

# **GENDER BIASES IN THE COLLEGIATE EDUCATION SYSTEM**

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## **ABSTRACT**

*Recently, societal norms have been changing as younger generations have started to break gender stereotypes. Because of these new social norms, a whole new world of opportunity has opened for women. This includes attending college or working in the business world. Women have enrolled in college, entered the workforce, and are working to improve life. With male and female population being both roughly 50%, there should be a correlation of male and female college acceptance rates. This study focused on the percent of females applying for college and their acceptance rates versus that of males. The results show, every year, the average percentage of female applicants accepted is higher than the average percentage of male applicants accepted. For five of the ten years followed, the chance the difference in the means watched is because of chance is too small, meaning there is a greater likelihood the difference is because of there being real differences between male and female applicants. The next steps would be to research further into the data and considering just studying the trends in two- and four-year schools only. Another interesting finding to look further into is why there is a negative correlation for the academic year variable with the percent of female and male applicants are accepted.*

**JEL:** J24, I23, J16, J24, I21

**KEYWORDS:** Gender, Education, SAT, College, Master's, Graduate, GPA

## **INTRODUCTION**

Over the past few years, it has become clear that females are outnumbering males in the college scene (Lopez, 2014). Studies have shown the reasons that females go to college are different from those of males; females tend to believe that if they are to enter the working world, they need a college degree (Nuland, 2013). Males are less likely to think like this and are more likely to connect going to college with getting a higher income (Nuland, 2013). As the barriers to entering the labor markets for women is lowering, universities are seeing a surge in female applications (Nuland, 2013). These trends are important to monitor to ensure females are provided the same access to education as males. Because the population is roughly fifty percent male and fifty percent female, the natural assumption would be that on average, the acceptance rates for men and women would be roughly the same (Hesketh and Xing, 2006).

Because there is a swell of females applying for and attending college across all nationalities, it is important to know that colleges are accepting around the same percentage of students (controlling for causes like SAT and ACT scores that do not meet the requirements). Simply looking at the number of male and female students will not bring any light to the subject since we already know that more females are attending college. Looking at percentages of accepted applications will better help the study of this topic.

The balance of this work is organized into the following four sections. First, there is a literature review looking at prior literature that informs this study. The next section includes methodology, including both the research question and experiment design. The third section includes the research findings. Finally, the research ends with conclusions, including limitations and future research.

## LITERATURE REVIEW

Recent literature has suggested that higher numbers of high school graduates are now attending college, and these numbers have been rising for the past few decades (Lopez, 2013). Several studies identify the growing disparity in college enrollment between males and females. The difference between the white male and white female high school graduates enrolled in college in 2012 was ten percent. Seventy-two percent of enrollees are female while 62 percent are male (Lopez, 2014). This trend holds true for minorities as well, and in 2012, 76 percent of female Hispanic high school graduates went to college, which held a 13-percentage point lead over the Hispanic males. As for Asian high school graduates, females had a 3 percent lead on the males, and African-American females were 12 percentage points higher than the males (Lopez, 2014).

Nuland & Ingram (2013), considered something more than just what percent of females and males were going to college. They decided to look at the *why* behind people attend college, particularly the difference between males and females. Prior research suggested that males do not connect going to college with entering the workforce, whereas females do, so a female's decision to go to college is linked to their plans to enter the workforce (Nuland, 2013). This makes sense because as the 'glass ceiling' for females has been lifting, it becomes more and more worthwhile for them to attend college and receive a higher education that they can then use towards a career.

Nuland and Ingram's study did not focus solely on whether being a female makes one more likely to go to college, or what their reasons are. They also looked for confirmation of the benefits of attending college, and the effects of personal demographic information, family circumstances and high school performance on the likelihood of an individual attending college. They used the data from the National Longitudinal Surveys of Youths from 1997. Specifically, in the data they used a variable that indicated college attendance, a dummy variable to suggest whether the respondent was raised in an urban environment, another variable meant to summarize family situations, for example, how many years of education their mother and father had and the family income. They also used a variable for the SAT math score but dropped the variable for SAT verbal scores due to the high correlation with the math variable, and because the variable was statistical insignificance in their regression (Nuland & Ingram, 2013). With these variables, they decided to run a Chow test, and see which variables were significant at the .01 level. The regression model they used explained 15.2 percent of the variability in the decision to attend college, and the results for the female variable were statistically significant and shows that being female increases the likelihood of attending college by 18.77 percentage points (Nuland & Ingram, 2013).

Another two-study investigation, conducted by Keiser, Sackett, Kuncel, & Brothen (2016), focused on how standardized testing like the SATs and ACTs underpredict how females will perform in college based on their GPA. In layman's terms, it means that when comparing the GPA of a female and a male that scored the same on the SAT or ACT, the female's GPA are higher. They wanted to study this further and decided there are two causes that can be causing this; the first is that females are more conscientious than males, meaning they wish to do what is right, especially to do one's work or duty well and thoroughly. This would be reflected in the grades they receive in class, which would explain why their GPAs are higher. The second is that females tend to take 'softer' majors than males, and easier classes, which would also explain why their GPAs are better (Keiser et al., 2016). Their study is divided into two parts, one that focuses on the underprediction of GPAs for females, and the second that focuses on the idea of females taking easier courses than males.

For the first study in this two-study investigation, they obtained their data from a large Midwestern university and specifically targeted all the participants in an introduction to psychology course that is highly structured, meaning the instruction and grading standards are consistent each semester. Their statistical analysis took many different variables into account for this study, needing the subjects to take certain added tests from the coursework and going to the university and other sources for the information they needed. They include ACT scores, gender, the course grade received in the psychology class, the total exam points, total quiz points, and total discussion points earned over the course of the psychology class, their cumulative GPA (recalculated without the psychology grade included to create independence between the two variables), and the results from the Berkeley Personality Profile (to get a measure for their level of conscientiousness) that they all took prior to taking the psychology class (Keiser et al., 2016).

The results from Keiser's study showed that males had higher scores on the ACT, but females had higher GPAs. On top of this, it was discovered the ACT did not underpredict the quiz and exam points that females earned, but what it did under predict was the less cognitive pieces of the grade in the course, for example, the discussion points earned. By the end of the study, the results revealed that conscientiousness does explain a portion of a female under prediction. The trait of conscientiousness mostly impacts the more discretionary parts of a student's grades, like the discussion points, which is enough to partially explain why female's SAT and ACT scores are not predictive of how females will perform in college because they do not test those sorts of skills.

The second study in this two-study investigation accessed a new data source from the College Board. This dataset included variables like academic aptitude, first-year GPA, course grades, gender, course challenge, and mean aptitude in the course (Keiser et al., 2016). The results they found affirmed that females have higher GPAs than their male counterparts and the males still had higher SAT and ACT scores. But regarding the course challenge levels, the males had a higher mean than the females, meaning that they were indeed taking harder courses than the females. This means the SAT and ACT scores are over predictive for males because they tend to take more challenging courses than females (Keiser et al., 2016). Also, the academic competition in the courses that males are taking also tends to be higher than the classes that females are taking. An explanation for this the fact that females tend to be drawn to less rigorous program and classes than men. For example, medical doctors and engineers are male-dominated degree programs while nursing and secretarial programs are female dominated. Solely looking at SAT and ACT scores without applying to degree programs where students are registered is not acceptable (Keiser et al., 2016).

This leads to the current study being conducted. Because of all the information gained from previous studies, like how more females are attending college, and that they have different reasons than males do for attending college, and that they are more likely to perform better than their SAT and ACT scores predict, and the percentage of females that apply to college and are accepted is greater than the percentage of males that apply to college that is accepted, it is time to look at whether or not the under predictability of the SAT and ACT scores for females is keeping them from entering graduate school.

## **METHODOLOGY**

The data used for this study is the 'IPEDS Analytics: Delta Cost Project Database 1987-2012 (CSV), which can be found on the National Center for Education Statistics website [<https://nces.ed.gov/ipeds/deltacostproject/>]. This study uses the file that contains only the 2000 – 2012 data. The data was collected by the Delta Cost Project at American Institutes for Research (AIR), which was established in 1946. They contribute to conversations about college education and the barriers that continue to grow for those looking for higher education, like increases in the cost of tuition and decreases in state support. Since college affordability is such a huge topic, the Delta Cost Project conducts annual surveys that gather information from every college, university and technical and vocational institutions that

share in the federal student financial aid programs. The dataset is constantly updated to allow for analyses of trends to be as up-to-date as possible, keeping conversations about the cost of higher education and what can be done about it continuing.

The data was read into SAS for all future statistical tests to be run on it. A Proc Means was administered on two numeric variables in the data; ‘groupid’ and ‘Isalarytotal’, which are the first and last numerical variables in the data set. We took the count and sum of the variables and compared them to what was found in the original excel file to ensure that all the data had been read incorrectly and the calculations in SAS were working properly with the data.

After thorough searches through the data dictionary that comes with this data set, a few variables of interest that relate to the goal of this study were discovered. This dataset includes variables for the number of applications a school has received, and how many of those were male and female. On top of this, the data has variables that show how many applicants were accepted, and how many of them were male or female. We can use this data to examine the rate at which females than males are attending college and see how it has changed over the 12-year period. In addition, this research will examine the percent of female applicants that are accepted, and the percent of male applicants that are accepted. These numbers are not describing the number of students that ended accepting an offer from the university or college, but those that were accepted by the university or college. The study does not look at which college the students ended going to, just the actions of the colleges and universities themselves. We want to discover how the colleges and universities behave on accepting students based on the variable gender.

## FINDINGS

Two variables are being observed in the research; the percent of male applicants that were accepted (appadmp) and the percent of female applicants that were accepted (appadwp). The descriptive statistics can be found in Table 1 in the appendix. They show the standard error of both variables is .001, which represents the sample means deviation from the population mean. That means the data is an accurate portrayal of the true population.

Table 1: Descriptive Statistics for the Population Mean of the Percent of Male Applicants Accepted and the Population Mean of The Percent of Female Applicants Accepted

Variable	N	$\mu$	$\sigma$	SE
appadmp	23,296	0.671	0.225	0.001
appadwp	23,303	0.683	0.224	0.001

*This table shows the descriptive statistics. This includes the population, mean, standard deviation and standard error for each of the two variables.*

Table 2: Moments and Tests for Normality for the Variables

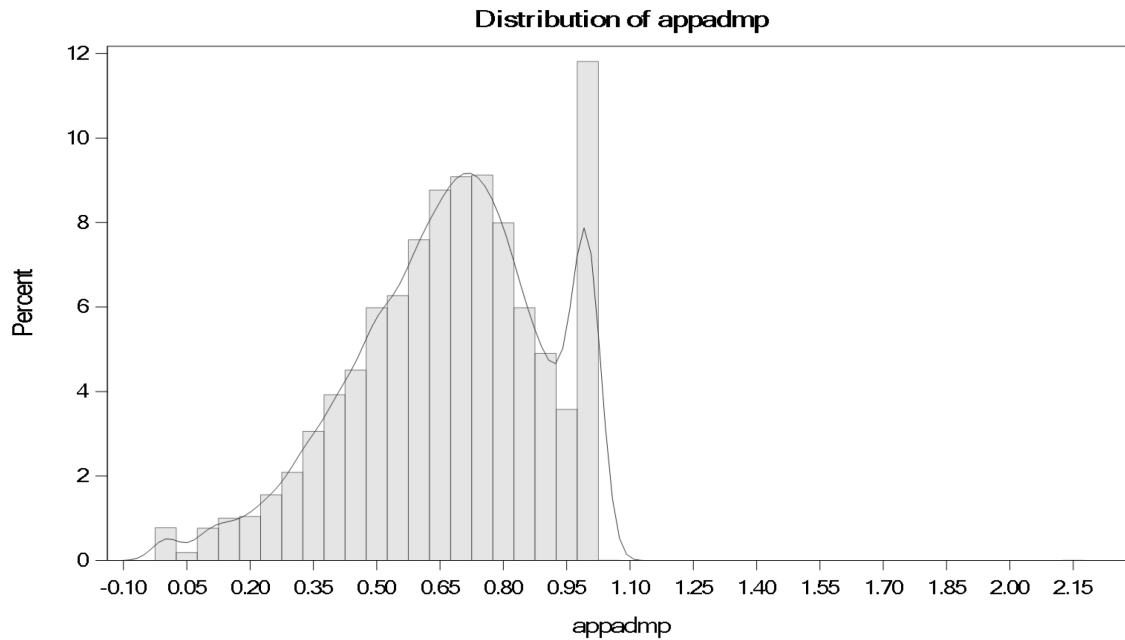
	Skewness	Kurtosis	K-S (p > D)
appadmp	-0.48	-0.07	0.07 (0.01)
appadwp	-0.52	-0.30	0.07 (0.01)

*This table shows the Tests of Normality for the variables. This includes the skewness, Kurtosis and the difference between them.*

Before running any tests on the data, the data needed tested for normality. Table 2 shows different statistics for the variables appadmp and appadwp. Both have seemed to be slightly skewed to the left, as shown by the skewness and kurtosis statistics, and the Kolmogorov-Smirnov statistics seem to hint the data may not be normal. But looking at Figures 1 and 2, which display the distribution plot of the variables appadmp

and appadwp respectively, the data looks to be roughly normal. Further analysis may be required, but for this study, the data will be assumed roughly normal. In Figure 1 below this can be seen.

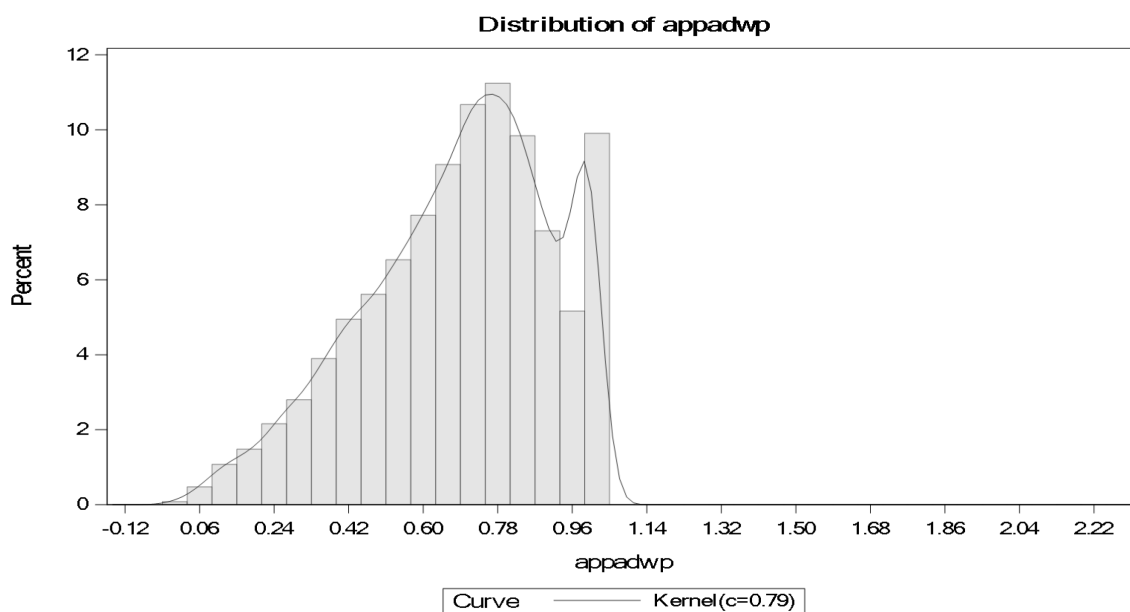
Figure 1: Distribution Plot of Variable appadmp



*This figure shows the Distribution plot for the variable appadmp.*

A similar situation can be seen for the second variable. This can be seen in Figure 2 below.

Figure 2: Distribution Plot of Variable appadwp



*This figure shows the Distribution plot for the variable appadwp.*

A correlation of the two variables being studied with the academic year (2003 through 2012) is shown in Table 3.

Table 3: Correlation Matrix

	appadmp	appadwp	academicyear
appadmp	1.00		
appadwp	0.87***	1.00	
academicyear	-0.08***	-0.09***	1.00

*This table shows the correlation of the two variables studied with the academic year.*

The correlations between all variables are statistically significant, and the strongest correlation is between appadmp and appadwp, which has a positive relationship. This means that as the percent of male applicants accepted increases, so does the percent of female applicants accepted. An interesting relationship that appeared in the data is that between the academic year and the variables appadmp and appadwp. Both have a slightly negative correlation, meaning that as the year increases, the percent of applicants for both genders that are being accepted decreases slightly. It is a slightly stronger negative correlation between the academic year and the percent of female applicants that are accepted.

After examining the differences in admission rates by gender by academic year, we then sought to determine if the phenomenon being observed – that females had higher admission rates than males – was occurring across all post-secondary institutions, or in certain sectors. In order to accomplish this task, we administered a one-way ANOVA (analysis of variance), which is a methodology ideal for comparing means across multiple samples (Berenson, Levine, & Szabat, 2014). In addition, the statistical significance of any difference was assessed using the Student-Newman-Keuls (SNK) test (Cody & Smith, 2006).

In our case, we recalculated the mean admission rates for males and females by academic year by post-secondary education sector, and then subtracted the female rate from the male rate in order to obtain the mean difference. A negative difference indicates that females have a higher admission rate than males, and are highlighted in Table 4 in yellow for easier visibility. With regard to the post-secondary education sector, the Integrated Postsecondary Education Data System (IPEDS) uses the following classification scheme:

Three groupings for degree type: 4-year (Bachelors degree or higher), 2-year (Associates degree), and < 2-year (Certifications). Three groupings for type of institution: Public Non-Profit, Private Non-Profit, and For-Profit institutions. Thus, there are nine post-secondary education sectors in the IPEDS data set (three degree-groupings X three institution-types). This is shown in Table 4.

Table 4: Mean Difference Analysis (t-test and ANOVA)

Academic Year	Percent Admitted		t-test	ANOVA on Difference (% Men Admitted less % Women Admitted)								
	Men	Women		4-Year			2-Year			< 2-Year		
				Public	Private	For Profit	Public	Private	For Profit	Public	Private	For Profit
2003	0.697	0.712	-2.29*	-0.019	-0.027	0.025*	0.015	0.022*	0.009	-0.016	-0.009	-0.041*
2004	0.695	0.710	-2.29*	-0.018	-0.024	0.004	0.005	0.006	0.001	-0.008	-0.026	-0.019
2005	0.685	0.697	-1.90	-0.017	-0.020	0.020	0.021	-0.004	-0.017	0.027*	-0.007	-0.027
2006	0.678	0.694	-2.49*	-0.014	-0.019	0.004	-0.007	0.011	-0.026	-0.006	0.001	-0.044
2007	0.674	0.686	-1.73	-0.015	-0.015	0.024*	-0.004	-0.006	-0.013	0.027*	-0.056	-0.034
2008	0.663	0.676	-1.96*	-0.017	-0.018	0.019	0.006	-0.006	-0.010	0.015	0.008	-0.033
2009	0.653	0.669	-2.37*	-0.016	-0.017	-0.009	0.013	-0.017	-0.013	0.006	0.046*	-0.036
2010	0.662	0.670	-1.26	-0.015	-0.015	0.009	0.003	0.036	-0.013	0.030	0.087*	-0.016
2011	0.631	0.641	-1.43	-0.015	-0.016	0.025	0.012	0.012	-0.033	0.007	0.021	-0.031
2012	0.659	0.662	-0.42	-0.015	-0.016	0.041	0.041	0.052	-0.006	0.020	0.017	-0.015

*This table shows the mean difference analysis by academic year. The leftward columns show the mean admission rates by gender, along with the t-test results. After the t-test, ANOVA results are shown, with differences that are negative indicating that women were accepted at a higher rate than men. Differences that are significant at the 5 percent level are marked with an \*.*

The ANOVA results shown in Table 4 indicate that three sectors – Public 4-Year, Private 4-Year, and For-Profit < 2-Year - consistently admit females at a higher rate than males. Institutions in the Public 4-Year and Private 4-Year sectors are considered ‘traditional’ 4-year colleges and universities, and add additional credibility to our initial findings that females have gained an advantage in terms of college admissions in the United States. However, the For-Profit < 2-Year sector caught our eye, in that it is the only other sector that admits women at a consistently higher rate than men. The majority of institutions in this sector are in fields such as ‘beauty’ and ‘cosmetology’, so it is not surprising that females have higher admission rates than males.

Interestingly, no other sector of the U.S. post-secondary education system consistently admits females at a higher rate than males. Quite the opposite, 4-year For-Profit institutions tend to consistently admit more males than females. In the 2-year sectors, the story is mixed, with some years admitting more females and other years more males. Nonetheless, these additional ANOVA results support our initial t-test results: ‘traditional’ 4-year public and private colleges are admitting more females than males, and this is occurring on a consistent basis.

### **A PATH FORWARD**

Because of how society is changing, and the different perceptions of women in the workplace, more and more females are attending college, and for mainly different reasons than male students. Since standardized tests like the SAT and ACT underpredict female performance in college, and that females do better because they are more conscientious than males. Research had been done in this subject before, but to add to it, this study looked at the percent of male applicants that get accepted compared to the percent of female applicants that get accepted.

### **CONCLUDING COMMENTS**

This research looked into the question of whether women are being held back from education based on SAT scores. Researcher’s designed this study to look at the differences between gender and how they handle education.

The goals were to explain the disparity between the common instance of higher female grade point average and work ethic, and the lower SAT scores that bar women from achieving an upper level education. These results are important because they show that colleges, universities, and other higher education institutions are tending towards accepting the same percent of females as they are males. Something that can be worrying for any students applying for higher education institutions is the percent of male and female applicants that are accepted is slightly negatively correlated with the academic year. This study did not separate trade schools or beauty schools from two- or four-year institutions in the data set, and looking at them separately may bring better insight on these trends. Researcher’s removed schools having either zero female or zero male applicants from the study to make sure that we were examining schools that had to choose between accepting both male and female students.

The results show there have been significant differences between the average percentages over five years, meaning that it isn’t because of random chance, but there is a difference between male and female applicants because the female average percent of applicants accepted is higher than that of the males.

This research has several benefits. One of which is the fact this study proves SAT scores are not a correct marker for forecasting the success of all students. Hopefully, this study inspires the education system to take this into account and weigh standardized test scores less than grade point average and professional recommendations. It also provides insight into fundamental gender differences that are applicable to

broader research regarding female and male lifestyle. Other researchers can use the information provided as a reference and build off what has been gathered and hypothesized here.

The limitations of this study include the inability to sort out the trade and beauty schools from the rest of the data. This may have skewed results due to the high female students in beauty school and the high-level of males in trade school, both of which do not accurately portray the typical male-to-female ratio found in two and four-year universities. It is also difficult to find out the number of applicants that were accepted but chose not to go. This lack of information does impact the accuracy of the findings.

This study has many opportunities for future research. The next steps should include further research on the data, separating out trade and beauty schools, and other miscellaneous schools, from the two- or four-year colleges and universities. Another step that could be taken would be looking further into the slight negative correlation between the academic year and percent of applicants accepted. It could be because there are more students applying to schools, but schools are not growing as fast and accepting roughly the same number of students each year. The data could also be viewed by state or region to further investigate the differences in the average percent of applicants accepted between male and female students.

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