28	0.778679
F1WRKHRS		
1	1.19	0.837703
2	1.27	0.785873
3	1.30	0.769102
4	1.35	0.738467
5	1.26	0.795463
6	1.18	0.844498
7	1.11	0.901083
8	1.16	0.862883
9	1.09	0.916095
Mean VIF	4.24	

Variable	VIF	1/VIF
BYSEX	1.00	0.996633
BYRACE		
2	11.12	0.089919
3	14.94	0.066929
4	15.68	0.063782
5	6.53	0.153221
6	30.62	0.032662
BYINCOME		
2	3.17	0.315183
3	4.84	0.206568
4	5.26	0.190009
5	9.59	0.104226
6	10.68	0.093602
7	12.91	0.077483
8	22.94	0.043594
9	33.24	0.030083
10	36.46	0.027425
11	26.75	0.037383
12	23.39	0.042753
13	9.26	0.107973
BYPARED		
2	3.83	0.261289
3	2.81	0.356193
4	2.81	0.356387
5	2.97	0.336650
6	4.68	0.213580
7	3.37	0.296800
8	2.58	0.387728
BYTXCSTD	1.40	0.716142
BYURBAN	1.15	0.866134
BY10FLP		
2	1.22	0.821123
3	1.35	0.739396
4	1.32	0.758062
5	1.42	0.703978
6	1.35	0.740973
7	1.32	0.760445
F1FULLTIME	1.01	0.990103
Mean VIF	9.21	