Fairness in College Admissions

Do colleges admit genders equally?

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I. Introduction

The college admissions process can be both an extremely stressful and rewarding time period for students as they prepare to enter secondary education. Colleges attempt to follow a balanced review process to ensure that applicants are admitted fairly, with most universities promoting that they maintain a "holistic approach" when considering applicants (Coleman, Arthur). As the admissions process has gotten much more competitive over the years, questions about the validity of the process piqued my interest, eliciting me to explore potential underlying or overlooked biases in the college admissions process. Early in my preliminary research, I noticed that women tended to be accepted at higher rates than men.

II. Statistical Question

This paper will attempt to answer the question, "Do colleges admit genders equally?" It will specifically focus on a bias favoring women applicants.

H_0 The mean difference between the proportion of women accepted to college and the proportion of men accepted to college is 0.

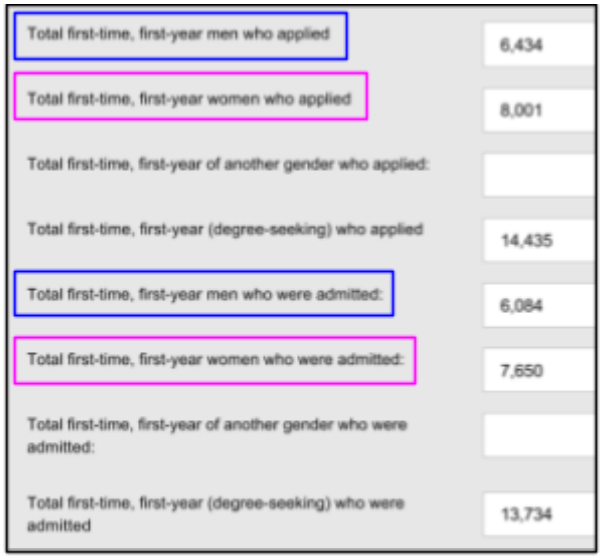
H_A The mean difference between the proportion of women accepted to college and the proportion of men accepted to college is greater than 0.

III. Data Collection

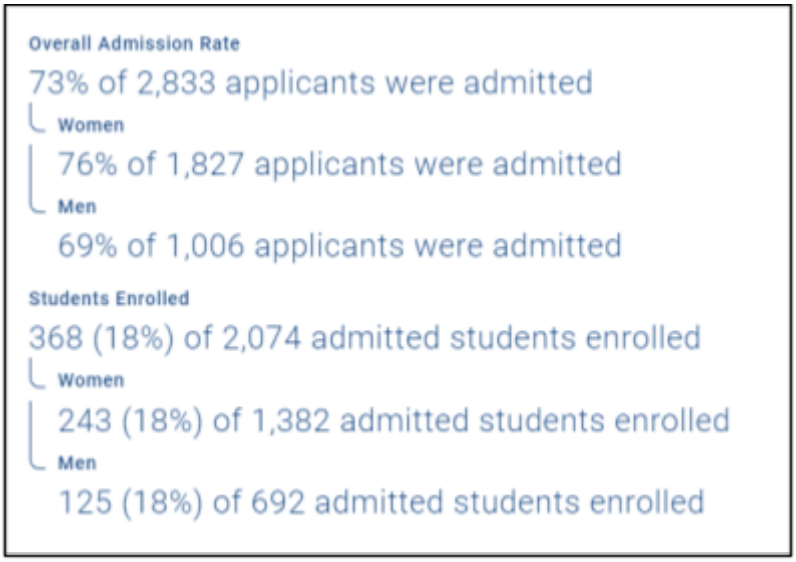
When collecting data, I wanted to ensure that I was not only focusing on well-known schools, as I wanted to generalize my statistical findings to as many universities in the United States as possible. I gathered 1500 universities ranked by the organization uniRank on their popularity, which was determined by web metric data. This will allow me to generalize my statistical findings to these 1500 colleges, which encompass a majority of the colleges in the United States. I used a stratified random sampling method, grouping the schools by their

popularity rank in cohorts of 300. For each group of 300, I used the range randomizer in Google Sheets to randomize their order and selected the ten schools at the top of each randomly generated list. Utilizing the stratified random sampling method allowed for an equal distribution of schools chosen based on their popularity.

After compiling my list of 50 schools (10 from each group), I began collecting the amount of male and female applicants and the amount of male and female acceptances from each school. Although it is not required, many colleges publish institutional reports, including common data sets for each school year, which contain the metrics for male and female applicants (Figure 1). In this case, I was able to collect data directly from each college. Although some schools have published their data for the 2023-2024 school year, many schools had the 2022-2023 school year as their most recently published, so I opted to use this year for every school. Still, some colleges require permission to view this data, so when necessary, I used *CollegeData*, a trusted database for college statistics, to collect data (Figure 2).



(Figure 1, Old Dominion University)



(Figure 2, *CollegeData*)

After using institutional reports from each school and opting for *CollegeData* when necessary, I was able to successfully collect data for each of the 50 selected schools.

IV. Data Display

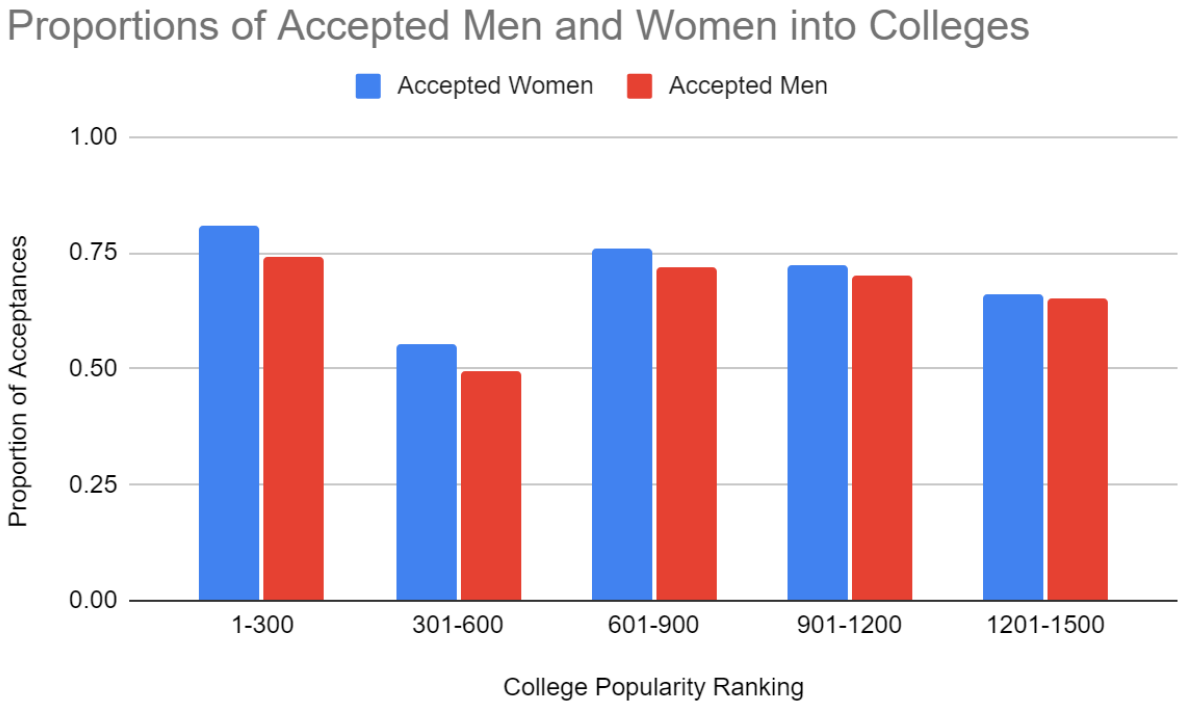
Here is a list of all the collected data, color-coordinated by each group of 300 (the expected acceptances were calculated based on the pooled proportions of the acceptences):

	College Rank	College Name	Acceptence Rate (%)	Women Applied	Men Applied	Women Accepted	Men Accepted	Expected Women Acceptence	Expected Men Acceptence
	187	Old Dominion University	0.9514374784	8001	6434	7650	6084	7612.451264	6121.548736
	197	University of North Carolina at Greensboro	0.9194094659	7755	3760	7161	3426	7130.020408	3456.979592
	29	Rutgers, The State University of New Jersey	0.7394040844	8180	6755	6309	4734	6048.32541	4994.67459
	289	Harvey Mudd College	0.1335585586	1509	2931	322	271	201.5398649	391.4601351
	225	North Dakota State University	0.9567662566	4876	3659	4695	3471	4665.192267	3500.807733
	76	University of Connecticut	0.5451410965	23074	17820	13,690	8,603	12578.58566	9714.41434
	241	Western Kentucky University	0.9694870087	4779	2726	4654	2622	4633.178414	2642.821586
	22	Michigan State University	0.8795110703	28362	24979	25246	21668	24944.69298	21969.30702
	162	Western Michigan University	0.8455197307	11507	8994	9889	7445	9729.395542	7604.604458
	136	Northern Illinois University	0.6261220826	2472	1984	1664	1126	1547.773788	1242.226212
	414	Pratt Institute	0.4486590964	6187	2091	2843	871	2775.853829	938.1461706
	586	Ohio Wesleyan University	0.5217881292	2688	2636	1560	1218	1402.566491	1375.433509
	373	College of the Holy Cross	0.3635588403	3668	3368	1381	1177	1333.533826	1224.466174
	475	University of Hartford	0.7867724868	8,118	5,112	6172	4237	6387.019048	4021.980952
	501	Carson-Newman University	0.7978142077	1787	1141	1459	877	1425.689989	910.3060109
	485	Denison University	0.2196399345	6,686	5,534	1,462	1,222	1468.512602	1215.487398
	525	The College of Wooster	0.5626810095	3560	3691	2191	1889	2003.144394	2076.855606
	339	Stevens Institute of Technology	0.46224	4315	8185	2359	3419	1994.5656	3783.4344
	591	SUNY Brockport	0.6794221007	4,437	3,246	3,069	2,151	3014.595861	2205.404139
	382	North Carolina Agricultural and Technical State University	0.5638318519	17616	8147	10173	4353	9932.461903	4593.538097
	867	Manhattanville College	0.8293503871	1,836	1,135	1,555	909	1522.687311	941.3126893
	631	St Petersburg College	1	1838	1348	1838	1348	1838	1348
	703	Chatham University	0.6634396355	2289	1223	1643	687	1518.613326	811.3866743
	702	University of Redlands	0.8293204922	2,062	1,676	1,765	1,335	1710.058855	1389.941145
	626	St. Mary's University	0.6077267932	4672	2912	2999	1610	2839.299578	1769.700422
	774	Queens University of Charlotte	0.7127457197	2,177	977	1,538	710	1551.647432	696.3525682
	814	New College of Florida	0.7540983607	1292	538	991	389	974.295082	405.704918
	710	Pennsylvania Academy of the Fine Arts	0.8837209302	138	34	125	27	121.9534884	30.04651163
	709	SUNY Polytechnic Institute	0.7728965004	1860	826	1410	666	1437.587491	638.4125093
	683	Colorado Christian University	0.7088888889	1,244	556	904	372	881.8577778	394.1422222
	1176	William Jewell College	0.4093357271	841	830	320	364	344.2513465	339.7486535
	961	Washington & Jefferson College	0.8154133002	1,564	1,654	1,209	1,415	1275.306401	1348.693599
	914	Wilmington University	0.991576414	985	677	976	672	976.7027677	671.2972323
	1038	Buena Vista University	0.7788018433	724	795	566	617	563.8525346	619.1474654
	1092	Western New Mexico University	1	509	363	509	363	509	363
	1133	Presbyterian College	0.5938720336	1,617	1,712	1,018	959	960.2910784	1016.708922
	1007	Daemen University	0.7272430669	2183	882	1681	548	1587.571615	641.428385
	1166	Curry College	0.8808257076	2,781	1,918	2,458	1,681	2449.576293	1689.423707
	1128	Texas Wesleyan University	0.4116255492	1,628	1,331	657	561	670.1263941	547.8736059
	932	Ringling College of Art and Design	0.647034931	1,827	635	1,214	379	1182.132819	410.8671812
	1265	Covenant College	0.8175765646	402	349	341	273	328.665779	285.334221
	1369	Ozark Christian College	0.5807291667	183	201	110	113	106.2734375	116.7265625
	1372	Concord University	0.9138728324	880	850	825	756	804.2080925	776.7919075
	1321	Newberry College	0.5740740741	1,125	1,035	625	615	645.8333333	594.1666667
	1429	Maranatha Baptist University	0.5689223058	282	117	135	92	160.4360902	66.56390977
	1347	Milwaukee Institute of Art & Design	0.6798941799	849	285	574	197	577.2301587	193.7698413
	1213	Southwestern Adventist University	0.6014285714	883	517	554	288	531.0614286	310.9385714
	1437	Paine College	0.515142338	2,185	1,117	1,162	539	1125.586008	575.4139915
	1351	University of Silicon Valley	0.6481481481	30	78	23	47	19.44444444	50.55555556
	1283	Lasell University	0.7320861278	1,827	1,006	1,382	692	1337.521355	736.4786445
Totals	N/A	N/A	69%	202290	150770	145056	100088	141380.1749	103763.8251

Here is the proportion of acceptances broken down by college ranking groups:

College Ranking	Proportion of Accepted Men	Proportion of Accepted Women
1 - 300	0.7427350641	0.808635527
301 - 600	0.4962573289	0.5531306085
601 - 900	0.7174164811	0.7609233306
901 - 1200	0.7001018802	0.7236509994
1201 - 1500	0.6502250225	0.6628498728

Here are the previous proportions displayed as a bar chart:



V. Data Analysis

By only looking at the bar chart, it is clear that the proportion of accepted women tends to be higher than the proportion of accepted men. Although the difference seems not to be very

significant, it is still present. This leads to the question, is there convincing evidence that the proportions of accepted men and accepted women differ?

VI. Inference Procedure

I will conduct a matched pairs t-test to determine if the mean difference between the proportion of accepted men and accepted women is statistically significant in favor of women applicants. I will use an alpha level of 0.05 when testing for significance.

Condition Check:

Random: The random condition is satisfied since the sampling method was stratified randomly using a random list generator. Since the sample was taken from the top 1500 colleges ranked in popularity, the data can be generalized to this population.

Independence: Since it would be impossible to sample with replacement or conduct an experiment, it is important to follow the 10% rule to meet the condition for independence. I selected a total of 50 colleges, which is less than 10% of the population that includes 1500 colleges.

Large Counts: For a matched paired test, a sample size of 30 or greater is required to meet the Central Limit Theorem. Since my sample size is 50, I met the large counts condition.

Since the conditions were met, I am able to perform the inference procedure. I am testing to see if there is convincing evidence that the mean difference between the proportion of accepted women and the proportion of accepted men is greater than 0.

The inference procedure elicited a p-value extremely close to 0 (approximately $2.4 * 10^{-6}$) with a t-score of 5.14.

VII. Conclusion

Because our p-value is extremely close to 0 (approximately $2.4 * 10^{-6}$), which is less than our alpha value of .05, we reject the null hypothesis as we have convincing evidence that the mean difference of the proportion of women acceptances and men acceptances is greater than 0. Not only does the data show potential favoritism towards women applicants in the bar graph, but it is also supported by statistically significant evidence.

VIII. Reflection

Reflecting on the process, I do not believe that there were any errors committed that could have skewed the results. I could have included more colleges in the population, but I felt that the 1500 most popular colleges encompassed any college relevant to the study, as many colleges outside of the 1500 most popular were small colleges in rural or secluded areas. Including these colleges in the study could have skewed the results as, due to their extremely small student bodies, they were not very representative of the study as a whole.

I could have run several different inference procedures, such as a two-sample z-test for differences in proportions or a two-sample t-test for differences in means. I decided the matched pairs test was the most suitable in this scenario because it reduces the impact of inter-college variability and controls for college-specific factors, such as specific admission policies, leading to more precise insights into the differences in acceptance rates between men and women.

Since the p-value was so low, I was alarmed and interested in further researching potential causes. According to The Washington Post, this difference in proportions could be due solely to the fact that women outperform men in high school (Cohen, Kate). Some people hypothesize that this difference is due to school's wanting to maintain a gender balance on campus, which leads to higher acceptance rates for women (Duelix). Still unsure of what to make of the data, I decided to reach out to the admission departments of the schools with the highest

difference between accepted applicants and expected acceptances. Unfortunately, none of the universities that I contacted wanted to make a comment on the disproportional acceptance rates.

I believe that there could be a magnitude of reasons for the drastic difference in women and men acceptance rates. In most cases, the universities received a higher volume of female applicants than male applicants. The theory that the imbalance is caused by the universities' attempts to maintain a gender balance is not supported by this data, as we would expect higher acceptance rates for men. A more reasonable justification would be that women could be applying to less competitive majors than men, such as arts and humanities majors, while men are applying to more STEM-related and business majors. This could be due to socialization, as men have been encouraged to enter these more competitive fields for generations. Since arts and humanities majors tend to have higher overall acceptance rates than STEM and business majors, and if we assume that more men are applying to STEM and business, the higher acceptance rates for women would be reasonable. Additionally, since women have historically applied to STEM majors less than men, some universities have developed programs that encourage women to enter fields in STEM. These programs could also heavily contribute to potential favoritism towards women applicants.

Ultimately, there is an apparent difference between the acceptance rates of men and women, but there could be several factors independent of college admissions biases that could be influencing this difference. Future research could further explore these contributing factors and seek direct input from university admissions departments to gain deeper insights into the reasons for these differences.

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