An investigative study of retention rates in physics graduate programs

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Introduction

- We know Graduate degree holders play a central role in the growth of science and technology for both institutions and the country.
- By determining which groups and institutions have the highest PhD completion rate we can look for causes behind such success and emulate them in other programs.
- The Integrated Postsecondary Education Data System (IPEDS) [1] and The Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS) [2] are national multi-departmental data sets.
- We develop a new measurement for PhD completion rate we call PCR. [3]
- Traditional equations for retention could not be used with the data.
- This is due to when the data is collected for these sources.
- We are able to gain more nuanced information about how PhD completion is affected by factors like race or sex using PCR.

Research Questions

1. **How can IPEDS be used to calculate Retention and PhD Completion rates?**
2. **What does IPEDS offer that other data sets do not?**

Methods

- IPEDS was trimmed to 58 institutions to compare data trends to our collaborators results from similar data
- Only the general physics degree was considered due to it being 91% physics degrees.
- IPEDS contains data for degrees earned and breakdown based off sex and race.
- The GSS contains data for full-time student enrollment based on sex and racial breakdowns.
- The data sets were linked by using the Universities UNITID variable,
- The data was then used to calculate PCR based off the equation developed by previous work

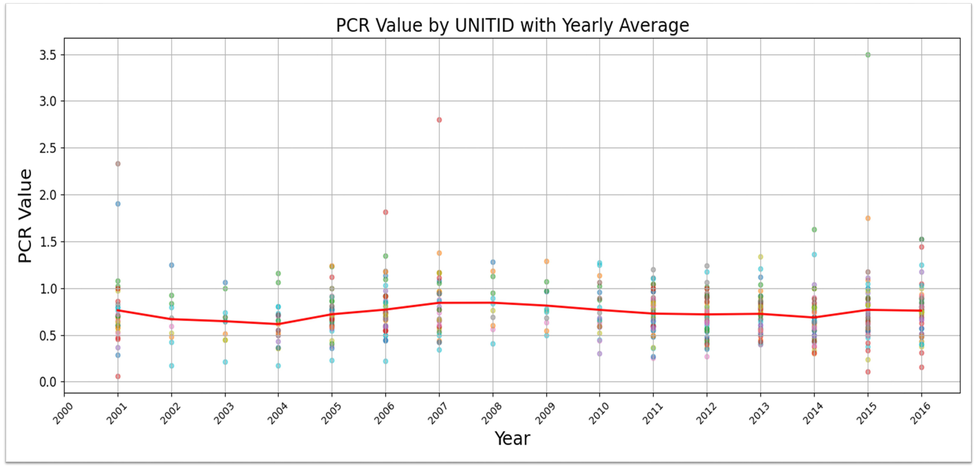
$$(PCR)_n^{(x)} = \frac{\sum_{i=-x}^{x} P_{n+6+i}}{\sum_{j=-x}^{x} F_{n+j}}$$

P_n : Degrees Awarded
F_n : Full time first year students enrolled in the fall semester
x : a variable that determines how many years +/- we average over, for our data it is 1.

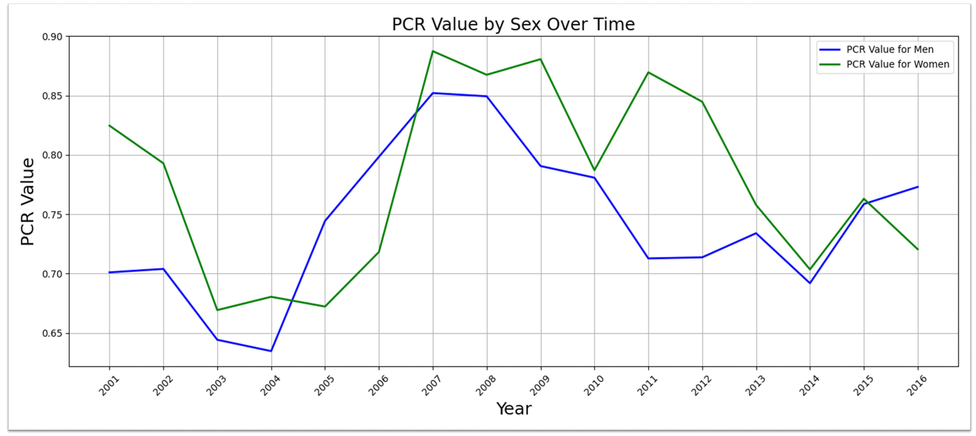
- We chose x = 1 as the majority of PhD's are earned in 5 to 7 years

Results

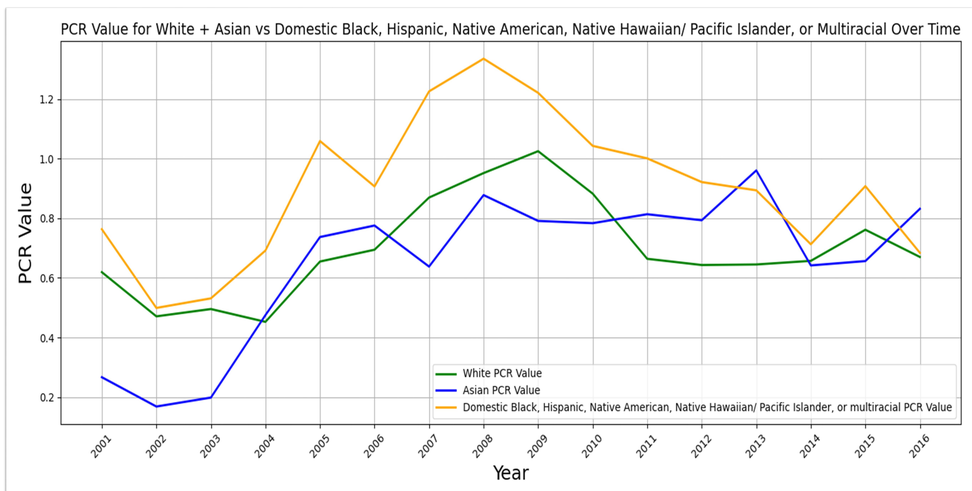
PCR National Values



PCR value for sex



PCR Values for Domestic Racial Breakdown



Discussion and Conclusions

- For the first graph, we expect a PCR of around .6 [4] but we find the average is higher .739
- The second graphs show that women are more likely to have a higher PCR value compared to men.
- The third shows individuals that domestic students that are Black, Hispanic, Native American, Native Hawaiian/ Pacific Islander, or multiracial are more likely to have a higher PCR value compared to White or Asian domestic students.
- We can expect these groups to have a higher likelihood of completing their PhD's when compared to Men or White and Asian domestic students.

Future Work

- Having shown the process can be used for the IPEDS data, we can apply the same process to other types of physics degrees and even other programs.
- Perform greater breakdowns about specific racial/sex combinations.
- With the changes to the data collection since 2017 we can start apply our method to masters students as well

Acknowledgements

Elisa supported through Kansas State University's REU program NSF award number 2244539

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Questions?
What is a useful retention calculation from aggregated program data?