California's Unlevel Playing Field

Disparity in Funding Between Collegiate Baseball and Softball in California

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Abstract

- Motivation: We intend to investigate whether or not the average expenses for baseball in California from 2015 to 2019 are truly greater than the average expenses for softball.
- Background: From Kylie's one num story: "Under Title IV federal student financial assistance programs, every year colleges across the United States must open their books and reveal the inner workings of their athletic departments. This requirement, set forth by the Equity in Athletics Disclosure Act, aims to ensure transparency in athletic funding, participation, and staffing. Since 2003, the Department of Education has collected data from 2,074 schools nationwide, 764 of which are located in California, through the Equity in Athletics Survey."
- research question: Are the average expenses of collegiate baseball greater than softball in California from 2015 to 2019
- data: we subsetted the data to only contain baseball and softball teams from California and then ran a two-sample t-test using the expenses for baseball and softball and the two samples. This subsets the data to only include 764 schools with 1528 teams total.
- Results: we obtain a very small p-value (p=1.35*e^-10) and find convincing evidence that the true average expenses for baseball are larger than for softball in California between 2015 to 2019.

Introduction

1. From Kylie's one num story: "In the sunny state of California, where the crack of the bat and the cheers of fans echo through the air, a tale of two sports unfolds. One is blessed with seemingly unlimited funds and admiration, and the other is left to fend for itself. A stark contrast in funding has long persisted between baseball and softball programs. This discrepancy becomes glaringly evident when examining the numbers"
2. "For decades, college baseball has enjoyed a lion's share of financial support, with state-of-the-art facilities, top-tier coaching staff, and generous scholarship allocations. Meanwhile, softball programs, though equally deserving of investment and recognition, are often overlooked and underfunded. The disparity serves as a barrier to the growth and development of female athletes, perpetuating inequality and hindering their ability to compete at the same level as their male counterparts. Denied access to resources and opportunities, female athletes are at a disadvantage both on and off the field, facing obstacles in their pursuit of academic and athletic success."
3. Quote from link below: "The softball team is changing for practice in the parking lot as there are no on site locker rooms at their field which is located about a half mile from the athletic offices; the team's male counterpart, the baseball team, enjoys use of a locker room and offices located right next to its field.' Other noted disparities include field renovations, equal access to scheduling for use of the indoor hitting facility, and coaches' salaries. 2"
4. Are the average expenses of collegiate baseball truly greater than softball in California from 2015 to 2019?
    a. Answer this by averaging over 2015 to 2019 for baseball and softball and running a two sample t-test on expenses to determine if there is a true difference (one-sided)
5. https://heinonline.org/HOL/Page?collection=journals&handle=hein.journals/tenn86&id=674&men_tab=srchresults

Data

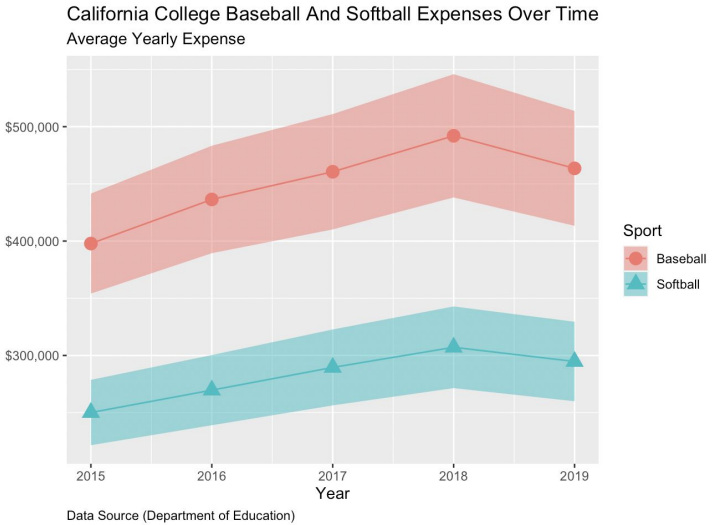
- Collection of data:
  - required by Equity in Athletics Disclosure Act
  - collected by The Department of Education through the Equity in Athletics Survey
  - Self reported by school annually for each athletic team
  - Started in 2003 but Tidyverse data is from 2015-2019
  - In-text: (Department of Education) ? (is this the right way to do this)
  - We will subset to only California
  - Each observation is a single collegiate sports team from a specific university
  - Inclusion: must be a US college with a title 9 federal student financial assistance program
    - In ours also must be in California
  - Exclusion: There are no exclusion criteria (is this true?)
  - Variables used are college, state, city, number of participating women, number of participating men, expenses for women (in dollars), expenses for men (in dollars), revenue for women (in dollars), and revenue for men (in dollars)
  - Variables of interest are sports, college, state, and expenses (in dollars)
  - Outcome is to determine if there is a difference in the expenses between men and women/softball and baseball

Methods

- Requirements for school inclusion: all co-educational postsecondary institutions that receive Title IV funding (i.e., those that participate in federal student aid programs) and that have an intercollegiate athletics program
- 2,074 schools in the U.S.
- 2 sample t-test using expenses or softball and baseball as the two samples
    - And confidence interval for true difference
- Changed NA to 0 for expenses for math
- Only included schools in California
- Data: each observation is a specific collegiate athletic team for each year in California
- Use of R to run t-test and ggplot to graph
- Limitation: softball and baseball are not exactly equivalent sports so we will keep this in mind during analysis

Results

Graph



Table

Table 1: CA Collegiate Baseball and Softball Expenses

Year	Expenses Baseball ($)	Expenses Softball ($)
2015	397818.2	250096.5
2016	436379.8	269675.2
2017	460608.8	289536.4
2018	492032.7	307159.0
2019	463564.6	294723.3

Note:

Source: Department of Education

Results Writing

H_0: $\mu_{Baseball}$-$\mu_{Softball}$ = 0

H_a: $\mu_{Baseball}$-$\mu_{Softball}$ > 0

t-value: 6.36

p-value: 1.35e-10

```
# A tibble: 1 x 8
  .y.                group1   group2      n1    n2 statistic    df        p
* <chr>              <chr>    <chr>    <int> <int>     <dbl> <dbl>    <dbl>
1 total_exp_menwomen Baseball Softball   775   693      6.36 1321. 1.35e-10
```

Discussion

Our analysis consists of a two-sample t-test performed in R that compares whether the average expenses of baseball are greater than the average expenses of softball in California from 2015-2019. Given our analysis, we have convincing evidence to reject the null hypothesis. Rather, we have statistically significant evidence to support the alternative hypothesis that the mean expenses of baseball are greater than the mean expenses of softball (p-value of 1.35e-10) for college baseball and softball teams in California from 2015-2019. Additionally, based on our results (visualizations), it is clear that baseball has higher expenses on average compared to softball as seen by the difference in heights of the lines. This is further shown in our table, where every year from 2015 to 2019 baseball appears to have higher mean expenses than softball. However, the expenses for both sports tend to increase at a similar rate over time, where there is an overall positive trend up until 2019 as well. Lastly, we can also examine the variability of both the average expenses of both sports by looking at the shaded regions of the graph. From this, there appears to be more variability in the average expenses for baseball than for softball in any particular year.

Discussion cont’d

- the results are practically significant: > $100,000 difference between the sports’ avg. expenses (sometimes more than half of softball expense?)

- cannot draw cause and effect conclusion because this is observational

- can only generalize these results to colleges/universities similar to those included in the study

    - California, baseball and softball teams, title 9 federal student financial assistance program

- potential source of error or bias:

    - Baseball and softball are “more popular” in CA compared to other states, so results don’t necessarily reflect other states??

Conclusion

Through our investigation of average expenses between collegiate baseball and softball, we found that baseball consistently has higher average expenses in California over the years. We created multiple visualizations, such as a line graph and a table, and performed a two sample t-test using the expenses of softball and baseball teams in California from 2015-2019 in order to come to this conclusion. While we have extremely strong evidence of this statistically, the visual trends in our results provides further evidence. Moreover, we also found that the average expenses for baseball varied more throughout the years compared to softball. Lastly, despite the magnitude of the gap between the average expenses in any given year, we were able to see a similar trend in average expense rate over time for both baseball and softball. For further research, we wonder if this pattern in average expenses between the two exists through 2024, but since our data only includes data up to 2019, we can only assume.

References

https://heinonline.org/HOL/Page?collection=journals&handle=hein.journals/tenn86&id=674&men_tab=srchresults

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- https://ope.ed.gov/athletics/#/

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- https://github.com/rfordatascience/tidytuesday/blob/master/data/2022/2022-03-29/readme.md (data set)